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Cover Page Footnote

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Evaluation of the Implementation of ERAS Protocol in Colorectal Surgery at dr. Cipto Mangunkusumo General Hospital, Jakarta

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Abstract

Introduction. The enhanced recovery after surgery (ERAS) protocol is an evidence-based perioperative strategy. It has been proven to reduce the postoperative length of stay and perioperative complications rates in colorectal surgery. The implementation of ERAS defined by 15 components. However, the evaluation of the ERAS component that has been applied to the outcomes is unclear.

Method. A retrospective study was performed on 63 patients who underwent elective colorectal surgery based on the ERAS protocol from January 2015 to December 2017 at Cipto Mangunkusumo Hospital. Patient characteristics, demographic, clinical findings, and length of stay (LOS) collected from medical records. The relationship between the number of ERAS that accomplish, and LOS was analyzed.

Results. All subjects implemented up to 11 of 15 ERAS components. The mean age was 53 years old; 46% were males, and 54% were females. There were no mortality rates. The morbidity rate was 7.9%, caused by surgical site infection 1.6%, pneumonia 1.6%, and urinary retention 4.8%. The most common location for colorectal tumor and procedure were sigmoid (47,6%) and colostomy closure (25,4%). There was a relationship between the total ERAS component protocols and the average length of stay ($p < 0.01$, $r = 0,568$).

Conclusion: The higher number of ERAS components applied to one patient, the shorter LOS for postoperative care needed.

Keywords: Colorectal, Enhanced Recovery After Surgery, Evaluation

Introduction

Enhanced recovery after surgery (ERAS) protocol or fast track surgery is a collection of evidence-based perioperative strategies that work synergistically to improve patient recovery after surgery.^{1,2,3} There are three main components of the ERAS protocol, namely preoperative, intraoperative, and postoperative care. Successful implementation of ERAS protocol requires collaboration between anesthesiologists, surgeons, nutritionists, and paramedics. Since 2005, ERAS guidelines for colorectal surgery eventually published. In practice, all components of the ERAS protocol are challenging to accomplish due to old habits and conventional perioperative management. However, there has never been a program evaluation of ERAS components applied to colorectal surgery patients concerning the outcomes.

ERAS Protocol

The ERAS protocol from Toronto in 2014 comprises 15 components used for perioperative management of colorectal surgery patients. Four components in preoperative, five in intraoperative, and six components in postoperative care.^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18}

Method

This study was a retrospective study with a cross-sectional design conducted at dr. Cipto Mangunkusumo Hospital, Jakarta from January

2015 until December 2017. Sampling proceeded by enrolling patients who had undergone elective colorectal surgery and fulfilled the inclusion criteria.

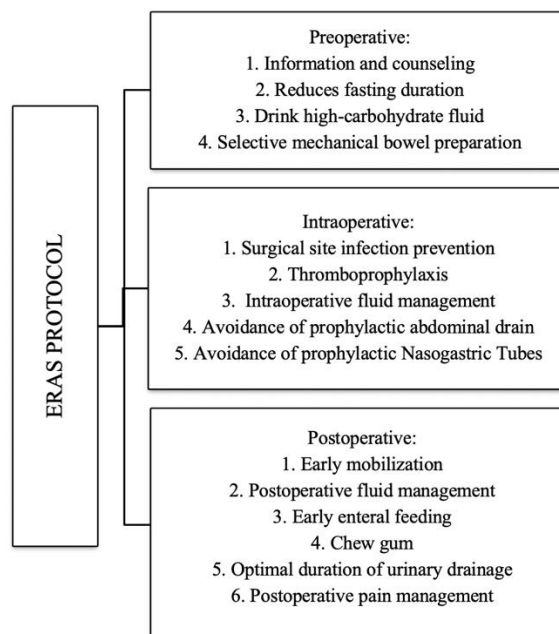


Figure 1. The protocol of enhanced recovery after surgery (ERAS)

Patients with terminal stage colorectal cancer, multiorgan resection, emergency conditions, and ASA class IV excluded. Subjects

characteristics, clinical status, medical background, procedure details, and LOS were the variables of interests. Univariate analysis proceeded in the assessment of 15 ERAS components implementation in patients with elective colorectal surgery. Bivariate analysis carried out to determine the correlation between the number of ERAS components that accomplish (numerical), and the LOS (numerical) uses the Pearson and linear regression tests. LOS counted from the day 0 of operation to discharge. Implementation of ERAS component was complete if fulfilled in all patients, incomplete if fulfilled in less than, and not done if fulfilled is nil.

The Committee of Ethic, Faculty of Medicine, Universitas Indonesia approved the study No 1200/UN2.F1/ETIK/2018 on November 19th 2018.

Results

Out of 146 subjects who underwent colorectal surgery, only 63 patients met the criteria. The mean age was 53 years old; 46% of patients were males, and 54% were females. Laparoscopic procedures enrolled in 15.9% of patients, minor to the of the conventional approach was 84,1%. The most common location for colorectal tumor and procedure were sigmoid (47.6%) and colostomy closure (25.4%). There were 0% of mortality rates found in 63 subjects. The morbidity rates were 7.9%, caused by surgical site infection (1.6%), pneumonia (1.6%), and urinary retention (4.8%). Detail of subjects' characteristics presented in Table 1.

