

EXAMINING ENHANCED RECOVERY AFTER SURGERY PROTOCOL  
COMPLIANCE

by

JONATHON D BAICH, BSN, RN & JOSEPH J VECORE, BSN, RN

A quality improvement project submitted in partial fulfillment of the  
requirements for the degree of

DOCTOR OF NURSING PRACTICE

2021

Oakland University  
Rochester, Michigan

APPROVED BY:

---

Signature of DNP Team Chair    Date

---

Signature of DNP Team Member    Date

## Dedication and Acknowledgement

### **Dedication**

To our families who have stood by us every step of the way and believing in us. We can never thank you enough for encouraging us to achieve our dreams. To our friends who supported us, thank you for reading, editing and being interested in our project. You have been there to pick us up when we are down and helping us get back up to continue on this journey, for that we are grateful. To our parents who have been supporting our dreams and providing emotional support. To our classmates who have been riding along with us on this rollercoaster, thank you for understanding the struggles and being a listening ear without judgement.

### **Acknowledgment**

To our chair, Dr. Linda McDonald, for believing in our project and supporting us through our doctorate experience, your guidance has been appreciated. To Howard Brown, thank you for your support and generosity throughout this doctorate experience.

## Abstract

**Background:** Enhanced recovery after surgery (ERAS) programs began in health institutions to improve patient outcomes and decrease hospital length of stay. ERAS protocols have shown to decrease hospital associated costs as well as reducing opioid consumption.

**Purpose:** This project aimed to determine how overall compliance to ERAS protocol, as well as how compliance to individual components of the ERAS protocol, affected hospital length of stay (LOS). In addition, the relationship between compliance and opioid consumption was assessed.

**Methods:** This quality improvement project consisted of a retrospective chart review of 100 patients undergoing colorectal surgery, boarded as ERAS.

**Results:** Key results found that as compliance to ERAS protocol increased, hospital LOS decreased. Additionally, statistically significant difference was noted in LOS between the levels of Foley catheter discontinuation ( $p < .001$ ) as well as mobilization by postoperative day (POD) 1 ( $p = .014$ ).

**Conclusion:** When opioid consumption was investigated, it was shown that as opioid consumption increased, hospital LOS increased. This project helped demonstrate that ERAS protocol compliance as well as limiting opioid consumption in the perioperative period leads to a decrease in hospital LOS.

Key Words: *ERAS, compliance, hospital LOS, opioids*

## Table of Contents

<b>Background and Significance</b> .....	1
<b>Literature Review</b> .....	2
Effects of ERAS Protocols .....	3
Length of Hospital Stay .....	3
Bowel Function .....	4
Overall Costs.....	4
Complication Rates .....	5
Adherence to ERAS .....	6
<b>Problem Statement</b> .....	7
<b>Conceptual Framework</b> .....	8
<b>Project Methodology</b> .....	9
Design.....	9
Data Collection Procedure.....	10
Data Analysis.....	11
Budget .....	11
<b>Results</b> .....	11
Patient Demographics .....	11
Compliance Rates .....	11
<i>Table 1: Frequency Table for the Rate of Compliance for Components of the ERAS Protocol</i> .....	12
<i>Table 2: Summary Statistics Table for Total ERAS Compliance, Morphine Milligram Equivalents, and Length of Stay</i> .....	14

Total ERAS Compliance and Hospital LOS .....	14
<i>Table 3: Spearman Correlation Results Between Total ERAS Compliance and     Length of Stay</i> .....	15
MME and Hospital LOS.....	15
<i>Table 4: Spearman Correlation Results Between Morphine Milligram     Equivalents and Length of Stay</i> .....	15
MME and Total ERAS Compliance .....	15
<i>Table 5: Spearman Correlation Results Between MME and Total ERAS     Compliance</i> .....	16
ERAS Components and Hospital LOS .....	16
Preoperative ERAS Components .....	16
Intraoperative ERAS Components .....	16
Postoperative ERAS Components.....	17
<i>Table 6: Two-Tailed Mann-Whitney Test for Length of Stay by         Discontinuation of Foley Catheter Postoperative Day 1</i> .....	17
<i>Table 7: Two-Tailed Mann-Whitney Test for Length of Stay by         Mobilization by Postoperative Day 1</i> .....	18
<b>Discussion</b> .....	18
Hospital Length of Stay.....	18
Secondary Outcomes.....	19
ERAS Protocol Components .....	19
ERAS Compliance .....	20
<b>Recommendations and Limitations</b> .....	22

Recommendations .....	22
Limitations.....	22
<b>Protocol Development</b> .....	23
ERAS Protocol Creation .....	23
ERAS Protocol Implementation .....	26
Pre-Hospital .....	26
Preoperative .....	27
Surgeon.....	27
Anesthesiologist.....	27
Preoperative Registered Nurse .....	28
Pharmacy .....	29
Intraoperative .....	29
CRNA.....	29
Circulating Registered Nurse.....	29
Postoperative.....	30
Post-Anesthesia Care Unit- Registered Nurse.....	30
Postoperative Unit Registered Nurse .....	30
Physical Therapy.....	31
ERAS Protocol Follow-Up.....	31
<b>Implications for Nursing Practice</b> .....	31
<b>Contributions to the Doctor of Nursing Practice Essentials</b> .....	32
<b>Conclusion</b> .....	33
<b>References</b> .....	34

<b>Appendix A.</b> Colorectal ERAS Protocol.....	39
<b>Appendix B.</b> Calculating Morphine Milligram Equivalents.....	40
<b>Appendix C.</b> ProMedica Toledo Hospital Enhanced Recovery After Surgery:	
Colorectal Surgery .....	41
<b>Appendix D.</b> ProMedica Toledo Hospital Enhanced Recovery After Surgery:	
Hospital Checklist.....	42
<b>Appendix E.</b> Institutional Review Board Approval .....	43
<b>Appendix F.</b> Data Collection Tool .....	44

## EXAMINING ERAS PROTOCOL COMPLIANCE

### EXAMINING ENHANCED RECOVERY AFTER SURGERY PROTOCOL COMPLIANCE

#### **Background and Significance**

Nearly two million Americans have become dependent on opioids due to misuse and more than four million Americans use prescribed opioids for non-medical reasons (Brandal et al., 2017). Since 2000, opioid overdose related deaths have quadrupled (Mauerman et al., 2017). This increase may be attributed to the substantial amount of opioid medications prescribed by medical professionals. In 2010, over 16,000 deaths were attributed to the use of prescription narcotics.

The development of enhanced recovery after surgery (ERAS) programs have allowed for improved patient outcomes with the use of a multimodal approach. The use of ERAS for surgical procedures also reduces perioperative complications that could lead to increased morbidity, mortality, and length of stay (Bryan, 2017). Additionally, by utilizing a multimodal anesthesia approach, ERAS protocols help limit opioid use during the perioperative period. Advantages of a multimodal approach include reduction of opioid-related adverse drug events, postoperative nausea and vomiting, postoperative ileus, urinary retention, chronic opioid dependence, and overall length of stay (Wilson, 2019). The use of these medications decreases the need for opioids and avoids events that may lead to morbidity, mortality, and increased length of stay (Wilson, 2019). The multimodal approach with ERAS includes the use of regional anesthesia and analgesia with opioid-sparing drugs such as dexamethasone, dexmedetomidine, lidocaine, acetaminophen, ketamine, cyclooxygenase inhibitors, and gabapentin.

Patients undergoing colorectal surgery are at a high risk for prolonged recovery, oftentimes attributed to the side effects of opioids (Wilson, 2019). The use of ERAS in colorectal patients helps improve postoperative pain management and may potentially decrease



## EXAMINING ERAS PROTOCOL COMPLIANCE

opioid use and its associated side effects. Colorectal ERAS protocols have also been shown to improve recovery time by having a faster return of function and mobility, a decrease in opioid-related adverse drug events, postoperative morbidity and mortality, and a decrease in hospital length of stay (LOS). ERAS protocols have been successfully used for colorectal patients to limit the use of opioid medication and improve patient outcomes (Wilson, 2019).

A quality improvement (QI) study was performed at Beaumont Hospital-Royal Oak. A retrospective chart review was performed on 100 patient charts who were boarded as ERAS for colorectal surgery. This study examined ERAS compliance to 12 components of the colorectal ERAS protocol at Beaumont Hospital- Royal Oak. Using the data collected, an ERAS protocol was developed for ProMedica Hospital-Toledo. To date, ProMedica Hospital-Toledo does not have a colorectal ERAS protocol.

### **Literature Review**

The purpose of this literature review was to answer the following question: In adult patients undergoing colorectal surgery, does compliance to ERAS protocol, as opposed to non-compliance, effect patient outcomes during the perioperative period, specifically opioid consumption during the postoperative period and hospital length of stay.

The use of ERAS in colorectal patients helps improve postoperative pain management, may potentially decrease opioid use and ultimately allows for a quicker return to pre-hospital functioning (Wilson, 2019). In addition to improving pain management, ERAS protocols decrease hospital length of stay, improve patient outcomes, decrease cost, and allow early return of bowel function (Hawkins et al., 2018; Lv et al. 2012; Ni et al. 2019; Siotos et al., 2018). It is prudent that ERAS protocols be used for colorectal patients to limit the use of opioid medication, decrease cost and hospital length of stay, while improving patient outcomes.

