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## Outcome of ERAS in colorectal cancer surgery

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### Abstract

**Introduction:** Enhanced recovery after surgery is widely especially in the colorectal surgery units. However, there is paucity of data in Malaysia context. We report the application and outcome trends over a 1-year period in a colorectal surgery unit of a public hospital.

**Method:** This is a prospective study involving patients who underwent surgery for colorectal cancer in the colorectal unit, Hospital Sultanah Aminah, from August 2020 to August 2021.

**Results:** The cohort comprises 70 patients operated in a 1-year period from August 2020 to August 2021. There were 33 males and 37 females. The mean age was 63.26 years (SD 11.398), (range 25 to 81). Most of them were of American Society of Anesthesiologists (ASA) 2 category (n=43, 61.4%), followed by ASA 1(n=24, 34.3%) and 3(43%) of ASA 3 status. The mean duration of surgery was 171 min (81min to 310min). Anastomotic leak (n=8) and ileus (n=8) were seen in 11% of the study population respectively. There were 6(8.6%) readmissions, with surgical site infection being the commonest reason. The average length of stay was 5.13 days (2 to 18). Of the 26 components of ERAS that were audited for compliance, only 5 showed poor adherence of less than 75% while the rest scored between 75 and 100%.

**Conclusion:** The increase in adherence to ERAS protocol reduced the length of stay and readmission rate. This series demonstrated a low mortality rate, with comparable morbidities to existing standards.

**Key words:** ERAS colon surgery

### Introduction

Enhanced recovery after surgery is an evidence-based approach in the perioperative management which has the patient outcome at its heart, has been widely practiced worldwide. Although there has been institutional adoption of this practice in Malaysia, there remains paucity of data on the outcome. Thus far, we have identified a solitary publication depicting the outcome of ERAS implementation in pancreaticoduodenectomies performed in a university hospital.(1) Secondly, there were no literature published on the application of ERAS in colorectal surgery in Malaysia. When ERAS came into conception, it began with colorectal surgery. Unfortunately, despite the large numbers of colorectal surgeries performed in Malaysia, especially in the public hospitals, the outcome data has not been well documented. (2)Hence, we intend to depict the application and outcome trends in the colorectal surgery unit in a 1-year period.

### Methods

This is a prospective study involving patients who underwent surgery for colorectal cancer in the colorectal unit, Hospital Sultanah Aminah, from August 2020 to 2021. The surgeries were performed by colorectal surgeon and colorectal fellows with supervision. The ERAS protocol that were implemented included pre-admission strategies such as counselling by nurses, dietitian and physiotherapist; preoperative strategies such as fluid restriction with no pre-operative intravenous fluid, carbohydrate loading, thromboembolic prophylaxis, antibiotic prophylaxis, selective mechanical bowel preparation; anesthesia modification such as maintenance of intraoperative

normothermia, opiate sparing anesthesia, goal directed fluid therapy, urethral catheter and nasogastric tube removal prior to anesthesia reversal; surgeon related peri-operative strategy such as use of laparoscopy approach, avoidance of drain insertion, sham feeding, early enteral feeding, and tubes removal; promoting early mobilization, targeted enteral feed, and post discharge interview.

The data collected include demographics (age & gender), ASA status, height and weight, types of surgical procedures, duration of surgery, surgical complications, mortality, readmission rates, and reinterventions. The compliance rate for each component of ERAS protocol is calculated and expressed in a Radar chart to identify area of inadequate compliance.

The data were analysed with IBM® SPSS® version 26 (Armonk, NY: IBM Corp). Discrete variables were expressed as counts (percentage) and continuous variables as means ± standard deviation (SD).

### Results

The cohort comprises 70 patients operated in a 1-year period from August 2020 to August 2021. There were 33 males and 37females. The mean age was 63.26 years (SD 11.398), (range 25 to 81). The body build represented with mean weight of 61.23 kg (SD 12.03), (37 to 90 kg) and mean Height of 160.52cm (SD 7.88), (143 to 178 cm). This is a multiethnic study population with 37 chinese, 29 Malays and 4 indian patients. Most of the cohort were of American Society of Anesthesiologists (ASA) 2 category (n=43, 61.4%), followed by ASA 1(n=24, 34.3%) and only 3(43%) of ASA 3 status. The mean duration of surgery was 171 min (81min to 310min). The various types of surgeries

were shown in Table 1. More than two thirds 2/3 of the surgeries were done for sigmoid colon and rectal tumor. Laparoscopic surgeries were performed in 14 cases. (Table 1). The Intraoperative difficulties were listed in Table 2.