Table 1. Subjects' characteristics

Variables (n=63)	2015 (n=24)	2016 (n=17)	2017 (n=22)	Total (n=63)
Age, n (%)				
18-35 years old	29.2	11.8	0	14.3
36-50 years old	33.3	11.8	27.3	25.4
51-65 years old	29.1	52.9	59.1	46
>65 years old	8.3	23.5	13.6	14.3
Gender, n (%)				
Male	37.5	53	54.5	46
Female	62.5	47	45.5	54
Average LOS (days)	8	9	7	8
Surgical approach (%)				
Laparoscopic	8.3	17.6	22.7	15.9
Open	91.7	82.4	77.3	84.1
Location, n (%)				
Ascending colon	16.7	23.52	22.7	20.6
Transverse colon	0	11.8	9.1	6.3
Descending colon	12.5	11.8	4.5	9.5
Sigmoid colon	54.2	35.3	50	47.6
Rectum	16.7	17.6	13.6	15.9
Surgical procedures, n (%)				
Right hemicolectomy	12.5	23.5	18.1	19
Left hemicolectomy	0	5.9	9	4.8
Colostomy closure	37.5	17.6	13.6	25.4
Anterior resection	8.3	5.9	13.6	9.5
Low anterior resection	8.3	11.8	9	9.5
Hartmann's procedure	12.5	5.9	4.5	6.3
Hartmann's procedure reversal	4.2	11.8	27.3	14.3
Abdominoperineal resection	16.6	17.6	4.5	12.7
Complication, n (%)				
Mortality	0	0	0	0
Morbidity	8.4	11.8	4.5	8
Surgical site infection	4.2	0	0	1.6
Pneumonia	0	5.9	0	1.6
Urinary retention	4.2	5.9	4.5	4.8
Ileus	0	0	0	0
Deep vein thrombosis	0	0	0	0
Abdominal abscess	0	0	0	0

Bleeding	0	0	0	0
Cardiac problem	0	0	0	0
Leakage anastomosis	0	0	0	0
Other	0	0	0	0

Of 63 subjects who underwent colorectal surgery in 2015, 2016, and 2017, none found to achieve complete 15 scores of ERAS components. Preoperative ERAS component judged by four subjects: the prevalence for the implementation of information and counseling components (100%), selective mechanical bowel preparation (52.4%), reduced fasting duration (0%), and drink high carbohydrate drink (0%). Details are presented in table 2.

Table 2: Evaluation implementation of preoperative ERAS protocol for colorectal surgery (in %)

ERAS components	2015		2016		2017		Total	
	C	I	C	I	C	I	C	I
Information and education	100	0	100	0	100	0	100	0
Reduced fasting duration	0	100	0	100	0	100	0	100
Drink high carbohydrate drink	0	100	0	100	0	100	0	100
Selective mechanical bowel preparation	41.7	58.3	58.9	41.1	45.5	54.5	52.4	47.6

C: complete, I: incomplete

Intraoperative ERAS component consists of six subjects: the prevalence for the implementation of surgical site infection prevention (100%), intraoperative fluid management (100%), thromboprophylaxis (0%), prophylactic abdominal drainage (46%), and nasogastric tube installation (14.3%). Details are presented in table 3.

Table 3: Evaluation implementation of intraoperative ERAS protocol for colorectal surgery

ERAS components	2015		2016		2017		Total	
	C	I	C	I	C	I	C	I
Surgical site infection prevention	100	0	100	0	100	0	100	0
Thromboprophylaxis	0	100	0	100	0	100	0	100
Intraoperative fluid management	100	0	100	0	100	0	100	0
Avoid of prophylactic abdominal drainage	62.5	37.5	41.1	58.9	27.3	72.7	46	54
Avoid of prophylactic Nasogastric tube	16.7	83.3	5.9	94.1	18.2	81.8	14.3	85.7

C: complete; I: incomplete

Postoperative ERAS component consists of five subjects: the prevalence for the implementation of postoperative fluid management (100%), chewing gum (0%), postoperative early mobilization (56.6%), early enteral feeding (87.3%), and the use of non-opioid analgesics (88.9%). Respectively, in the case of the optimal duration of urinary drainage, the prevalence was 27%. Details are presented in table 4.

Table 4: Evaluation implementation of postoperative ERAS protocol for colorectal surgery

ERAS component	2015		2016		2017		Total	
	C	I	C	I	C	I	C	I
Early mobilization	54.2	45.8	29.4	70.6	77.3	22.7	55.6	44.4
Postop fluid management	100	0	100	0	100	0	100	0
Early enteral feeding	87.5	12.5	94.1	5.9	81.8	18.2	87.3	12
Chew gum	0	100	0	100	0	100	0	100
Optimal duration of urinary drainage	20.8	79.2	23.5	76.5	36.4	63.6	27	73

Non-opioid analgesic	79.2	20.8	94.1	5.9	100	0	88.9	11.1
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C: complete; I: incomplete

Of the 63 subjects, the total number of ERAS components following the protocol per subject was at least five components, 11 components maximal. There was a relationship between the total number of ERAS components per subject and the average length of stay ($p = 0.01$, $r = -0.568$). The result shows the more the components of ERAS fulfilled per subject, the average length of stay decreases. Details are presented in table 5.

