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Enhanced Recovery after Surgery Protocol and the Factors Associated with Prolonged Hospitalization in Major Gynecologic Surgery at Suratthani Cancer Hospital

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ABSTRACT

Objectives: To evaluate the effectiveness and safety of our adopted enhanced recovery after surgery (ERAS) program for elective major gynecologic surgery at Suratthani cancer hospital and identified the factors contributing to prolonged hospitalization.

Materials and Methods: In this retrospective study, all patients who underwent major gynecologic surgery at Suratthani cancer hospital from July 2016 to December 2020 were included. We defined prolonged length of stayed group as those above medians of length of hospitalization and identified the risk factors that associated to this group.

Results: Two hundred and fifty patients who underwent major gynecologic surgery at Suratthani cancer hospital, were included. The median length of post-operative hospital stay was 3 days. And 86 (34.4%) patients have more than 3 days of post-operative hospital stay. The factors that associated with prolonged hospital stay were high body mass index (BMI), high American Society of Anesthesiologists (ASA) classification, disease of cervix, Radical hysterectomy with pelvic node dissection (RHND) operation, extremely blood loss, prolonged operative time and complication from surgery.

Conclusion: Our ERAS program showed some potentials of patient care in major gynecologic surgery. The risk factors that associated with prolonged hospital stay in this study were mostly non-modifiable. This result will be used to improve our ERAS program and promote the ERAS program in major gynecologic surgery.

Keywords: ERAS, hospitalization, length of stayed, major gynecologic surgery.

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โปรแกรมส่งเสริมการฟื้นฟูหลังผ่าตัดทางนรีเวชในโรงพยาบาลมะเร็งสุราษฎร์ธานี และปัจจัยที่ส่งผลต่อความล่าช้าในการจำหน่ายผู้ป่วย

กาญจนา กันธิยะ, สรวัจน์ เจนวณิชสถาพร

บทคัดย่อ

วัตถุประสงค์: *เพื่อประเมินประสิทธิภาพและความปลอดภัยของโปรแกรมส่งเสริมการฟื้นฟูหลังผ่าตัดที่ปรับเพื่อมาใช้ในการผ่าตัดผู้ป่วยทางนรีเวชในโรงพยาบาลมะเร็งสุราษฎร์ธานี และประเมินปัจจัยที่มีผลต่อความล่าช้าในการจำหน่ายผู้ป่วย*

วัสดุและวิธีการ: *เป็นการศึกษาแบบย้อนหลัง โดยนำผู้ป่วยที่ได้รับการผ่าตัดทางนรีเวชในโรงพยาบาลมะเร็งสุราษฎร์ธานี ตั้งแต่ กรกฎาคม 2559 ถึง ธันวาคม 2563 และได้จำแนกผู้ป่วยที่นอนโรงพยาบาลนาน คือกลุ่มที่มากกว่าค่ามัธยฐาน และศึกษาปัจจัยที่มีผลต่อความล่าช้าในการจำหน่ายในผู้ป่วยกลุ่มนี้*

ผลการศึกษา: *ผู้ป่วยจำนวน 250 ราย ที่ได้รับการผ่าตัดทางนรีเวชในโรงพยาบาลมะเร็งสุราษฎร์ธานี พบว่ามัธยฐานของวันเฉลี่ยที่นอนโรงพยาบาลอยู่ที่ 3 วัน และ 84 ราย (ร้อยละ 34.4) นอนโรงพยาบาลนานกว่า 3 วัน และพบปัจจัยที่มีผลต่อความล่าช้าในการจำหน่ายผู้ป่วย ได้แก่ ดัชนีมวลกายที่สูง, การประเมินสมรรถภาพของผู้ป่วยก่อนการผ่าตัดที่สูง, โรคที่เกี่ยวกับปากมดลูก, การผ่าตัดมดลูกออกแบบถอนรากถอนโคน, การเสียเลือดมาก, ระยะเวลาการผ่าตัดที่ยาว และมีภาวะแทรกซ้อนจากการผ่าตัด*