## EXAMINING ERAS PROTOCOL COMPLIANCE

### Effects of ERAS Protocols

#### *Length of Hospital Stay*

Implementation of ERAS protocols versus standard protocols for colorectal surgeries have been shown to improve patient outcomes. Patient's length of hospital stay is shorter when ERAS protocols are implemented, allowing a quicker return to pre-hospital function. Separate meta-analyses performed by Ni et al. (2019) and Lv et al. (2012) showed that hospital length of stay was reduced in ERAS groups versus non-ERAS groups. Ni et al. (2019) concluded that the ERAS group had a shorter postoperative hospital stay by an average of two days ( $p = .00$ ). Lv et al. (2012) reported a mean difference of 1.77 days ( $p < 0.00001$ ) for patients who were treated with the ERAS protocol versus the traditional group.

Siotos et al. (2018) performed a meta-analysis that also looked at the impact of fast-track surgery (FTS) for patients undergoing laparoscopic gastrointestinal surgeries. In this study, the concept of FTS is the same as ERAS. It was concluded that the hospital LOS was reduced in patients who were scheduled under FTS by a mean difference of -2.24 days (95% CI -2.63 to 1.85 days).

Other studies also looked at pre- and post-ERAS implementation and how a patient's hospital LOS was affected. An observational cohort study by Arrick et al. (2019), noted that mean hospital LOS was significantly reduced (10.1 vs 6.9 days;  $p \leq .05$ ) in the post-ERAS group, and a retrospective, observational cohort study by Hawkins et al. (2018) found that median LOS was decreased from 5.2 to 3.5 days ( $p < .001$ ) in the post-ERAS group. A retrospective review of prospectively collected data was performed by Liroso et al. (2018), comparing pre-ERAS and ERAS groups. It was noted that the overall mean hospital LOS was

## EXAMINING ERAS PROTOCOL COMPLIANCE

reduced (5.4 vs 6.3 days;  $p < .001$ ) in the ERAS group versus the pre-ERAS group (Lirosi et al., 2018).

### ***Bowel Function***

Discharge criteria must be met by the patient in order to be sent home after surgery. Use of an ERAS protocol allows for earlier return of bowel function following colorectal surgery, and allows for oral intake to resume more quickly. This helps prevent postoperative complications that increase hospital length of stay. One of the most common postoperative complications from colorectal surgery is a prolonged ileus, which is also a devastating side effect of opioid use. During the postoperative period, prolonged ileus occurs in 10-17% of cases (Moghadamyeghaneh et al., 2016). Implementation of an ERAS protocol can help decrease the incidence of ileus by utilizing opioid sparing techniques, early mobilization, and initiating an oral diet on postoperative day 0.

Ni et al. (2019) found a significant difference in time to first flatus (-12.18 hours,  $p = .00$ ) and time to first defecation (-32.93 hours,  $p = .00$ ) between the ERAS group and the traditional care group. Similarly, a study conducted by Siotos et al. (2018) found that the use of an ERAS protocol significantly reduced the time to first flatus from 1.2 days to 0.67 days, influencing a one day decrease in postoperative stay.

Discharge criteria must be met by the patient in order to be sent home after surgery. Earlier return of gastrointestinal function allows for oral intake to resume more quickly which helps to expedite the discharge process. Utilizing ERAS protocols and decreasing the amount of opioids allows for a decreased hospital length of stay which ultimately decreases overall hospital costs.

### ***Overall Costs***

## EXAMINING ERAS PROTOCOL COMPLIANCE

The use of ERAS protocols not only improve patient outcomes, but they also have a significant financial impact. The average cost for all colectomy-related hospital stays was found to be approximately \$20,819 in a study conducted by Dor et al. (2013). Studies performed by Hawkins et al. (2019) and Nelson et al. (2016) found that implementation of ERAS protocols for colorectal surgery has a profound financial impact. Nelson et al. (2016) found ERAS protocols decreased hospital costs by \$1000-\$7000, depending on the patient and their comorbidities. Furthermore, Hawkins et al., (2019) found that utilization of ERAS protocols reduced the median variable costs by 32.7% compared to those who did not receive an ERAS protocol; however, a comparison of pre- and post-ERAS costs was not able to be determined. Without specific costs, the actual cost savings are unknown. It has also been shown that laparoscopic colectomy surgery versus open colectomy surgery significantly reduced the overall costs by 7.6% (Dor et al., 2013). Along with cost-savings appreciated by the laparoscopic approach to colorectal surgery, the addition of ERAS protocols allows for a further reduction in overall costs by decreasing hospital length of stay.

### ***Complication Rates***

Complications can occur after any type of surgery. As foreign objects are introduced to the body, there is added stress and the body's homeostatic mechanisms are disrupted. There are a multitude of complications that can occur postoperatively, including pneumonia, prolonged ventilation or reintubation, sepsis, and surgical site infection. Arrick et al. (2019) found with a high level of ERAS adherence (>75%), overall complication rates decreased from 31.5% to 11.2%. High levels of ERAS adherence led to decreased pulmonary complications which was attributed to early mobilization, appropriate pain control and fluid management. Ultimately,

## EXAMINING ERAS PROTOCOL COMPLIANCE

these components likely played a role in atelectasis reversal, improved gas exchange, a reduction in diaphragmatic splinting and limited respiratory excursion (Arrick et al., 2019).

Two separate meta-analyses conducted by Lv et al. (2012) and Vardhan et al. (2010) both found that patients who underwent colorectal surgery with an ERAS protocol, had significantly fewer postoperative complication rates ( $p < .00001$ ) compared to patients who received standard care. Hawkins et al. (2018) also concluded ERAS protocols for colorectal surgical patients lead to a significant decrease in complication rates ( $p < .001$ ) when compared to standard treatment. Specifically, Hawkins et al. (2018) mentions that there was a reduction in surgical site infections, development of sepsis, as well as a reduction in developing pulmonary complications

### **Adherence to ERAS**

In order for ERAS protocols to succeed, high levels of adherence must be met. A study by Ripolles-Melchor et al. (2019) examined 13 facilities with ERAS protocols and found that low adherence to ERAS protocols resulted in more patients with postoperative complications. The study found that adherence levels of less than 50% resulted in complications in 13.1% of patients. Adherence rates of 75%-90% resulted in a 11.6% complication rate and greater than 90% adherence led to a complication rate of only 9.3% (Ripolles-Melchor et al., 2019).

Colorectal ERAS protocols involve several components that must be completed in each phase of a surgical admission-preoperative, intraoperative and postoperative. While protocols may vary slightly based on health institutions, components for perioperative phases (preoperative, intraoperative, postoperative) are typically similar. An observational cohort study of elective colorectal surgical patients examined compliance rates in each perioperative phase of the ERAS protocol (Arrick et al., 2019). Arrick et al. (2019) found the high adherence group

## EXAMINING ERAS PROTOCOL COMPLIANCE

(defined as  $\geq 75\%$  adherence) had a decrease in both complication rates and mean hospital LOS compared to the low adherence group. Adherence to the ERAS protocol was noted to be highest in the preoperative and intraoperative components, however, was found to be lacking in the postoperative component. A systematic review conducted by Fagard et al. (2019) investigated the effects of ERAS protocols in 21 studies that included 3,495 patients undergoing colorectal surgery. Fagard et al. (2019) found that the preoperative and intraoperative ERAS components had a higher adherence rate than postoperative adherence components. Arrick et al. (2019) also concluded a high adherence rate in both the preoperative and intraoperative phase (82% adherence) in relation to the postoperative adherence (60%). Further studies should be conducted to verify these findings and explore possible rationale (Fagard et al., 2019).

A number of studies have been conducted to determine the outcomes of ERAS on patients undergoing colorectal surgery. Findings from these studies consistently indicate that implementation of ERAS improves numerous outcomes, including average hospital LOS (Lv et al., 2012; Ni et al., 2019; Siotos et al., 2018), time to first defecation (Ni et al., 2019; Siotos et al., 2018), overall complication rates (Lv et al., 2012; Ni et al., 2019), and a decrease in overall costs (Siotos et al., 2018). Adherence to ERAS protocols in the postoperative period is low (Arrick et al., 2019; Fagard et al., 2019), and further investigation is needed. Few studies actually reported opiate consumption in the postoperative period and its correlation with ERAS compliance, indicating that future studies are needed to explore this concept.

### **Problem Statement**

In order for the ERAS protocol to be successful in improving patient outcomes, health care providers and patients need to adhere to the ERAS protocol. Beaumont Hospital-Royal Oak currently implements an ERAS protocol for eligible patients undergoing colorectal surgery. The

## EXAMINING ERAS PROTOCOL COMPLIANCE

initiation of the ERAS protocol begins prior to hospital admission for surgery and continues until discharge.

This project analyzed the specific criteria used in a colorectal ERAS protocol (Appendix A) as well as developed education for clinicians regarding expectations of ERAS protocol use. Utilizing the evidence found from this quality improvement project at Beaumont Hospital-Royal Oak, an ERAS protocol was developed for presentation to hospital administrators at ProMedica Toledo Hospital.

The purpose of this study was to examine the rate of compliance to the ERAS protocol during colorectal surgery at Beaumont Hospital- Royal Oak. The different levels of compliance were evaluated for their effects on the following patient outcomes: opioid consumption during the postoperative period and hospital length of stay.

### **Conceptual Framework**

The Six Sigma Quality Improvement model was used for this quality improvement project. Utilizing Six Sigma, this project focused on process characterization that included defining the project and process measurement, evaluating existing sigma, and analyzing the process data. Also, process optimization and simulation were incorporated, which included improving and optimizing the process, evaluating the new sigma, and maintaining the process (Taghizadegan, 2006). This model of Six Sigma helped improve ERAS compliance and overall customer (patient) satisfaction, which is the biggest priority of any organization (Taghizadegan, 2006). Patients who are undergoing any type of surgery hope for the best outcome possible. The use of ERAS will provide patients with a better surgical experience by facilitating a quicker return to oral intake, quicker hospital discharge, and quicker recovery to pre-hospital functioning.

