



ERAS: An Audit of Existing Practices

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Abstract

Objectives Enhanced recovery after surgery (ERAS) is a set of multidisciplinary, evidence proven guidelines which enhance perioperative recovery in various surgical branches. This study was planned as a pilot effort with the aim of evaluating the surgical team's compliance to ERAS, in the absence of a structured programme, in the department of gynaecologic oncology of a tertiary care hospital in India.

Methods This is a retrospective audit of patients who underwent elective surgery, in the department of gynaecologic oncology, in a tertiary care centre in India, between 15th August 2019 to 15th October 2019. Emergency operations and those surgeries with palliative intent were excluded from the study. Electronic outpatient and inpatient records of patients chosen by convenient sampling were examined. Adherence to 18 components (pre-operative, intra-operative and post-operative) from the ERAS guidelines pertaining to surgical care were analysed.

Results A total of 50 patients were included. Mean age group was 50 years (22–76 years). Majority of patients (60%) had a Charlson Deyo score of 0. Excellent compliance was noted with respect to preoperative counselling (94%), intraoperative management (86%) and post-operative factors such as early ambulation, thromboprophylaxis and early discharge. Practices which required improvement included reduction of period of pre-operative fasting, prehabilitation, carbohydrate loading, gum chewing and coffee consumption and early initiation of feeding in post-operative period.

Conclusion Dedicated and co-ordinated team effort will ensure that an ERAS protocol is enforced. Periodic auditing will reveal inconsistencies in compliance and guarantee benefit to patients.

Keywords ERAS · Gynaecology oncology · Audit · Compliance

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Introduction

Enhanced recovery after surgery (ERAS) is a set of multidisciplinary, evidence proven guidelines devised by Dr Henrik Kehlet (Rigshospitalet, Copenhagen University), to enhance post-operative recovery in various surgical branches [1]. The ERAS society was formed in 2010 and provided a template model consisting of 20 elements, broadly classified as pre/intra and post-operative sectors. Guidelines for gynaecologic oncology were published in 2016 and updated in 2019 [2]. Research has shown reduced post-operative complication rate and documented patient benefit by its adoption into practice [3]. Consistent and systematic compliance to ERAS during preoperative, intraoperative and post-operative period ensures its maximum derived benefit [4].

Despite the documented benefit, it is uncertain to what degree ERAS is implemented by a surgical speciality, in the absence of an active ERAS programme. Conventional

surgery and surgeon’s wisdom have been the dominant resistance force in establishing ERAS [5]. This study was planned as a pilot effort with the aim of evaluating the surgical team’s adherence to ERAS in the absence of a structured programme in the Department of Gynaecology Oncology of a tertiary care hospital, in India.

Methods

This is a retrospective audit of 50 patients chosen by convenient sampling who underwent elective surgery in the department of gynaecologic oncology in a tertiary care centre in India between 15th August 2019 to 15th October 2019. Emergency, day care and palliative surgeries were excluded. Adherence to 18 (pre-operative, intra-operative and post-operative) components from the ERAS guidelines, pertaining to surgical care were analysed as shown in Fig. 1. Data analysis was done using SPSS (Statistical Product and Service Solutions) version 21 (IBM, Armonk, New York, USA).

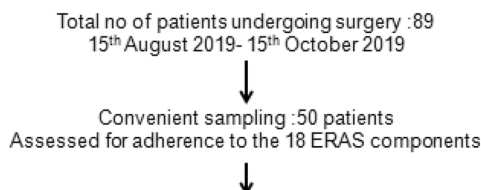
Results

A convenient sample of 50 patients was selected from 89 patients who underwent surgery during this period, and their electronic outpatient and inpatient records were examined.