สรุป: *โปรแกรมส่งเสริมการฟื้นฟูหลังผ่าตัด ในการผ่าตัดทางนรีเวชในโรงพยาบาลมะเร็งสุราษฎร์ธานีมีผลลัพธ์ที่ดี โดยผู้ป่วยส่วนใหญ่สามารถจำหน่ายได้เร็ว และมีภาวะแทรกซ้อนกับอัตราการมานอนโรงพยาบาลซ้ำที่ต่ำ จากข้อมูลนี้จะช่วยพัฒนาโปรแกรมส่งเสริมการฟื้นฟูหลังผ่าตัด ของเราให้ดีขึ้น และสนับสนุนให้โรงพยาบาลอื่นใช้โปรแกรมนี้มากขึ้น*

คำสำคัญ: *โปรแกรมส่งเสริมการฟื้นฟูหลังผ่าตัด Enhanced recovery after surgery (ERAS) program, ระยะเวลาการนอนโรงพยาบาล, การผ่าตัดทางนรีเวช*

Introduction

Enhanced recovery after surgery (ERAS) was first outlined by a Danish surgeon, Dr. Henrik Kehlet in 1995 for colorectal surgery[1]. It is the evidence base multimodality protocol that aim to migrate the physiologic stress and optimize the rehabilitation of patient. Numerous publications have validated its efficacy to reduced hospital stay and complication rate[2].

In the recent years, ERAS protocol has been adopted in several other fields of surgeries[3-6]. ERAS protocol for gynecologic surgery also showed promising outcome. The previous studies showed postoperative hospital length stay in ERAS group that was shorter than the conventional group, 6.5 ± 3.5 days and 10.7 ± 11.4 days, respectively[7]. Meta-analysis demonstrated a 1.6 days decrease in length of stay (LOS), 32% reduction in complications and a 20% reduction in readmission (odds ratio (OR) 0.80, 95% confidence interval (CI) 0.64-0.99) for ERAS patients[8]. However ERAS protocol still underused in gynecologic surgery. Data from an international survey showed only 33% of institution that ERAS protocol was implemented and only 19% in asia[9].

Suratthani cancer hospital is the tertiary referral cancer center in the southern region 11 of Thailand. The ERAS protocol for gynecologic surgery was implemented and adapted to patients since the gynecologic oncology department was established in 2016. The purpose of this study was to evaluate effective and safety of our ERAS program for elective gynecologic surgery and identified factors associated with prolonged hospitalization. The results may guide to develop intervention to the target at risk patients, improve overall care, and reduce resource utilization.

Materials and Methods

We conducted a retrospective study using collected data included all patients who underwent elective major gynecologic surgery at Suratthani cancer hospital from July 2016 to December 2020.

Inclusion criteria was 18 or more-year-old patients who underwent elective major gynecologic surgery at Suratthani cancer hospital. Exclusion criteria were 1) patients whose data were lost and 2) patients who were referred to another hospital during admission.

Our ERAS protocol was adopted and developed from ERAS® society guideline10 that are detailed in Table 1.

The sample size was calculated with the formula for descriptive study using confidence level of 95% and 5% margin of error and proportions of prolonged hospital stay from a study proposed by Agrawal et al[11]. The minimal sample sizes were 236 cases.

The data were collected, and medical records were reviewed. The collected data included age, weight, height, underlying disease, diagnosis, operative detail, length of stay, and postoperative morbidity and mortality. We allocated the patients into two groups by using medians of length of post-operative hospital stay. Firstly, patients in normal length of stay (NLOS) group and secondly, patients in prolonged length of stay (PLOS). NLOS were defined as those equal or below medians of length of post-operative hospital stay and PLOS were defined as those above medians of length of post-operative hospital stay.