## EXAMINING ERAS PROTOCOL COMPLIANCE

### **Project Methodology**

#### **Design**

This project consisted of three phases. In the first phase, a retrospective chart review was conducted on patients who underwent colorectal surgery with the use of an ERAS protocol at Beaumont Hospital- Royal Oak. The chart review focused on specific components of the ERAS protocol in the three perioperative phases (pre-, intra-, and postoperative). The charts were retroactively reviewed from December 31<sup>st</sup>, 2019 until data was collected on 100 patients. Phase two involved analyzing compliance to the ERAS protocol and correlating the data with patient outcomes. Based on the findings from Beaumont Hospital-Royal Oak, phase three involved developing a colorectal ERAS protocol for ProMedica Toledo Hospital. See Appendix A for the components of ERAS protocol that were analyzed for compliance.

Based on review of the literature, high compliance to the components of the ERAS protocol led to better outcomes. For this project, a high rate of compliance was defined as greater than 70% of the ERAS components followed, moderate compliance included 40-70% of the ERAS components followed, and low compliance had less than 40% of the ERAS components followed. During the chart review, a component was considered “complied to” if it was documented in the patient’s chart. Compliance included medications being scanned as given, charted evidence of patient mobilization on POD 1 in the “Care Activities” section in EPIC, and discontinuation of the Foley catheter by POD 1. A charted nasogastric tube (NGT) during surgery was the only component considered “not adhered to,” as this ERAS protocol looked to avoid NGT insertion altogether. Upon completion of the chart reviews, evaluation of the patient outcomes (opioid consumption and length of stay) were compared between the three compliance groups (high, moderate, and low). After obtaining the results and noting where lack of



## EXAMINING ERAS PROTOCOL COMPLIANCE

compliance occurred, appropriate and specific education was provided to the perioperative staff. Education was designed for the preoperative, intraoperative, and postoperative areas to discuss the importance of ERAS and the effect lack of compliance has on patient outcomes. The education was given to staff in their respective areas of work and took place during a monthly staff meeting at Beaumont Hospital-Royal Oak.

After data was reviewed and synthesized from Beaumont Hospital-Royal Oak, an ERAS protocol was developed for ProMedica Toledo hospital. Implications to practice at ProMedica Toledo Hospital included a proposed change of practice to all health care members involved in perioperative patient care. A presentation was delivered to hospital administration and surgical staff regarding the importance of an ERAS protocol. The findings from the quality improvement project as well as implementation of the ERAS protocol was discussed.

### **Data Collection Procedure**

Retrospective chart reviews were conducted on 100 patients who had undergone colorectal surgery at Beaumont Hospital-Royal Oak in 2019. The inclusion criteria included patients 18 to 80 years of age undergoing scheduled colorectal surgery boarded as ERAS, American Society of Anesthesiologist (ASA) Physical Status Classification of 2 or 3, non-diabetic and not taking prescribed opioids prior to surgery. Exclusion criteria included surgeries that were viewed as “radical,” included other surgical specialties, or surgeries in which an epidural catheter was placed for pain management. The chart review examined the compliance to the components of ERAS during the preoperative, intraoperative and postoperative periods (Appendix A). When calculating opioid consumption during the intraoperative and postoperative periods, the morphine milligram equivalents (MME) scale (Appendix B) was used to provide an accurate comparison of opioid consumption between compliant and noncompliant groups.

## EXAMINING ERAS PROTOCOL COMPLIANCE

### **Data Analysis**

Data analysis was performed with Intellectus Statistics (2020). Descriptive statistics (mean, median, mode, and standard deviation) were used when comparing opioid administration, and hospital length of stay. After the analysis of compliance rates of individual ERAS components (Appendix A), using descriptive statistics, educational interventions were developed to target areas of noncompliance.

### **Budget**

For data collection there was not a budget required since the study was completed by nurse anesthesia students. For the statistical analysis of the data, two hundred dollars was spent on the Intellectus Statistics program that assisted with data analysis and organization.

## **Results**

### **Patient Demographics**

One hundred charts were reviewed of patients undergoing colorectal surgery boarded as ERAS at Beaumont Hospital-Royal Oak. Fifty-eight participants were male and forty-two were female. Thirty seven percent of patients were classified as an ASA 2, while 63% were classified as an ASA 3.

### **Compliance Rates**

All components were classified as a high rate of compliance (> 70%), except for consumption of a carbohydrate drink and discontinuation of a Foley catheter on POD 1. Only one patient was noted to have consumed the carbohydrate drink on the day of surgery, indicating a low rate of compliance. The Foley catheter was discontinued in 65% of the patients on postoperative day 1, which is classified as a moderate rate of compliance. Table 1 illustrates the components of the ERAS protocol that were measured and the rates of compliance.

## EXAMINING ERAS PROTOCOL COMPLIANCE

**Table 1***Frequency Table for Rate of Compliance for Components of the ERAS Protocol*

Variable	<i>n</i>	%
Attendance of B-ready Clinic		
No	7	7.00
Yes	93	93.00
Consumption of Carbohydrate Drink		
No	99	99.00
Yes	1	1.00
Preoperative Administration of gabapentin		
No	21	21.00
Yes	79	79.00
Preoperative Administration of Entereg		
No	5	5.00
Yes	95	95.00
Intraoperative Administration of IV Tylenol		
No	4	4.00
Yes	96	96.00
Intraoperative administration of IV Toradol		
No	15	15.00
Yes	85	85.00
Administration of IV fluids ( $\leq 3$ ml/kg/h)		
No	4	4.00
Yes	96	96.00
Avoidance of NGT Insertion		
No	22	22.00
Yes	78	78.00

## EXAMINING ERAS PROTOCOL COMPLIANCE

Administration of Lidocaine Infusion		
No	0	0.00
Yes	100	100.00
Antiemetics Administered		
No	0	0.00
Yes	100	100.00
D/C Foley Catheter POD 1		
No	35	35.00
Yes	65	65.00
Mobilization by POD 1		
No	5	5.00
Yes	95	95.00

---

*Note.* Due to rounding errors, percentages may not equal 100%. D/C= discontinue; IV= intravenous; kg= kilogram; ml= milliliter; NGT= nasogastric tube; POD= postoperative day.

Data was analyzed using the Intellectus Statistics program (2020). Descriptive statistics were utilized to compute total ERAS compliance, total MME and hospital LOS. For this project, a high rate of compliance was defined as greater than 70% compliance of the ERAS components followed, a moderate rate of compliance included 40-70% compliance to the ERAS components and a low rate of compliance comprised of less than 40% compliance to the ERAS components. Total ERAS compliance was defined as the number of components of the ERAS protocol that were followed. The average total ERAS compliance was 9.83 out of 12 items. ERAS compliance was found to range from six to 12 components followed correctly.

The ERAS protocol was further divided into preoperative, intraoperative and postoperative compliance. Preoperative compliance was moderate at 67% compliance,

## EXAMINING ERAS PROTOCOL COMPLIANCE

intraoperative compliance was high at 92.5% compliance, and postoperative compliance was high at 80% compliance.

Opioid administration was compared by using morphine milliequivalents. The average MME was 49.70 milligrams (mg), and the average hospital length of stay was 104.84 hours, as shown in Table 2.

**Table 2**

*Summary Statistics Table for Total ERAS Compliance, Morphine Milligram Equivalents, and Length of Stay*

Variable	<i>M</i>	<i>SD</i>	<i>n</i>	<i>SE<sub>M</sub></i>	Min	Max	Skewness	Kurtosis
Total ERAS Compliance	9.83	1.09	100	0.11	6.00	12.00	-0.87	0.79
MME (mg)	49.70	73.53	100	7.35	0.00	373.00	2.04	3.94
LOS (hours)	104.84	59.12	100	5.91	2.50	382.00	1.84	4.55

*Note.* ERAS= early recovery after surgery; LOS= length of stay. MME= morphine milligram equivalents.

### **Total ERAS Compliance and Hospital LOS**

This study used Spearman correlation to analyze the relationship between total ERAS compliance and LOS. A significant negative correlation was observed between total ERAS compliance and LOS and is shown in Table 3. This correlation indicates that as total ERAS compliance increases, LOS tends to decrease.

**Table 3**

*Spearman Correlation Results Between Total ERAS Compliance and Length of Stay*

## EXAMINING ERAS PROTOCOL COMPLIANCE

Combination	$r_s$	95% CI	$p$
Total ERAS Compliance- Hospital LOS (hours)	-0.23	[-0.41, -0.04]	.020

*Note.* ERAS= early recovery after surgery; LOS= length of stay.

**MME and Hospital LOS.**

The relationship between MME and hospital LOS was assessed utilizing Spearman correlation analysis. The result of the correlation was examined based on an alpha value of .05. Table 4 displays that a significant positive correlation was observed between MME and LOS. This correlation indicates that as MME increases, LOS tends to increase.

**Table 4**

*Spearman Correlation Results Between Morphine Milligram Equivalents and Length of Stay*

Combination	$r_s$	95% CI	$p$
MME (mg) and LOS (hours)	0.48	[0.31, 0.62]	< .001

*Note.* LOS= length of stay; mg= milligrams; MME= morphine milligram equivalents.

**MME and Total ERAS Compliance**

The relationship between MME and total ERAS compliance was evaluated utilizing Spearman correlation analysis. The result of the correlation was examined based on an alpha value of .05. There were no significant correlations between any pairs of variables. Table 5 presents the results of the correlation.