The median age of these patients was 50 years (22–76 years). Majority of patients (60%) had a Charlson Deyo score

of 0 and ECOG (Eastern Co-operative Oncology Group) performance status of 0 or 1(84%) (Table 1). Of the 50 cases, 42 cases had a preoperative diagnosis of malignancy and 8 cases were diagnosed to be benign, post-surgery. Carcinoma ovary accounted for 23 cases (46%) followed by carcinoma endometrium which accounted for 17 cases(34%). Staging laparotomy for ovarian and endometrial malignancy was the most common surgery performed (30 cases). Three patients with carcinoma endometrium underwent laparoscopic surgery and lymphadenectomy. Hyperthermic intraperitoneal chemotherapy (HIPEC) was performed in 1 patient. Splenectomy was done in 2 patients, peritonectomy was done in 5 patients, and diaphragmatic stripping in 4 patients.

In the pre-operative phase, compliance to 3 components was assessed: the pre-op counselling, preparation of the patient and duration of restriction of solids and liquids. Overall compliance to pre-op counselling was 94% with lower compliance to incision counselling (Table 2). Fourteen patients underwent mechanical bowel preparation without antibiotics as planned by preoperative evaluation. Pre-op aerobic exercises and chlorhexidine bath were not followed, and pre-op carbohydrate loading was followed in



Preoperative components	Intraoperative components	Postoperative components
Counselling	SSI prevention	Fluid management
Prehabilitation	Hypothermia	Multi-model analgesia
Bowel Preparation	Use of drains	DVT prophylaxis
Pre-operative fasting	Antibiotic prophylaxis	Normoglycemia
Carbohydrate loading	Minimal invasive surgery application	Early feeding
Thrombo prophylaxis		Drain removal
		Discharge date

■Emergency, palliative and minor surgeries have been excluded

Table 1 Demographic profile of patients

Clinical characteristics	Results (N=50)
Age (median) (range)	50 years (22–76 years)
BMI* (median) (range)	26.2 kg/m ² (20–42 kg/m ²)
<i>ECOG**</i>	
0–1	42(84%)
2	8(16%)
<i>Charlson Deyo score</i>	
0	30(60%)
1	15(30%)
2	5(10%)
≥ 3	0
<i>Nature of disease</i>	
Malignancy ^a	42
Ovarian cancer	23
Endometrium cancer	17
Cervix cancer	2
Benign cases	8
<i>Type of surgery</i>	
Staging laparotomy	30
Interval debulking surgery	6
CRS and HIPEC	1
Radical hysterectomy	3
Laparotomy frozen proceed	7
MIS (minimal invasive surgery)	3

*Body mass index; **Eastern Co-operative Oncology Group performance status

^aSubtext italicised

Fig. 1 Study flow diagram

Table 2 Measure of compliance to components of ERAS

ERAS compliance measures	Results ^a	Overall compliance (%)
<i>Preoperative components</i>		
Preoperative counselling ^b		
Disease management	50/50	100
Incision	42/50	84
Care plan	46/50	92
Surgery	50/50	100
Prehabilitation		
Aerobic exercises	0/50	0
Correction of anaemia	8/8	100
Optimization of nutrition	3/3	100
Avoidance of routine mechanical bowel preparation	31/31	100
Carbohydrate loading	11/50	22
Preoperative fasting:		
2 h for liquids	2/50	4
6 h for solids	0/50	0
Chlorhexidine bath	0/50	0
Thromboprophylaxis (TED stockings ^c and prophylactic heparin)	50/50	100
<i>Intraoperative components</i>		
Air blankets	42/42	100
Antibiotic prophylaxis	50/50	100
Chlorhexidine skin preparation	50/50	100
Intermittent pneumatic compression	50/50	100
Minimal access surgery	5/15	33
<i>Post-operative measures</i>		
Early ambulation	50/50	100
Regular diet within 24 h of surgery	18/50	36
Gum chewing	0/50	0
Coffee consumption	2/50	4
Thromboprophylaxis (TED stockings ^c and prophylactic heparin)	50/50cxs	100
Opioid sparing analgesia	14/50	28
Normoglycemia	4/8	50

^aNumerator is the number of cases where compliance was followed and the denominator is the number of eligible cases

^bSubtext italicized

^cThromboelastic deterrent stockings

approximately 22% cases. Compliance to preoperative fasting guidelines of 2 h for clear fluids and 6 h for solids was poor.