Statistical analyses included descriptive and inferential statistics. Variables were described using frequency and percentages for categorical data and mean, standard deviation (SD), median, interquartile range (IQR) for quantitative data. In comparison of 2 groups, categorical variables were analyzed using chi-square test. Continuous data were analyzed by using the student t-test for the data with normal distribution, and Mann-Whitney U test for the data with non-normal distribution. OR ratio was calculated with binary logistic regression analysis. A p value less than 0.05 was considered as statistically significant. Data were analyzed using SPSS® version 22.0 for Windows®.

Table 1. Enhanced recovery after surgery (ERAS) Protocol.

Preoperative	Give operative information
	Nutritional screening and treatment
	Give antidepressant as needed
	No routine mechanical bowel preparation
Intraoperative	Control excessive bowel exposure
	Prophylaxis antibiotic
	Prophylaxis VTE prevention with Enoxaparin SC (if no contraindicated)
	Locoregional anesthesia
	Epidural block
	Local injection
	Abdominal tap block
Postoperative	Promote early ambulation
	24 hr after surgery – sit or upright position
	48 hr after surgery – walk
	Promote respiratory exercise
	Early taking oral diet
	Day after surgery – oral fluid intake
	24 hr after surgery – soft diet
	Minimized intravenous fluid, keep urine output at 0.5-1 ml/kg/hr
	Multimodality analgesia
	Acetaminophen prescribed every 4 hours
	NSAIDs for selected case
	Reduced opioid use
Discharge criteria	No fever or tachycardia
	No clinical complication
	Ambulation with minimal assistance
	Adequate pain control with oral analgesia
	Adequate hydration and nutrition intake

VTE: venous thromboembolism, SC: subcutaneous, NSAIDs: non-steroidal anti-inflammatory drugs

Results

There were 258 patients who underwent elective gynecologic surgery patients at Suratthani cancer hospital from July 2016 to December 2020. Eight patients were excluded due to referred to other hospital during admission: 3 patients were required ICU after surgery, 4 patients had the condition that required internal medicine physician care and 1 patient had intraoperative complication. Therefore, a total of 250 patients were included for analysis in this study. (Fig. 1)

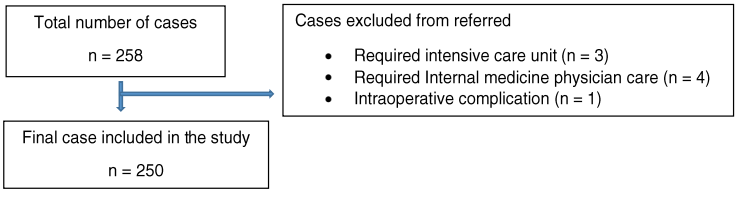

Fig. 1. Detail of patients.

The demographic and characteristics of the patients are shown in Table 2. A total of 250 patients with a mean age of 49 years (range 19 - 84 years), the mean body mass index (calculated as weight (kg)/ height (m^2)) was 25.1 kg/m^2. While most cases did not have underlying (64%) and 56% of the cases were diagnosis malignancy. More than half of cases had an ASA (American Society of Anesthesiologists) classification of 2. Most patients (86%) received general analgesia (GA), 9.6% of patients received GA combined with regional analgesia (RA) and 1.2% of patients received only RA. Most patients underwent surgical staging and follow by total abdominal hysterectomy with bilateral salpingo-oophorectomy, salpingo-oophorectomy, radical hysterectomy with pelvic node dissection, and total abdominal hysterectomy. 26 patients used patient controlled analgesia (10.4%). Mean overall morphine dosage was 5.6 mg (SD ± 4 mg).

Postoperative complications was 4% with bleeding 2 cases, bowel eviscerated 1 case, respiratory complication 4 cases, femoral nerve neuropraxia 2 cases, and vesicovaginal fistula 1 case. One patient had hospital readmission within thirty days of discharge due to retained foreign body.

Table 2. Characteristic of patients (n = 250).