**Table 5**

## EXAMINING ERAS PROTOCOL COMPLIANCE

### *Spearman Correlation Results Between MME and Total ERAS Compliance*

Combination	$r_s$	95% CI	$p$
MME (mg) and Total ERAS Compliance	-0.14	[-0.33, 0.05]	.153

*Note.* ERAS= early recovery after surgery; mg= milligrams; MME= morphine milligram equivalents

### **ERAS Components and Hospital LOS**

Two-tailed Mann-Whitney two-sample rank-sum tests were conducted to examine whether there were significant differences in LOS during the preoperative, intraoperative, and postoperative phases as well as the different components of the ERAS protocol.

#### ***Preoperative ERAS Components***

Prior to undergoing colorectal surgery, patients were to attend the B-Ready Clinic along with consuming a carbohydrate drink two hours before their scheduled surgery. Once at the hospital on the day of surgery, patients were to receive both oral gabapentin and Entereg prior to going back to the operating room. After analyzing the results, no statistical significance was noted with the B-ready clinic attendance, consumption of carbohydrate drink, preoperative gabapentin, or preoperative Entereg impact on overall hospital LOS ( $p > .05$ ).

#### ***Intraoperative ERAS Components***

Once the patient arrived in the operating room, several components of the ERAS protocol were to be executed. Patients received IV Ofirmev, IV Toradol, and IV fluids at 3 ml/kg/h. Per the ERAS protocol the anesthesia staff were to avoid placement of a NGT during the operation.

There was no statistically significant difference in LOS in regard to intraoperative IV Tylenol administration ( $p = .792$ ), IV Toradol administration ( $p = .505$ ), IV fluid administration of 3ml/kg/h ( $p = .449$ ), nor avoidance of NGT placement ( $p = .865$ ).

## EXAMINING ERAS PROTOCOL COMPLIANCE

***Postoperative ERAS Components***

Postoperatively, patients were to have their Foley catheter discontinued by POD 1 as well as begin mobilization on POD 1. There was a significant difference noted in LOS between the levels of Foley catheter discontinuation ( $p < .001$ ) as well as mobilization by POD 1 ( $p = .014$ ). These results are illustrated in Tables 6 and 7, respectively.

**Table 6**

*Two-Tailed Mann-Whitney Test for Length of Stay by Discontinuation of Foley Catheter on Postoperative Day 1*

Variable	Mean Rank		<i>U</i>	<i>z</i>	<i>p</i>
	No	Yes			
LOS (hours)	64.61	42.90	1631.50	-3.57	< .001

*Note.* LOS= length of stay

**Table 7**

*Two-Tailed Mann-Whitney Test for Length of Stay by Mobilization by Postoperative Day 1*



## EXAMINING ERAS PROTOCOL COMPLIANCE

Variable	Mean Rank		<i>U</i>	<i>z</i>	<i>p</i>
	No	Yes			
LOS (hours)	81.50	48.87	392.50	-2.45	.014

*Note.* LOS= length of stay

### Discussion

Starting in the early 1990s, health institutions began implementing ERAS protocols. The use of such protocols has led to improved patient outcomes as well as significant financial savings. Additionally, ERAS protocols have helped anesthesia providers reduce opioid consumption in the perioperative period by providing a multimodal anesthesia approach. This quality improvement project focused on compliance to an ERAS protocol and its role on patient outcomes and opioid consumption. Aims of this project included determining how overall compliance to the ERAS protocol, as well as each individual component of the ERAS protocol, affected hospital LOS. In addition, the relationship between compliance and opioid consumption was assessed. Furthermore, the findings of this project were used to develop an ERAS protocol for ProMedica Toledo Hospital.

#### Hospital Length of Stay

Hospital LOS was evaluated for 100 patients undergoing colorectal surgery in which an ERAS protocol was utilized. Hospital LOS was defined as the time from anesthesia stop until hospital discharge. A significant negative correlation existed between ERAS compliance and hospital LOS—as ERAS compliance increases, hospital LOS decreases. This finding is congruent with that of the literature (Arrick et al., 2019; Hawkins et al., 2019; Lv et al., 2012; Ni et al., 2019; Sarin et al., 2016; Vardhan et al., 2010).

## EXAMINING ERAS PROTOCOL COMPLIANCE

The time that a patient spends in a hospital can be influenced by many factors. In a postoperative abdominal surgery patient, pain as well as postoperative nausea, vomiting, and ileus play an important role in the length of time spent in the hospital. In this project, pain was studied indirectly by the amount of opioids administered to patients postoperatively, measured in MME. This study found that as MME increased, hospital LOS also increased (Table 5). This is likely due to the negative effects of opioids, including postoperative nausea and vomiting as well as postoperative ileus.

The negative effects of opioids may require a patient to stay in the hospital longer than expected, thereby raising costs that the hospital must absorb. Patients in which an ERAS protocol was followed can have a cost savings of up to approximately \$7000 (Nelson et al., 2016). The savings can be contributed to a decrease in postoperative complications that would require longer hospitalizations such as postoperative ileus, surgical site infection, or pneumonia. When anesthesia providers modify their anesthetic plan to include ERAS principles, deleterious side effects may be eliminated or decreased, thus saving the patient and the hospital a significant amount of money.

### **Secondary Outcomes**

#### ***ERAS Protocol Components***

This project examined the individual components of the ERAS protocol to determine if compliance to the individual components alone were enough to impact length of stay. Of the 12 ERAS components, only early mobilization (out of bed by POD 1) and removal of the Foley catheter on POD 1 lead to a statistically significant decrease in hospital LOS. In two meta-analyses, patients with early mobilization, as well as Foley catheter removal have a reduced risk of postoperative ileus, urinary tract infections and hospital LOS (Vardhan et. al, 2010, Ni et. al,

## EXAMINING ERAS PROTOCOL COMPLIANCE

2019). Early mobilization not only decreases postoperative ileus, it also affords a quicker return to preoperative activity levels. This is extremely important since postoperative complications delay patients' return to prehospital function. Patients who develop postoperative ileus have an increase in mortality, reoperation rates, and hospital readmission. It is well-known that complications from urinary tract infections can lead to sepsis, prolonged hospital stay and increased costs. Okrainec et al. (2017) mentions that if a Foley catheter remains in for a duration of greater than two days, this may become problematic for UTI development along with the patient being discharged elsewhere instead of home.

### ***ERAS Compliance***

In this study, the average rate of ERAS compliance was 81%-correlating to high compliance. All three perioperative phases (preoperative, intraoperative and postoperative) were also evaluated for compliance. The preoperative phase had a moderate rate of compliance, at 67% compliance. The intraoperative phase and postoperative phase both received a high rate of compliance with 92.5% and 80% compliance, respectively.

The carbohydrate drink that was to be consumed in the preoperative period was the least compliant component that was measured in the protocol. Consumption of the carbohydrate drink was lacking in 99% of the charts that were reviewed. Thorough chart reviews noted that there was not a specific documentation area in the patient's chart that one could acknowledge consumption of the carbohydrate drink on the morning of surgery. In only one instance was consumption of carbohydrate drink documented and in this record it was found in the nursing notes. This is concerning, as carbohydrate loading plays an important role in patient recovery from surgery. Kalogera & Dowdy (2019) mention that carbohydrate loading prior to surgery helps prevent muscle breakdown and insulin resistance that occurs from surgical stress, helping

## EXAMINING ERAS PROTOCOL COMPLIANCE

improve tissue healing. Gustafsson et al. (2011) make note in their single-center prospective cohort study that a preoperative carbohydrate drink reduced the risk of postoperative symptoms such as nausea, vomiting, diarrhea, pain and dizziness by 44%. Gustafsson et al. (2011) also concur with Kalogera & Dowdy (2019) that tissue healing is also improved as a reduction in wound dehiscence is noted with the carbohydrate drink (OR, 0.16; 95% CI, 0.05- 0.50).

The authors suspect that there was a much higher compliance to the carbohydrate drink than was documented. Compliance to the carbohydrate drink could be improved by creating an area in the EPIC charting system for proper documentation. Currently, the present charting system does not have a specific area to identify if the carbohydrate drink was consumed the morning of surgery. The patient's chart that was noted to have consumed the carbohydrate drink the morning of surgery was found via a separate nursing note that was written the day of surgery stating that the patient did consume the drink. A simple checklist placed in Epic for ERAS patients could improve the charting and therefore tracking of the carbohydrate drink.

The ERAS protocol called for removal of the Foley catheter by POD 1. Removal of the Foley catheter by POD 1 was missed 35% of the time in the postoperative period, which can contribute to the slightly lower levels of compliance compared to intraoperative compliance. This is concerning, as noncompliance to Foley catheter removal can lead to a longer patient stay, along with an increased risk of developing a urinary tract infection (UTI). Okrainec et al. (2017) examined whether compliance with urinary catheter removal was associated with a decrease in UTI and LOS. Catheter removal was considered compliant if removal was done within 24 hours after surgery. Okrainec et al. (2017) found that the median LOS of patients who underwent a colon operation was reduced (4 days versus 5 days; p value < 0.001) if the catheter was removed within 24 hours after surgery. Also, patients who had a rectal operation performed, Okrainec et

## EXAMINING ERAS PROTOCOL COMPLIANCE

al. (2017) noted that compliance with catheter removal reduced the median LOS as well (5 vs 8 days;  $p < .001$ ). To improve compliance to this step of the ERAS protocol, removal of the Foley catheter prior to leaving the operating room is recommended, when possible. While no studies specifically mentioned Foley catheter removal in the operating room, the authors feel this would help with better compliance.