Table 5: Relationship between the number of ERAS components fulfilled by the length of stay

Total ERAS components	n = 63	Average LOS (day)	p	r
1-4	0	-		
5	2	9 days		
6	9	10 days		
7	21	9 days		
8	13	8 days	<0.01	$r = -0.568$
9	12	6 days		
10	5	5 days		
11	1	4 days		
12-15	0	-		

Four components had been implemented well with a 100% compliance rate, seven components had not been implemented well, with a compliance rate of less than 100% and four components have never been implemented at RSCM to date.

Table 6: Evaluation implementation of ERAS protocol for colorectal surgery at Cipto Mangunkusumo Hospital in 2015, 2016, and 2017

ERAS Components	Already complete	Not complete	Not done
Preoperative	Information and counseling	Selective mechanical bowel preparation	Reduced fasting duration, drink carbohydrate rich drink
Intraoperative	Surgical site infection prevention, intraoperative fluid management	Avoid used of prophylactic, Nasogastric tube, avoid used of prophylactic abdominal drain	Thromboprophylaxis
Postoperative	Postoperative fluid management	Early mobilization, early enteral feeding, optimal duration of urinary drainage, Non-opioid analgesic	Chew gum
Total	4 components	7 components	4 components

Discussion

In the ERAS protocol in the colorectal surgery from Toronto in 2014, there were a total of 15 components that must be applied. It found that only 11 of 15 ERAS components applied in the study (73%). The four components that unable applied include: 1) shortened preoperative fasting, 2) high-carbohydrate preoperative diet, 3) deep vein thrombosis prevention, and 4) chewing gum. There was no improvement in the number of ERAS components from year to year, even the implementation of ERAS was better in 2015 than in 2017. Several reasons may lead to an incomplete application, e.g., the differences in mindset among surgeons, anesthesiologists, nutrition specialists, and

paramedics. Cipto Mangunkusumo, as a university hospital, also implemented perioperative care by many students with varied knowledge.

In the clinical setting, it is challenging to implement all of the ERAS components because of three main aspects: doctors, patients, and hospitals. Based on the doctor's aspect, it can be caused by a different mindset among surgeons, anesthesiologists, nutrition specialists, and paramedics. Some surgeons remain to keep the old paradigm for colorectal perioperative management. Those are an adequate fasting period and prohibiting the administration of a liquid three hours preoperatively. To successfully implement ERAS protocol requires collaborative efforts from various divisions. Based on hospitals aspect, limited health facilities, and long waiting hours of fasting before surgery might be the problem. Based on the patient aspect, there are differences in characteristics and culture between Indonesian people and other countries. Chewing gum intervention may become an obstacle; Indonesians not accustomed to chewing gum, and it may cause various undesirable things such as the risk of choking and aspirations.

Three antibiotics used in the ERAS protocol from Toronto. Those found different from the antibiotic use in policy in the Hospital. In our center, gentamicin and metronidazole as a surgical site infection prevention used as the protocol. Cefazolin, as one of the antibiotics in ERAS protocols, has never been used in Indonesia. Gentamicin and metronidazole are proven to be effective for both Gram-negative and anaerobic bacteria in colorectal. In this study, there was no case of deep venous thrombosis, even without the administration of anti-thrombotic drugs. It can be concluded that deep vein thrombosis prevention as a component in ERAS will not become necessary unless there is any indication.

In clinical practice, the use of nasogastric tubes must be selective, following the case experienced by the patient. The patient with the risk of obstruction or excessive intraoperative manipulation may lead to intestinal paralysis. The nasogastric tube for decompression and postoperative aspiration prevention is indicated.

To this finding, if a minimum of ten components applied to one subject, it may reduce the length of stay by five days from 8-9 days ($p < 0.05$ with $r = -0.568$; or have a significant correlation with the strength of moderate). Applying ten components out of a total of 15 ERAS components has fulfilled the main goal of ERAS protocol in colorectal surgery and reduced patient length of stay to five days postoperatively. The logistic regression showed that the more ERAS components applied to one subject, the shorter length of stay had become. Decreased length of stay has a positive impact on doctors, health providers, and patients themselves. By considering three main aspects: doctors, hospitals, and patients as a critical issue, it can be considered to make an adjusted ERAS protocol for Indonesian patients with colorectal surgery.

Conclusion

Our center has implemented 11 out of 15 ERAS components from Toronto as perioperative management. The ERAS protocol has been proven to reduce the length of stay for postoperative colorectal surgery ($p = 0,01$, $r = -0,568$). To improve the outcomes, we can adjust the ERAS

protocol from Toronto with the characteristics and culture of the Indonesian population.

Disclosure

The authors report no conflicts of interest in this work.

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