Age (years)	Mean 49.3 (SD ± 12.6)
< 40	56 (22.4%)
40 - 59	142 (56.8%)
60 - 80	52 (20.8%)
BMI (kg/m^2)	Mean 25.1 (SD ± 5.61)
< 20	26 (10.4%)
15 - 25	108 (43.2%)
25 - 30	65 (26%)
> 30	49 (19.6%)
Underlying disease	
No	160 (64%)
Hypertension	65 (26%)
Diabetes mellitus	27 (10.8%)
Pulmonary disease	9 (3.6%)
Other cancer	4 (1.6%)
Other disease	9 (3.6%)
Menopause	118 (47.2%)
ASA classification	
1	83 (33.2%)
2	142 (56.8%)
3	25 (10%)
Diagnosis	
Ovarian neoplasm	112 (44.8%)
Benign	61 (24.4%)
Borderline	8 (3.2%)
Malignant	43 (17.2%)
Uterus neoplasm	100 (40%)
Benign	33 (13.2%)
Malignant	67 (26.8%)

Table 2. Characteristic of patients (n = 250). (Cont.)

Cervix neoplasm	38 (15.2%)
Benign	4 (1.6%)
Carcinoma in situ (CIS)	4 (1.6%)
Malignant	30 (12%)
Pathology	
Benign	98 (39.2%)
Borderline or CIS	12 (4.8%)
Malignant	140 (56%)
Stage 1	98 (39.2%)
Stage 2	16 (6.4%)
Stage 3	15 (6%)
Stage4	11 (4.4%)
Operation	
TAH	8 (3.2%)
Unilateral or bilateral SO	29 (11.6%)
TAH with Unilateral or bilateral SO	51 (20.4%)
Surgical staging (TAH with bilateral SO with Lymphadenectomy with Omentectomy)	140 (56%)
RHND	22 (8.8%)
Anesthesia type (%)	
General anesthesia (GA)	223 (89.2%)
Regional Anastasia (RA)	3 (1.2%)
Combined GA and RA	24 (9.6%)
Incision	
Midline	221 (88.4%)
Pfannenstiel	26 (10.4%)
Maylard	3 (1.2%)
Other organ resection	7 (2.8%)
Small bowel	5 (2%)
Colo-rectum	2 (0.8%)
Intraoperative other organ injuries	18 (7.2%)
Major Vessel	6 (2.4%)
Bowel	9 (3.6%)
Ureter	1 (0.4%)
Bladder	2 (0.8%)
Blood loss (ml)	median 300 (IQR 150-600)
Massive blood loss (> 1,500 ml)	7 (2.8%)
Operative time (min)	median 160 (IQR 110-240)

Table 2. Characteristic of patients (n = 250). (Cont.)

Complication	10 (4%)
Post-operative bleeding	2 (0.8%)
Bowel eviscerated	1 (0.4%)
Respiratory complication	4 (1.6%)
Femoral nerve neuropraxia	2 (0.8%)
Vagino-vesicle fistula	1 (0.4%)
Time to soft diet (days)	Mean 1.1 (SD ± 0.07)
Pain control	
Patient controlled analgesia (PCA)	26 (10.4%)
Conventional as-need analgesia	224 (89.6%)
Overall morphine dose (mg)	Mean 5.6 (SD ± 4)
Length of stay (days)	Median = 3 (IQR 3-4) (min 1 - max 13)
	Mean 3.5 (SD ± 1.4)
Length of stay > 3 days	86 (34.4%)
Cause of prolong LOS	
Patient preference	24 (9.6%)
Poor intake	8 (7.2%)
Poor ambulation	15 (6.0%)
Respiratory complication	4 (1.6%)
Re-operation	3 (1.2%)
Foley catheter related	12 (4.8%)
Fever	3 (1.2%)
Other	7 (2.8%)
Re-admission within 30 days	1 (0.4%)

CIS: carcinoma in situ, RHND: radical hysterectomy with pelvic node dissection, GA: general anesthesia, RA: regional anastasia, PCA: patient controlled analgesia, LOS: length of stay, IQR: interquartile range