### **Recommendations and Limitations**

#### **Recommendations**

This study was performed at Beaumont Hospital-Royal Oak, a level-one trauma center with an established ERAS protocol for colorectal surgery. The ERAS protocol has been implemented at this institution for several years, allowing for a high rate of compliance. As mentioned in the discussion portion of this paper, it is recommended that an ERAS tab be created in the charting system that allows for easier documentation of the ERAS components along with easier auditing and chart reviews. Easier access to documentation may show improved compliance to an already highly compliant protocol. In this project, if there was no documentation of a component, then said component was not completed. Improvements such as documentation of the preoperative carbohydrate drink as well removal of the Foley catheter by POD 1 are important for sustaining a high rate of compliance to the ERAS protocol

Based on the already established ERAS protocol at Beaumont Hospital-Royal Oak, an ERAS protocol has been created for ProMedica Toledo Hospital. Please refer to appendix C for a detailed reference of the protocol.

#### **Limitations**

One limitation of this project was the small sample size. The sample size included 100 charts that reviewed patients undergoing colorectal surgery utilizing an ERAS protocol. To

## EXAMINING ERAS PROTOCOL COMPLIANCE

establish a better understanding of ERAS compliance, a larger sample size would be needed to obtain more accurate results.

Another limitation is the type of surgery that was reviewed. This project chose to examine any type of colorectal surgery. A sigmoid surgery is less invasive compared to a bowel resection with ostomy placement, and would likely entail a decreased LOS and MME. In addition, multiple colorectal surgeons were included during the chart reviews. There are several colorectal surgeons at Beaumont Hospital-Royal Oak, all with varying surgical experience, therefore, surgical outcomes may have been different based on who performed the surgery. However, regardless of the type of colorectal surgery being performed or the surgeon performing it, higher compliance to the ERAS protocol led to a decrease in LOS as well as MME consumption.

A final limitation was the documentation of the ERAS preoperative components. The researchers were unable to find documentation of the carbohydrate drink which led to a low compliance rate (1%). It is possible that more than one patient complied with the carbohydrate drink and it wasn't charted. Developing a checklist for preoperative components in Epic is a proposed recommendation.

### **Protocol Development**

#### **ERAS Protocol Creation**

An ERAS protocol was created for ProMedica Toledo Hospital based on the current protocol at Beaumont Hospital-Royal Oak and the findings from this project. The protocol at ProMedica Toledo Hospital was developed but not implemented due to time constraints. The following paragraphs will describe how the protocol implementation should occur.

## EXAMINING ERAS PROTOCOL COMPLIANCE

Initially, a meeting involving colorectal surgeons and anesthesia staff should be conducted to discuss the feasibility of a colorectal program. In this meeting, the results of the findings of the project at Beaumont-Royal Oak should be presented as well as the ERAS protocol developed for ProMedica Toledo Hospital. If the colorectal surgeons and anesthesia staff agree on the feasibility of implementing a colorectal ERAS program at ProMedica Toledo Hospital, future meetings should be scheduled with representatives from other hospital specialties. Minimally these should include the operating room staff, perioperative nursing staff (pre-op, intra-op, and post-operative areas), floor nursing staff, pharmacy, dietary, physical therapy, computer information technologist, and hospital administrators.

Education will be provided to CRNAs and anesthesiologists to explain their involvement with the ERAS protocol. The goal is to provide further anesthesia-specific information on what tasks need to be performed during the intraoperative period by the anesthesia provider. Due to time constraints, education will be provided at the monthly anesthesia meetings. Questions will be answered, and additional ERAS-specific information can be sent via email.

Future meetings with stakeholders should emphasize the need for collaboration with the development and implementation of the ERAS protocol. Meetings with each of the stakeholders should include an explanation of the process and benefits of the ERAS protocol. Professional collaboration between teams involves communication, an understanding of the overall goal and each stakeholder's role. Making sure that each team member is informed on what their role entails will allow for a more fluent transition for this implementation and better patient outcomes. An explanation of the expectations of each stakeholder should be distributed and questions about the process should be answered.

## EXAMINING ERAS PROTOCOL COMPLIANCE

Ideally, a presurgical clinic should be developed to focus specifically on colorectal ERAS patients. This clinic would introduce the patient to ERAS and explain the benefits of an ERAS-boarded surgery. This clinic would be staffed by a nurse practitioner and case manager trained in ERAS. The nurse practitioner would be responsible for reviewing the patient's medical history and performing the history and physical. Also, the nurse practitioner would be able to write the necessary prescriptions that the patient may need prior to surgery. The case manager would provide education to the patient about ERAS and explain to them what to expect the days leading up to surgery.

Meetings with hospital administration should include discussion on potential costs of implementing an ERAS protocol. Education of all medical staff that are involved with the clinic must occur. The additional cost for the education would include salary for the educators as well as the learners. Additional nursing staff, as well as administrative assistants, may be needed as the ERAS program grows, adding to the cost as well. The clinic could reside in the colorectal surgeon's present office. Additionally, the development of an informational ERAS education packet will be required. This packet will include specific patient directions and information regarding the carbohydrate drink, bowel preparation, preoperative showering, and what medications to consume on the morning of surgery. The creation and printing of this informational packet will also add to the overall cost. The benefits and cost-savings of the ERAS protocol, as well as the costs associated with running a presurgical clinic should be addressed in the initial meetings with hospital administrators.

After the process is developed and education has been given to all care providers, colorectal surgery could start offering an ERAS option to appropriate patients. ERAS protocols were designed to improve patient outcomes following surgery by reducing perioperative



## EXAMINING ERAS PROTOCOL COMPLIANCE

complications (Bryan, 2017). Utilizing a multimodal anesthetic approach, complications such as opioid-related drug events, postoperative nausea and vomiting, postoperative ileus, urinary retention, and chronic opioid dependence can be drastically reduced (Wilson, 2019).

Appropriate patient selection are patients who are considered opiate-naïve and not taking opioids prior to surgery. The protocol developed for ProMedica Toledo Hospital has the following inclusion criteria: patients 18 to 80 years of age undergoing scheduled colorectal surgery, American Society of Anesthesiologist (ASA) Physical Status Classification of 2 or 3, non-diabetic and not taking prescribed opioids prior to surgery. The aforementioned criteria was based on inclusion criteria that was determined from the chart reviews at Beaumont Hospital-Royal Oak.

### **ERAS Protocol Implementation**

The following sections describe the proposed implementation of the ERAS protocol developed for ProMedica Toledo Hospital.

#### ***Pre-Hospital***

After meeting with the colorectal surgeon, the patient will be identified as a suitable candidate for ERAS for their upcoming surgery. Prior to leaving that appointment, the patient will schedule an upcoming appointment to be seen by the nurse practitioner and case manager who work at the ERAS clinic. During this ERAS appointment, the ERAS process will be described to the patient in further detail. The nurse practitioner will perform a history and physical, obtain appropriate lab work, and provide postoperative prescriptions. The case manager will instruct the patient about what they need to do during the days leading up to surgery. Patients will be asked to sign a waiver acknowledging they have been provided education, understood the information, and can fulfill the duties that are asked of them. If the nurse practitioner determines

## EXAMINING ERAS PROTOCOL COMPLIANCE

that additional diagnostic testing is needed, or that a medical specialty needs to clear the patient for surgery, those additional steps will be taken, and the patient will be reassessed for ERAS-boarded surgery.

### *Preoperative*

Upon arrival to the hospital on the morning of surgery, patients will be registered and escorted to the pre-operative holding area. The patient's chart will identify them as an ERAS patient. A hard copy checklist document (Appendix D) will be present in the pre-operative area that will follow the patient throughout the remainder of their stay. This paper will serve as not only a checklist to help with ERAS, but also as an audit tool. Future hopes for the ERAS program include an electronic checklist in the EPIC charting system for easier documentation and auditing purposes. Each specialty involved in the patients' care has specific protocol components to complete that contributes to the success of the ERAS protocol. The following section of the paper will provide a walk-through of what a typical colorectal ERAS patient should experience the day of surgery once they arrive to the hospital.

**Surgeon.** The surgical team will indicate in the EPIC system that the patient will be following the ERAS protocol. They will activate the ERAS order set which will generate orders for post-operative period of the patient's hospital stay.

**Anesthesiologist.** The anesthesiologist who is caring for the ERAS patient will select the ERAS order set. This order set will include the medications that the patient is to receive for the ERAS protocol-starting in the preoperative holding area. Medications in the preoperative area will include oral entereg and gabapentin (unless contraindicated). For this protocol, gabapentin is only contraindicated in patients older than 70 years. If a patient is already taking gabapentin, they will be asked to take their own medication on the day of surgery. Also, isotonic crystalloid

## EXAMINING ERAS PROTOCOL COMPLIANCE

IV fluids will be ordered to infuse at 3 cc/kg/hr. A lidocaine infusion will be ordered at this time. This order will be sent to the pharmacy department so the lidocaine infusion may be released and sent to the preoperative area for the CRNA to take back to the operating room.

Intraoperative medications will be ordered and will include Ofirmev, Toradol, and antiemetics.

**Preoperative Registered Nurse.** The preoperative RN will start 2 peripheral intravenous (IV) catheters (18 gauge or greater). One peripheral IV will be placed on an automatic infusion pump and started at 3 cc/kg/hr. The second IV catheter will be placed but an infusion will not be started in the preoperative area. Patients will receive both gabapentin 300 mg and entereg 12 mg orally, unless contraindicated. If the patient is 70 years old or greater and does not take gabapentin at home, this medication will not be given to them prior to surgery. If it is determined that the patient takes gabapentin or entereg at home, the patient will be told to take those medication(s) the morning of surgery. Documentation of these medications will be done in the EPIC system and the ERAS checklist. The preoperative RN will also confirm the consumption of the carbohydrate drink and the antimicrobial scrub. Consumption of a carbohydrate drink is an important ERAS component that helps to attenuate the catabolic responses surgery has on the body which may increase the risk of postoperative complications (Tall & Nygren, 2020). Despite the very low compliance of carbohydrate drink consumption noted on the chart reviews from Beaumont Hospital-Royal Oak, it was felt that compliance was higher but not charted due to the lack of an ERAS checklist in the EPIC system.