We prospectively documented the surgical complications as listed in Table 3. Anastomotic Leak (n=8) and ileus (n=8) were seen in 11% of the study population respectively (Table 3). The reintervention for anastomotic leak were transanal drains for low anastomosis, relaparotomy and washout ± redo anastomosis for intraperitoneal high anastomosis. Colonoscopic clipping was performed for stapler line bleeding. Relaparotomy and internal hernia repair was performed for one case of small bowel obstruction (Table 3). There were 6 readmissions, with surgical site infection being the commonest reason. Only 1 case of small bowel obstruction needed relaparotomy. The average length of stay was 5.13 days (2 to 18).

**Table 1: The type of surgery**

Extent of resection	N	%	laparoscopic
Anterior resection (AR)	36	51.4	13 (2 converted open)
Low AR	10	14.3	1
ULAR	4	5.7	-
APR	5	7.1	-
Left colectomy	7	10.0	1
Right Colectomy	5	7.1	1
Panproctocolectomy/total colectomy	3	4.3	-

**Table 2: Intraoperative difficulties**

Difficulties	N
Adhesions	1
Anastomosis failure	1
Iatrogenic bowel perforation	1
Uterine vessel injury	1
Excessive blood loss due to vascularized tumor	1
Dilated small bowels	1
Rectal stump tear	1
Vaginal wall involvement	1

**Table 3: Surgical complications and associated reintervention**

COMPLICATION	N
Urinary Retention	2
Ileus	8
Anastomotic Leak	8
Organ Space Surgical Site Infection (SSI)	2
Superficial Surgical Site Infection	2
Bleeding	2
Small Bowel Obstruction Due to Internal Herniation	1

*Aforementioned Complications Were Intervened with One Of The Following Manners: Transanal Drain, Relaparotomy And Washout, Relaparotomy And Repair of Internal Hernia, Relaparotomy And Redo Anastomosis, Colonoscopic Clipping*

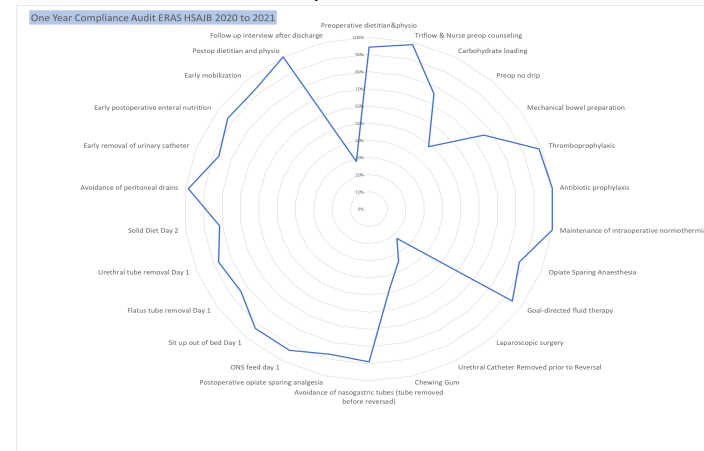
**Table 4: Readmission reasons and rate**

Readmission	N = 6 (8.6%)
Ileus	2
Bowel Obstruction	1
Organ Space SSI	1
Superficial SSI	2

With ERAS protocol implementation, we also audited the satisfaction of patient on their mobility, symptoms of nausea & vomiting (N&V) in a scale of zero to ten. They rated an average of 7.33 for mobility and 7.24 for N&V. The multimodal

analgesia practiced in our study population resulted in 10 patients needing patient-controlled analgesia (PCA) with morphine. All of them were weaned off from it within an average of 3.4 days (range 1 to 16 days).

Compliance to ERAS protocol, was audited across the multiple components from pre, intra and post-operative periods. The audit revealed 5 components that were less satisfactory in terms of compliance rates. They were “NO intravenous fluids preoperative (49%), Laparoscopic Surgery (23%), Urethral Catheter Removal prior to Reversal of Anesthesia (34%), Chewing Gum (47%) and post discharge follow up (29%). Apart from that, majority of the other components revealed good compliance rate at 76 to 100% (Table 5 and Figure 1). On a positive note, there was no mortality from current series.