As shown in Table 2, excellent compliance 100% was achieved to the intraoperative components which included use of air warming blankets, antibiotic prophylaxis, chlorhexidine skin preparation and use of intermittent pneumatic compression. Minimal access surgery was done in 33% of cases. Naso-gastric drains and intraperitoneal drains were used in 2 patients. As shown in Table 3, Foley's transurethral catheter was mostly removed between 24 and 48 h (62.7%). Two patients had an intraperitoneal drain which were removed after 72 h.

In the post-operative phase, good compliance was noted in early ambulation, deep venous thrombosis prophylaxis bundle (use of intermittent pneumatic compression, heparin administration and thromboelastic deterrent stockings (TEDS) and maintenance of euglycemia as shown in Table 2. Extended thromboprophylaxis was followed for all major oncology surgeries. Certain components like gum chewing and coffee consumption were not adhered to in majority of patients. Mean time to restart clear liquids and liquid diet was 4 h (2–12 h) and 16 h (3–33 h). Fifty per cent (25 patients) were started on soft solids between 24 and 48 h.

A multimodal analgesia approach was observed with paracetamol being the primary pain relief in all patients. Pain

Table 3 Clinical characteristics in the post-operative period

Post-operative characteristics	No of patients
Transurethral catheter removal	N=50
≤24 h	3(6%)
>24–48 h	32(64%)
>48–72 h	4(8%)
>72 h	11(22%)
Intraperitoneal drain removal ^a	N=2
≤72 h	0
>72 h	2 (100%)
Re-feeding (soft diet)	N=50
≤24 h	18 (36%)
>24–48 h	25 (50%)
>48–72 h	4 (8%)
>72 h	3 (6%)
Hospital stay (days)	N=50
≤24 h	3 (6%)
>24–72 h	25 (50%)
>72–96 h	11 (22%)
>96 h	11 (22%)
Pain relief medications	N=50
Epidural	43 (84%)
Paracetamol	50 (100%)
NSAIDS*	12 (24%)
Tramadol	36 (72%)
Morphine	7 (14%)

*Nonsteroidal anti-inflammatory drugs

^a2 Patients who underwent bowel resection–anastomosis

score scale based on Wong-Baker faces scale was plotted on post-op day 2 as shown in Fig. 2. Twenty-nine patients had a score of 3–4 and six patients had a score greater than 5. A collective assessment of the various factors was tabulated as excellent, good and poor compliance as shown in Fig. 3. During this period, there was one major post-operative complication, class 3 b as per Clavien-Dindo classifications. She had re-laparotomy in view of peritonitis due to intestinal leak and recovered eventually.

Discussion

ERAS includes components of patient care which begin from the time when the patient is planned for surgery in the outpatient department (OPD) till time of discharge. These components have been individually tested and found to improve perioperative care. Systematic incorporation and compliance to all ERAS time tested components have shown to reduce post-surgical complications by up to 50%, length of stay by 30% and overall costs [6–8]. For successful implementation of a multiple component guideline [9] standard operating protocol should be drawn up and a dedicated trained team should be installed to achieve the goal. We performed this audit to study the compliance to the guidelines prescribed by the ERAS society for gynaecologic oncology surgeries in the absence of a checklist and a dedicated team.

Prehabilitation permits preparation of the patient for anaesthesia, surgery and its aftermath [10] and includes various interventions such as exercise, nutrition and