**Pharmacy.** When the patient is registered on the day of surgery, an alert will be sent to pharmacy notifying them that an ERAS patient is in the hospital. This will alert pharmacy to make a lidocaine infusion and send it to the preoperative area. The lidocaine infusion will accompany the patient to the operating room where the CRNA will administer it.

## EXAMINING ERAS PROTOCOL COMPLIANCE

### *Intraoperative*

**CRNA.** After a standard induction and intubation, the CRNA will start the lidocaine infusion prior to incision. Ofirmev and ketorolac will be administered intravenously to the patient. Opioids can be used judiciously to treat tachycardia and hypertension, however, this QI study found that as administration of opioids increased, hospital LOS increased. Initial education with anesthesia staff about the ERAS protocol, statistics from the Beaumont hospital-Royal Oak will be provided showing the correlation between increased opioid consumption and hospital LOS.

The CRNA will administer antiemetic medications based on the patient's Apfel score. The 4 primary risk factors included in the Apfel score are: female, non-smoker, history of motion sickness/PONV, and opioids. Antiemetics will be administered as follows:

- 0-1 risk factors: Ondansetron 4 mg 15 minutes prior to the end of the case
- 2 risk factors: Dexamethasone 4 mg IV with induction
- 3 risk factors: Scopolamine patch prior to surgery OR Phenergan 12.5 mg OR Benadryl 25 mg OR Droperidol 0.625 mg, OR Reglan 10 mg.
- 4 risk factors: Add from the list above

**Circulating Registered Nurse.** The chart reviews of adherence to colorectal ERAS protocol at Beaumont Hospital-Royal Oak demonstrated a low compliance of removing Foley catheters postoperatively. Statistical significance was noted between Foley catheter removal by POD 1 and hospital length of stay in our data analysis. Our data analysis showed that patients who had their Foley catheter removed by postoperative day 1 had their LOS decreased by almost 24 hours (42.90 vs 64.61  $p < .001$ ) when compared to patients who did not have their Foley removed within the first 24 hours postoperatively. In the protocol for ProMedica Toledo

## EXAMINING ERAS PROTOCOL COMPLIANCE

Hospital, the Foley catheter should be removed prior to the patient leaving the OR unless contraindicated. Although removal of the Foley catheter in the operating room was not found in any ERAS protocol in the literature review, the authors of this paper recommend removal in the OR to increase compliance and lead to better overall ERAS outcome. Any contraindications for Foley removal in the OR will require the attending physician to change the postoperative order to allow the Foley to remain in place.

### *Postoperative*

**Post-Anesthesia Care Unit- Registered Nurse.** Postoperatively the patient will be taken to the post anesthesia care unit (PACU), where the CRNA will identify the patient as a colorectal ERAS patient in the chart, verbally, and with the ERAS checklist sheet that will accompany them. Isotonic IV fluids will be continued at 3 cc/kg/hr. Ofirmev, will be continued every 6 hours for the first 24 hours, and IV Toradol (15 mg) can be administered every 6 hours for the first 72 hours. If additional pain management is needed, the ERAS order set will include both oral and IV narcotics to be given. An ERAS diet order set will be available for the patient, and they will advance their diet per the order and as they tolerate.

**Postoperative Unit Registered Nurse.** Upon admission to the surgical unit, the patient will be identified as a colorectal ERAS patient. The registered nurse on the surgical unit will review the ERAS checklist and the ERAS order set. The RN will contact the physical therapy department to notify them of the patient's arrival. Depending on the timing of arrival to the postoperative unit, a physical therapist (PT) may or may not be able to see the patient that day. It is expected that the patient will be ambulated out of bed once they arrive to the floor, even if PT is not able to come on the surgical day. Patients with early mobilization have a reduced risk of postoperative ileus, urinary tract infections and hospital LOS (Vardhan et. al, 2010, Ni et. al,

## EXAMINING ERAS PROTOCOL COMPLIANCE

2019). Early mobilization not only decreases postoperative ileus, it also affords a quicker return to preoperative activity levels. In this quality improvement project early mobilization was found to significantly decrease hospital LOS by over 32 hours (48.87 vs 81.50;  $p < .014$ ).

**Physical Therapy.** The physical therapy department will follow the postoperative order set to assist patients in completing mobilization activities per the protocol. Patients will be encouraged to ambulate as much as possible, getting them back to their prehospital condition. Physical therapy will conclude when the physical therapists deems it is appropriate.

### **ERAS Protocol Follow-Up**

An important process of any quality improvement (QI) project is the evaluation of the QI measure. Follow-up is necessary to see if the QI change is appropriate and beneficial for the hospital and patients. To obtain appropriate data and outcomes from the ERAS protocol, at least 1 year of ERAS implementation would be necessary to compare ERAS patient outcomes to the standard care. Evaluation will look to compare hospital length of stay, MME, and postoperative complications between the patients who were boarded as ERAS and patients who had colorectal surgery done without the ERAS protocol.

### **Implications for Nursing Practice**

Maintaining the highest level of standards for patients is a fundamental principle of nursing practice. The application of ERAS into practice involves implementing evidence from the literature, while integrating new knowledge into patients and healthcare members that are involved (American Association of Colleges of Nursing [AACN], 2006). Through the utilization of information systems, this project helped improve and support patient care by integrating a new ERAS protocol to ProMedica Toledo Hospital while also improving the areas with a low rate of ERAS compliance at Beaumont Hospital-Royal Oak.

## EXAMINING ERAS PROTOCOL COMPLIANCE

As life expectancy continues to increase, patients will continue to present with multiple comorbid conditions, thus creating complex practice situations for healthcare providers. By integrating knowledge from multiple sources and across multiple disciplines, the use of the ERAS protocol for colorectal surgery will provide patients with a better overall experience.

Implications to practice include making sure that the patient receives the appropriate medications that are outlined in the protocol. The ERAS protocol will set the standard of what is expected from ProMedica Toledo hospital. To help make sure that the protocol is being followed, monthly chart audits will take place, along with auditing the ERAS checklist that follows the patient throughout their hospital stay.

### **Contributions to the Doctor of Nursing Practice Essentials**

The Doctor of Nursing Practice (DNP) essentials were developed by the American Association of Colleges of Nurses (AACN). The DNP essentials consist of eight components that require fulfillment in order for graduate students to become doctorate prepared nurses. Throughout the development of this DNP project, the researchers were able to satisfy many of the DNP essentials. This quality improvement project most specifically satisfies DNP essentials I, III and VIII.

Essential I: Scientific Underpinning for Practice was fulfilled by examining and incorporating nursing theory into this DNP project. The Six Sigma theory was utilized in this project to help improve patient outcomes by identifying areas of improvement in an existing ERAS protocol at Beaumont Hospital-Royal Oak.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice was achieved by incorporating evidence-based protocols to improve patient care and outcomes.

## EXAMINING ERAS PROTOCOL COMPLIANCE

The objective of this project was to examine an existing ERAS protocol for colorectal surgery patients in order improve patient outcomes, thus supporting essential III.

Essential VIII: Advanced Nursing Practice was met by working with multiple healthcare disciplines to improve patient outcomes. The results of this project were discussed with multiple disciplines: the anesthesia department, perioperative nursing staff and floor nursing staff.

Furthermore, the development of an ERAS protocol was presented to hospital administration, anesthesia department and nursing staff at Toledo-ProMedica Hospital, fulfilling essential VIII.

### **Conclusion**

Our findings suggest that high ERAS protocol compliance for colorectal surgery leads to a decrease in MME and hospital LOS for patients. Proper documentation is necessary in order to make sure that each part of the ERAS protocol is adhered to. While only patient mobilization and discontinuation of the Foley catheter was noted to be statistically significant with LOS, the overall patient experience can be improved with high compliance to ERAS protocols. There remains an area for compliance improvement by creating an ERAS-specific portion in the charting system to allow for easier documentation and review of each individual portion of the protocol.