The patients had an average length of post-operative hospital stay at 3.5 days and the median at 3 days with 164 (65.6%) patients who demonstrated good functional recovery and have 3 or less days, they were allocated to NLOS group and 86 (34.4%) patients who had more than 3 days of post-operative hospital stay, were allocated to PLOS group. The reasons of prolong hospital stay were poor oral intake (18 cases, 7.2%), poor ambulation (15 cases, 6%), Foley's catheter related condition (12 cases, 4.8%), respiratory complications (4 cases, 1.6%), fever (3 cases, 1.2%), reoperation (3 cases, 1.2%), other (7 cases, 2.8%) and 24 patients (9.6%) who met discharge criteria but preferred to stay in the hospital.

The present study found PLOS group had statistically significant ($p < 0.05$) association with more BMI, high ASA classification (ASA class 3, OR 2.74, 95%CI 1.17-6.25), disease of cervix (OR 2.16, 95%CI 1.04-4.35), radical hysterectomy with pelvic dissection operation (OR 6.01 95%CI 2.26-16.03), blood loss, prolong operation and complications (Table 3).

Table 3. Characteristic of patients by length of stay (LOS) and univariate analysis of risk factors associated with prolonged LOS.

	NLOS (n = 164)	PLOS (n = 86)	p value	OR (95%CI)
Age (years) mean ± SD	48.6 ± 12	50.7 ± 12.4	0.87	1.009 (0.986-1.032)
BMI (kg/m^2) mean ± SD	24.5 ± 4.4	25.9 ± 6.2	< 0.01	1.034 (0.980-1.091)
Underlying disease				
No underlying disease	106 (64.6%)	55 (63.9%)	0.77	0.94 (0.62-1.32)
Hypertension	39 (23.7%)	26 (30%)	0.26	1.33 (0.76-2.45)
Diabetes mellitus	19 (11.5%)	8 (9.3%)	0.58	0.78 (0.39-1.82)
Pulmonary disease	7 (4.2%)	2 (2.2%)	0.43	0.50 (0.12-2.60)
Other cancer	4 (2.4%)	0 (0%)	0.14	-
Other disease	5 (3%)	4 (4.6%)	0.51	1.55 (0.46-5.93)
ASA Classification			0.04	
1	54 (32.9%)	29 (33.7%)		1.01 (0.5-1.8)
2	99 (60%)	43 (50%)		0.63 (0.3-1.1)
3	11 (6.7%)	14 (16.2%)		2.74 (1.17-6.25)
Disease			< 0.01	
Ovarian neoplasm	80 (48.7%)	32 (37.2%)		0.62 (0.36-1.01)
Uterus neoplasm	65 (39.6%)	35 (40.6%)		1.04 (0.62-1.77)
Cervix neoplasm	19 (11.5%)	19 (22.0%)		2.16 (1.04-4.35)
Pathology			< 0.01	
Benign	77 (46.9%)	21 (24.4%)		0.36 (0.23-0.67)
Borderline or CIS	7 (4.2%)	5 (5.8%)		1.38 (0.42-4.49)
Malignant	80 (48.7%)	60 (69%)		2.42 (1.39-4.21)
Operation			< 0.01	
TAH	8 (4.8%)	0 (0%)		-
Unilateral or bilateral SO	25 (15.2%)	4 (4.6%)		0.27 (0.09-0.80)
TAH with Unilateral or bilateral SO	38 (23.1%)	13 (15.1%)		0.59 (0.29-1.18)
Surgical staging	87 (53%)	53 (61.6%)		1.42 (0.83-2.41)
RHND	6 (3.6%)	16 (18.6%)		6.01 (2.26-16.03)
Anesthesia type (%)			0.23	
General anesthesia (GA)	150 (91%)	73 (84%)		0.52 (0.23-1.17)
Regional Anastasia (RA)	2 (1.2%)	1 (1.1%)		0.95 (0.08-10.66)
Combined GA and RA	12 (7.3%)	12 (13.9%)		2.05 (0.88-4.79)
Other organ resections	3 (1.8%)	4 (4.6%)	0.14	2.66 (0.57-11.97)
Injuries	9 (5.4%)	9 (10.4%)	0.27	2.01 (0.76-5.27)
Blood loss (ml) median (IQR)	200 (100-450)	350 (300-850)	< 0.01	1.000 (1.000-1.010)
Operative time (min) median (IQR)	140 (100-200)	210 (150-300)	< 0.01	1.006 (1.003-1.010)
Complication	0 (0%)	10 (11.6%)	< 0.01	-
PCA	13 (7.9%)	13 (15.1%)	0.21	2.06 (0.91-4.68)
Morphine (mg) mean ± SD	5.3 (SD ± 4.5)	6.6 (SD ± 3.7)	0.77	1.13 (9.94-1.23)