**Figure 1: Radar Chart of compliance rate for ERAS components**

**Table 5: Compliance Rate for ERAS component**

ERAS key components in colorectal surgery	Compliance rate
Preoperative dietitian& physiotherapy	94%
Triflow & Nurse preop counseling	99%
Carbohydrate loading	76%
<b>Preop no intravenous fluids</b>	<b>49%</b>
Mechanical bowel preparation	76%
Thromboprophylaxis	99%
Antibiotic prophylaxis	100%
Maintenance of intraoperative normothermia	100%
Opiate Sparing Anaesthesia	87%
Goal-directed fluid therapy	94%
<b>Laparoscopic surgery</b>	<b>23%</b>
<b>Urethral Catheter Removed prior to Reversal</b>	<b>34%</b>
<b>Chewing Gum</b>	<b>47%</b>
Avoidance of nasogastric tubes (tube removed before reversed)	89%
Postoperative opiate sparing analgesia	87%
ONS feed day 1	93%
Sit up out of bed Day 1	93%
Flatus tube removal Day 1	84%
Urethral tube removal Day 1	87%
Solid Diet Day 2	81%
Avoidance of peritoneal drains	99%
Early removal of urinary catheter	87%
Early postoperative enteral nutrition	93%
Early mobilization	93%
Postop dietitian and physio	100%
<b>Follow up interview after discharge</b>	<b>29%</b>

**Table 6: Comparison of current series with previous local series on the application of ERAS at later period**

	2017 to 2018 (n=23)	2020 to 2021 (n=70)
Length of stay (days)	6.26 days (SD 3.414)	5.13 days (SD 3.55)
Readmission	4/23 (17.39%)	6/70 (8.6%)
Mortality	0	0

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**Discussion**

The incidence of colorectal cancer in Malaysia is 21.3 cases per 100,000 population. Most of our cohort consists of the Chinese ethnicity which is similar to the ethnicity-related incidence reported by the national colorectal cancer registry. (3)

Among the current pool of patients, only 10 patients required additional intravenous analgesia in the form of PCA morphine. This may due to the use of preperitoneal pump which had good opiate sparing effect. Ironically, there were 8 patients who had Type 1 intestinal failure despite previous literature indicating that ileus is reduced by use of preperitoneal local analgesia. (4)

In contrast to our previous series from 2017, the rate of readmissions and length of stay have been lower in the current cohort (table 6)(5). However, the retrospective nature and smaller sample size of the earlier study may limit the accuracy of the comparison.

**Conclusion**

The current study revealed that the implementation and further increase in adherence to ERAS protocol reduced the length of stay and readmission rate. Even though the extent of resection qualifies more than a third of the cases to be major surgeries, the mortality rate is low, and morbidities are comparable to previous published data. Local modification of ERAS protocol to improve compliance rate and evidence-based recommendation to other regional centers may improve the overall outcome of colorectal cancer surgery in Malaysia.

**Abbreviations**

ASA: American Society of Anesthesiologists

SSI: Surgical site infection

N&V: nausea and vomiting

PCA: patient controlled analgesia

ERAS: enhanced recovery after surgery

**References**

1. Ariffin AC, Mohammad AT, Zuhdi Z, Azman A, Othman HA, Jarmin R. Enhanced Recovery after Surgery (ERAS) Implementation after Pancreaticoduodenectomy: Interim Result. 2014;8.
2. Veetil SK, Lim KG, Chaiyakunapruk N, Ching SM, Abu Hassan MR. Colorectal cancer in Malaysia: Its burden and implications for a multiethnic country. *Asian Journal of Surgery*. 2017 Nov 1;40(6):481–9.
3. Portal Rasmi Kementerian Kesihatan Malaysia [Internet]. [cited 2021 Sep 19].
4. Huei TJ, Lip HTC, Zhe TJ, Dzainuddin NAN, Khee CK. Pre-Peritoneal Catheter Analgesia For Pain Management After Colorectal Surgery In 64 Consecutive Patients. :4.
5. Tan HCL, Tan JH, Nur Dzainuddin NA, Chan KK. First feasibility study and short-term outcomes of laparoscopic-assisted anterior resection in colorectal cancer in Malaysia. *Ann Coloproctol*. 2020 Mar 16;