## EXAMINING ERAS PROTOCOL COMPLIANCE

## References

- American Association of Colleges of Nursing. (2006). The essentials of doctoral education for advanced nursing practice. *American Association of College of Nursing*. Retrieved from <https://www.aacnnursing.org/dnp/dnp-essentials>
- Arrick, L., Mayson, K., Hong, T., & Warnock, G. (2019). Enhanced recovery after surgery in colorectal surgery: Impact of protocol adherence on patient outcomes. *Journal of Clinical Anesthesia, 55*, 7-12. doi.org/10.1016/j.jclinane.2018.12.034.
- Brandal, D., Keller, M., Lee, C., Grogan, T., Fujimoto, Y., Gricourt, Y., Yamada, T., Rahman, S., Hofer, I., Kazanjian, K., Sack, J., Mahajan, A., Lin, A., & Cannesson, M. (2017). Impact of enhanced recovery after surgery and opioid-free anesthesia on opioid prescriptions at discharge from the hospital: A historical-prospective study. *Anesthesia & Analgesia, 125*(5), 1784–1792. doi.org/10.1213/ane.0000000000002510.
- Bryan, K. B. (2017). Limiting Opiates during Colorectal Surgery under an ERAS Protocol. *International Student Journal of Nurse Anesthesia, 16*(2), 24–28.
- Calculating morphine milligram equivalents (MME). Reprinted from *Centers for Disease Control and Prevention*, by U.S. Department of Health and Human Services, November 4 2019, retrieved from [https://www.cdc.gov/drugoverdose/pdf/calculating\\_total\\_daily\\_dose-a.pdf/](https://www.cdc.gov/drugoverdose/pdf/calculating_total_daily_dose-a.pdf/).
- Cohen, J. (1988). *Statistical power analysis for the behavior sciences* (2nd ed.). West Publishing Company.
- Conover, W. J., & Iman, R. L. (1981). Rank transformations as a bridge between parametric and nonparametric statistics. *The American Statistician, 35*(3), 124-129.  
doi:10.1080/00031305.1981.10479327

## EXAMINING ERAS PROTOCOL COMPLIANCE

- Dor, A., Koroukian, S., Xu, F., Stulberg, J., Delaney, C., & Cooper, G. (2012). Pricing of surgeries for colon cancer: Patient severity and market factors. *Cancer, 118*(23), 5741-5748. doi: 10.1002/cncr.27573.
- Fagard, K., Wolthuis, A., D'Hoore, A., Verhaegen, M., Tournoy, J., Flamaing, J., & Deschodt, M. (2019). A systematic review of the intervention components, adherence and outcomes of enhanced recovery programmes in older patients undergoing elective colorectal surgery. *BMC Geriatrics, 19*(1), 157. doi.org/10.1186/s12877-019-1158-3
- Gustafsson, U. O., Hausel, J., Thorell, A., Ljungqvist, O., Stop, M., & Nygren, J. (2011). Adherence to the enhanced recovery after surgery protocol and outcomes after colorectal cancer surgery. *American Medical Association, 146*(5), 571-577. doi: 10.1001/archsurg.2010.309
- Hernandez, N. M., Parry, J. A., & Taunton, M. J. (2017). Patients at risk: Large opioid prescriptions after total knee arthroplasty. *The Journal of Arthroplasty, 32*(2017), 2395-2398.
- Intellectus Statistics [Online computer software]. (2020). Intellectus Statistics. <https://analyze.intellectusstatistics.com/>
- Kalogera, E., & Dowdy, S.C. (2019). Enhanced recovery after surgery and acute postoperative pain management. *Clinical Obstetrics And Gynecology, 62*(4), 656-665.
- Lloyd, C., & Maas, F. (1993). The helping relationship: The application of Carkhuff's model. *Canadian Journal of Occupational Therapy, 60*(2), 83-89.
- Lv, L., Shao, Y., & Zhou, Y. (2012). The enhanced recovery after surgery (ERAS) pathway for patients undergoing colorectal surgery: An update of meta-analysis of randomized

## EXAMINING ERAS PROTOCOL COMPLIANCE

- controlled trials. *International Journal of Colorectal Disease*, 27(12), 1549–1554.  
doi.org/10.1007/s00384-012-1577-5
- Mauermann, E., Ruppen, W., & Bandschapp, O. (2017). Different protocols used today to achieve total opioid-free general anesthesia without locoregional blocks. *Best Practice & Research Clinical Anaesthesiology*, 31(4), 533–545. doi.org/10.1016/j.bpa.2017.11.003
- Melnyk, M., Casey, R. G., Black, P., & Koupparis, A. J. (2011). Enhanced recovery after surgery (ERAS) protocols: Time to change practice? *Canadian Urological Association Journal*, 5(5), 342-348. doi: 10.5489/cuaj.11002
- Moghadamyeghaneh, Z., Hwang, G., Hanna, M., Phelan, M., Carmichael, J., Mills, S., Pigazzi, A., & Stamos, M. (2016). Risk factors for prolonged ileus following colon surgery. *Surgical Endoscopy*, 30(2), 603–609. doi.org/10.1007/s00464-015-4247-1
- Nelson, G., Kiyang, L., Chuck, A., Thanh, N., & Gramlich, L. (2016). Cost impact analysis of Enhanced Recovery After Surgery program implementation in Alberta colon cancer patients. *Current Oncology (Toronto, Ont.)*, 23(3), e221–7. doi.org/10.3747/co.23.2980
- Ni, X., Jia, D., Chen, Y., Wang, L., & Suo, J. (2019). Is the enhanced recovery after surgery (ERAS) program effective and safe in laparoscopic colorectal cancer surgery? A meta-analysis of randomized controlled trials. *Journal of Gastrointestinal Surgery*, 23, 1502-1512. doi.org/10.1007/s11605-019-04170-8
- Nygren, J., & Tall, J. (2020). Preoperative fasting and carbohydrate treatment. In O. Ljungqvist, N. K. Francis, & R. Urman (Eds.), *Enhanced recovery after surgery a complete guide to optimizing outcomes* (pp. 31-36). Springer, Cham.
- Okraïnec, A., Aarts, M., Conn, L. G., McCluskey, S., McKenzie, M., Pearsall, E. A., Rotstein, O., Victor, J. C., & McLeod, R. S. (2017). Compliance with urinary catheter removal

## EXAMINING ERAS PROTOCOL COMPLIANCE

- guidelines leads to improved outcome in enhanced recovery after surgery. *Journal of Gastrointestinal Surgery*, 21(8), 1309-1317. doi.org/10.1007/s11605-017-3434-x
- Pecorelli, N., Balvardi, S., Liberman, A. S., Charlebois, P., Stein, B., Carli, F., Feldman, L. S., & Fiore, J. F. (2019). Does adherence to perioperative enhanced recovery pathway elements influence patient-reported recovery following colorectal resection? *Surgical Endoscopy*, 33, 2806-2815. Doi.org/10.1007/s00464-019-06684-3
- Ripolles-Melchor, J., Ramirez-Rodriguez, J. M., Casans-Frances, R., Aldecoa, C., Abad-Motos, A., Logrono-Egea, M., Garcia-Erce, J. A., Camps-Cervantes, A., Ferrando-Ortola, C., Suarez de la Rica, A., Cuellar-Martinez, A., Marmana-Mezquita, S., Abad-Gurumeta, A., & Calvo-Vecino, J. M. (2019). Association between use of enhanced recovery after surgery protocol and postoperative complications in colorectal surgery: The postoperative outcomes within enhanced recovery after surgery protocol (POWER) study. *JAMA Surgery*, 154(8), 725-736. doi: 10.1001/jamasurg.2019.0995.
- Siotos, C., Stergios, K., Naska, A., Frountzas, M., Pergialiotis, V., Perrea, D. N., & Nikiteas, N. (2018). The impact of fast-track protocols in upper gastrointestinal surgery: A meta-analysis of observational studies. *The Surgeon*, 16, 183-192. doi.org/10.1016/j.surge.2017.12.001
- Tabachnick, B. G. & Fidell, L. S., (2019). *Using multivariate statistics*. Pearson Education.
- Taghizadegan, S. (2006). *Essentials of Lean Six Sigma*. Burlington, MA: Elsevier.
- Varadhan, K. K., Neal, K. R., Dejong, C., Fearon, K., Ljungqvist, O., & Lobo, D. N. (2010). The enhanced recovery after surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: A meta-analysis of randomized controlled trials. *Clinical Nutrition*, 29, 434-440. doi: 10.1016/j.clnu/2010.01.004

## EXAMINING ERAS PROTOCOL COMPLIANCE

Westfall, P. H., & Henning, K. S. S. (2013). *Texts in statistical science: Understanding advanced statistical methods*. Taylor & Francis.

Wilson, R. (2019). Morpheus and the underworld—Interventions to reduce the risks of opioid use after surgery: ORADEs, dependence, cancer progression, and anastomotic leakage. *Journal of Gastrointestinal Surgery*, 23(6), 1240–1249. doi.org/10.1007/s11605-019-04167-3

## EXAMINING ERAS PROTOCOL COMPLIANCE

## Appendix A

## Colorectal ERAS Protocol

Preoperative	Intraoperative	Postoperative
Attendance to START clinic Consumption of carbohydrate loading drink prior to surgery. Medications preoperatively (when applicable): 600-1200 mg gabapentin 12 mg of Entereg 1000 mg IV OFRIMEV	IV fluids on infusion pump at 3 ml/kg/h Avoidance of nasogastric tube Lidocaine bolus of 1.5 mg/kg with induction, followed by 2-3 mg/kg/h Administration of antiemetic drugs per risk factors	Continuation of IV fluids at 3 ml/kg/h Discontinuation of Foley catheter on POD 1 Mobilization on POD 1

## EXAMINING ERAS PROTOCOL COMPLIANCE

## Appendix B

## Calculating Morphine Milligram Equivalents

<b>Opioid</b> (doses in mg/day except where noted)	<b>Conversion Factor</b>
<b>Codeine</b>	0.15
<b>Fentanyl</b> (0.1 mg)	10
<b>Hydrocodone</b>	1
<b>Hydromorphone</b>	4
<b>Methadone</b>	
1-20 mg/day	4
21-40 mg/day	8
41-60 mg/day	10
≥61-80 mg/day	12
<b>Morphine</b>	1
<b>Oxycodone</b>	1.5
<b>Oxymorphone</b>	3

These dose conversions are estimated and cannot account for all individual differences in genetics and pharmacokinetics.