CIS: carcinoma in situ, RHND: radical hysterectomy with pelvic node dissection, GA: general anesthesia, RA: regional anastasia, PCA: patient controlled analgesia, IQR: interquartile range

Discussion

In Thailand, the studies on ERAS care guidelines on gynecological surgery are currently limited especially in cancer surgery. In this study, we collected the data of the patient who underwent elective major gynecologic surgery which mostly were diagnosed or clinical suspected of malignant. We demonstrated good post-operative recovery with median postoperative hospital stay at 3 days and 65.6% of patients have 3 days or less which was consistent with most retrospective studies established in Gynecologic Oncology[8, 12-14].

Overall post-operative morphine dosage was low in this study (average 5.6 mg) due to our multimodality analgesia. PCA may be not suitable in our patient because low morphine needed and trended to associate with prolong hospital stay (15.1% vs 7.9%) but no statistical significant ($p = 0.21$).

This study demonstrated safety in our protocol with lower morbidity and mortality than most previous studies but may be due to patient selection bias[8, 12-15]. We found that more BMI, high ASA classification, disease of cervix, RHND operation, blood loss, prolong operation and complications are associated with PLOS that mostly were non-modifiable risk factors.

Many previous studies showed better results than ours with median post-operative hospital stay at 1 or 2 days and we had a lot of rooms to improve our protocol. First, no patient in this study underwent laparoscopic surgery which previous study demonstrated improvement post-operative recovery and shortened hospital stay[16]. Second, there were 24 patients in this study (9.6%) who met discharge criteria but preferred to stay in the hospital, indicated inadequate pre-operative counselling. Lastly, most patient with cervical cancer who underwent RHND (72%) had prolong hospital stay due to urinary retentions. Nerve sparing RHND has reported to improved bladder function[17, 18], this technique should be considered in selected patients.

However, there were several limitations to this study. First, there were a large amount of selection bias due to it was designed as a retrospective descriptive study and Surathani cancer hospital does not have Intensive Care Unit (ICU) and internal medicine staff, so we can not perform operation in high-risk patients and 8 patients who needed ICU or internal medicine care were referred to tertiary care hospital. Second, we did not have the result of the period before conducting ERAS protocol to compare because Gynecologic division in our hospital just opened in 2016. Lastly, our protocol was not strict, therefore the management was based on each surgeon's preference and this study did not evaluate the adherence of the patient to the protocol.

The ERAS program will help the hospital with earlier discharge, reduced costs of medical treatment, and reduced overcrowding problems but the program is still underused in gynecologic surgery. This study was a pilot study for our ERAS program, which was easily applied and showed a favorable outcome. In the future, we can use this result to improve our ERAS program for the benefit of the patients and the hospital.

Conclusion

Our ERAS program showed some potentials of patient care in major gynecologic surgery with median post-operative length of stay at 3 days and low complication rate. High BMI, high ASA classification, disease of cervix, RHND operation, blood loss, prolong operation and complications were associated with PLOS that mostly were non-modifiable risk factors. This result will be used to improve our ERAS program and promote the ERAS program in major gynecologic surgery.

Potential conflicts of interest

The authors declare no conflicts of interest.

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