(Centers for Disease Control and Prevention, 2019)

EXAMINING ERAS PROTOCOL COMPLIANCE

Appendix C

ProMedica Toledo Hospital Enhanced Recovery After Surgery: Colorectal Surgery

ProMedica Toledo Hospital Enhanced Recovery After Surgery Protocol: Colorectal Surgery		
Pre-Operative Surgeon	Intraoperative CRNA	Post-Operative PACU
<ul style="list-style-type: none"> <li>Surgical case shall be boarded with "ERAS" as first word</li> <li>Surgeon should meet with patients 1-4 weeks prior to surgery</li> <li>Patient will be given an education booklet by surgeon's office staff when surgery is scheduled                             <ul style="list-style-type: none"> <li>Order HbA1C on all patients 3 days prior to surgery-cancel if &gt;9%</li> <li>Instruct patient to shower with antibacterial soap for 3 days</li> </ul> </li> <li>Preop order Neurontin 1200 mg po (give 600 mg if patient is over 70 years or pre-existing confusion/sedation or renal failure), postop continue 600 mg po TID until discharge</li> <li>Patient to perform standardized mechanical bowel prep and standardized oral antibiotic bowel prep</li> <li>Preop order entereg 12 mg PO and postop 12 mg PO BID for max 7 days</li> <li>Preop order Zofran 4 mg q6h x 24 hours</li> <li>Preop Ofirmev 1000 mg IV q6h x24 hours (1<sup>st</sup> dose in OR)</li> <li>Toradol 15 mg q6h x 72 hours (max 12 doses-1<sup>st</sup> dose in OR)</li> <li>Zofran 4 mg q6h x 24 hours (1<sup>st</sup> dose in OR)</li> <li>FBS in preop unless HgA1C &lt; 6.0</li> <li>Follow bowel order set and "favorites"</li> <li>Postoperative diet will consist of: clear liquids then advance to soft diet as tolerated</li> <li>IVF at 3 cc/kg/hr, antiemetics ATC, OFIRMEV for 24 hours, Toradol ATC x 72 hours</li> </ul>	<ul style="list-style-type: none"> <li>Lidocaine bolus 1.5 mg/kg with induction followed by 2 mg/kg/hr until emergence (based on ABW)</li> <li>Use sevoflurane for the duration of the case</li> <li>NG should be avoided (use of OG ok)</li> <li>Use flush syringes after drug administration</li> <li>Use 250cc 5% albumin if fluid replacement is needed</li> <li>Discuss fluid boluses with MDA as needed</li> <li>Maintain IV fluids on pump at 3 cc/kg/hr</li> <li>Monitor BS if HgA1C &gt;6.0 preop or FBS is elevated</li> <li>If possible, ask surgeon if local anesthetic at surgical site will be used</li> <li>Give antiemetics per risk factors (female, non-smoker, surgery type, previous PONV)</li> <li>First dose of Ofirmev to be given 30 minutes prior to end of case</li> <li>First dose of Toradol 15 mg IV to be given at end of case</li> <li>First dose of Zofran 4 mg at end of case</li> </ul> <p>4 primary risk factors for PONV:</p> <ul style="list-style-type: none"> <li>Female</li> <li>Non-smoking</li> <li>History of motion sickness/PONV</li> <li>Opioids</li> </ul> <p>(score 1 for each applicable risk factor)</p> <p>Score</p> <ul style="list-style-type: none"> <li><b>0-1 risk factors:</b> no prophylaxis OR Zofran 4 mg IV 30 minutes prior to the end of the case</li> <li><b>2-3 risk factors:</b> Zofran 4 mg IV 30 minutes prior to the end of the case AND Dexamethasone 4 mg IV on induction of anesthesia</li> <li><b>4 risk factors:</b> Zofran 4 mg IV 30 minutes prior to the end of the case AND Dexamethasone 4 mg on induction of anesthesia AND an additional antiemetic from a different class ordered by the anesthesiology (Compazine 10 mg, Benadryl 25 mg, Droperidol 0.625 mg or Scopolamine patch 1.5 mg)</li> </ul>	<ul style="list-style-type: none"> <li>Maintain IV fluids at 3cc/kg/hr</li> <li>Give antiemetics as ordered/PRN</li> <li>Check BS if HgA1C &gt; 6.0</li> <li>Document pain and nausea</li> <li>Give pain meds as ordered (ok to give pain meds)</li> <li>May give albumin or IV fluids as ordered</li> </ul>
<p><b>Anesthesiologist</b></p> <ul style="list-style-type: none"> <li>Order lidocaine drip at 1.5 mg/kg</li> <li>Order 5% albumin 250cc PRN</li> <li>Insert thoracic epidural for open procedures (ok to give versed/fentanyl) when appropriate</li> </ul>		<p><b>Floor</b></p> <ul style="list-style-type: none"> <li>All patients will receive a non-opioid analgesic (Toradol) around the clock for the first 72 hours postop (1<sup>st</sup> dose in OR)</li> <li>Surgeon will submit order that this is an "ERAS patient" to floor nurse</li> <li>Follow nausea and vomiting risk factor guidelines</li> <li>Postop prophylaxis with Zofran 4 mg q6h x 24 hours (1<sup>st</sup> dose in OR)</li> <li>Encourage patient to chew gum for nausea treatment 20 minutes 3x/day</li> <li>Check BS postop day 1 and 2 if HgA1C &gt;6.0</li> <li>Patients will drink clear liquids on the day of surgery</li> <li>Patients to return to soft diet on the day after surgery</li> <li>Patients with weakness or instability will receive PT consult</li> <li>Patients will walk 20 minutes 4 times/day beginning on the day after surgery and sit in chair 6-8 hours/day</li> <li>Patients will get out of bed the evening of surgery</li> <li>Patients will begin limb and breathing exercises when awake</li> <li>Monitor I/O and follow postop bladder urinary retention guidelines</li> <li>D/C Foley postop day 1 (if not already removed in PACU)</li> </ul>
<p><b>Pre-Op Nurse</b></p> <ul style="list-style-type: none"> <li>Ask if patient drank carbohydrate drink 2 hours prior to admission</li> <li>Patient to receive 1200mg oral gabapentin (if patient is over 70 years, or renal failure or pre-existing sedation/confusion you may give 600 mg)</li> <li>Patient to receive 12 mg entereg PO upon arrival to preop</li> <li>Draw FBS in preop unless HgA1C done prior to preop is &lt; 6.0</li> <li>Draw HgA1C in preop if not done</li> <li>Start 1 IV in preop and place on pump (dual pump if possible). Fluids run at 3 cc/kg/hr. 2 IVs for robotic cases</li> <li>Give antiemetics as ordered (scopolamine patch)</li> <li>Have lidocaine drip and tubing available at bedside</li> </ul>		



## EXAMINING ERAS PROTOCOL COMPLIANCE

## Appendix D

## ProMedica Toledo Hospital Enhanced Recovery After Surgery Protocol: Colorectal Surgery Hospital Checklist

<b>ProMedica Toledo Hospital Enhanced Recovery After Surgery Protocol: Colorectal Surgery Hospital Checklist</b>
<p><b>Preoperative</b></p> <ul style="list-style-type: none"> <li>○ Completed bowel prep along with antimicrobial scrubs</li> <li>○ Completed carbohydrate drink 2 hours before hospital arrival</li> <li>○ Neurontin and entereg medications given</li> <li>○ 2 peripheral IVs inserted. 3cc/kg/hr started in 1 of the IVs and the other IV saline locked</li> <li>○ Bag of lidocaine at preoperative bedside from pharmacy. Will be transported to OR with patient</li> <li>○ Give antiemetics as ordered</li> </ul>
<p><b>Intraoperative</b></p> <ul style="list-style-type: none"> <li>○ Lidocaine bolus of 1.5 mg/kg with induction followed by 2 mg/kg/hr until emergence</li> <li>○ Use of Sevoflurane</li> <li>○ Give antiemetics per risk factors</li> <li>○ Ofirmev</li> <li>○ Toradol</li> <li>○ Zofran</li> </ul>
<p><b>Postoperative</b></p> <ul style="list-style-type: none"> <li>○ Maintain IV fluids at 3 cc/kg/hr</li> <li>○ Pain medications PRN</li> <li>○ Document pain and nausea</li> </ul>
<p><b>Floor/Day of surgery</b></p> <ul style="list-style-type: none"> <li>○ Identify ERAS patient admission</li> <li>○ Postoperative PONV prophylaxis</li> <li>○ Clear liquid diet</li> <li>○ Patient out of bed</li> </ul>
<p><b>POD 1-Discharge</b></p> <ul style="list-style-type: none"> <li>○ Soft diet</li> <li>○ PT to see patient if necessary</li> <li>○ Patient to walk 20 minutes 4 times/day</li> <li>○ Sit in chair 6-8 hours/day</li> <li>○ Limb and breathing exercises</li> <li>○ Discontinue Foley catheter</li> </ul>

## EXAMINING ERAS PROTOCOL COMPLIANCE

## Appendix E

## Institutional Review Board Approval

**Beaumont**

---

**Research Institute  
Institutional Review Board**

September 10, 2020

Linda McDonald  
Anesthesia & Perioperative Medicine

**RE: IRB#:** 2020-307  
**Protocol Title:** Evaluating Adherence to Enhanced Recovery After Surgery in colorectal surgery

Dear Linda McDonald,

The Institutional Review Board (IRB) has reviewed the Human Subject Determination Form/application which you completed. This is not human subject research according to definition (per 45 CFR 46, 21 CFR 56); you may begin your project. This is a nursing Evidence-based practice (QA/QI) project. Please keep this letter as a record of this determination.

Sincerely,

A handwritten signature in black ink, appearing to be "Graham Krasan".

Graham Krasan, MD  
Chairperson  
**Institutional Review Board/CW**

3811 West Thirteen Mile Road Royal Oak, Michigan 48073-6769  
248-551-0662