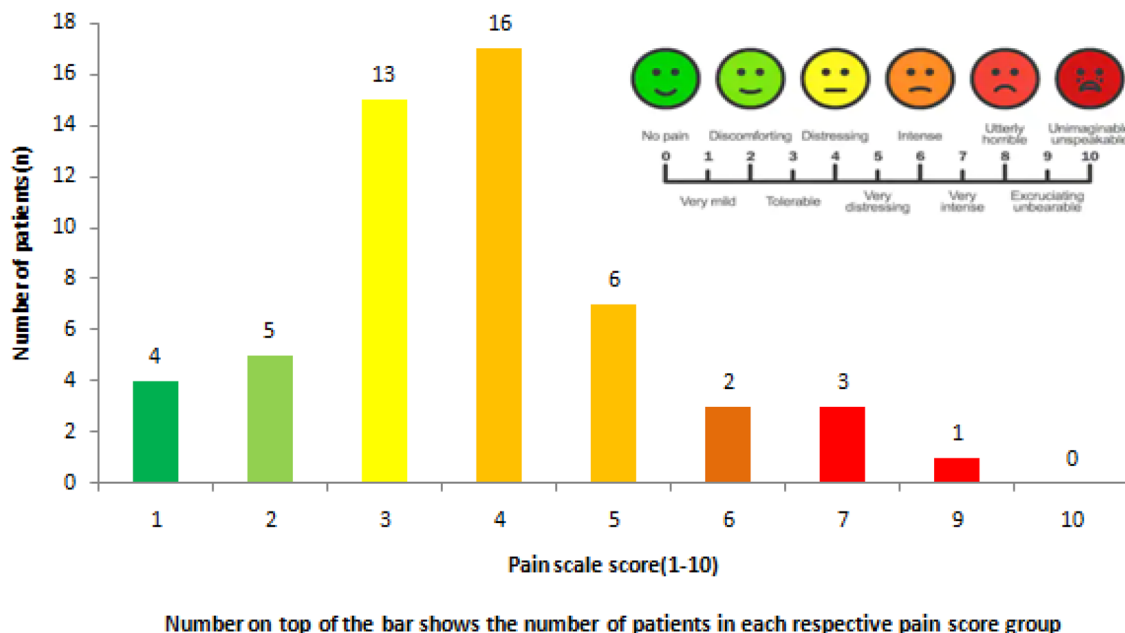


Fig. 2 Pain score on day 2

Excellent compliance (90-100%)	Good compliance (60-90%)	Poor compliance (<60%)
<p>Preoperative components</p> <ul style="list-style-type: none"> • Counselling • Correction of anemia and nutritional rehabilitation • Avoidance of mechanical bowel preparation • Thromboprophylaxis <p>Intraoperative components</p> <ul style="list-style-type: none"> • Thromboprophylaxis • Normothermia <p>Post-operative components</p> <ul style="list-style-type: none"> • Early ambulation 	<ul style="list-style-type: none"> • Early post-operative discharge 	<p>Preoperative components</p> <ul style="list-style-type: none"> • Aerobic exercises • Carbohydrate loading and fasting guidelines • Chlorhexidine bath • Choice of minimal access surgery <p>Post-operative components</p> <ul style="list-style-type: none"> • Gum chewing and caffeine consumption • Initiation of regular diet • Post operative opioid sparing analgesia

Fig. 3 Compliance scores as a percentage of the various factors

anxiety allaying counselling after preoperative assessment. The zero compliance with regard to aerobic exercise noted in this study could be secondary to lack of knowledge about its benefit among the medical personnel, focus on pre-operative work up and obvious pre-operative morbidities that the patient suffers from, besides general lack of “fitness” among patients themselves.

Various modalities like mechanical bowel preparation and long duration of fasting have been advocated as good measures by “conventional” surgeons in view of proposed benefits such as ease of bowel handling and to avoid spillage of contents in event of intra-operative bowel injury or spillage. However, this has not been substantiated by evidence and can be detrimental [11–13]. Fourteen patients who were anticipated to require bowel resection and anastomosis based on preoperative evaluation received mechanical bowel preparation without antibiotics as per the department’s policy.

Carbohydrate loading and avoidance of prolonged preoperative fasting reduce catabolic response to surgical stress [14]. The poor compliance noted in this study highlights the need for co-ordination between the anaesthetists and surgeons and enforcement by nurses. Compliance to carbohydrate loading and pre-op chlorhexidine bath were followed in 11/50 patients and none, respectively. Although a few studies fail to support routine use of chlorhexidine for prevention of SSI [15–17], it is still a low cost effective intervention that can be used in order to reduce bacterial contamination of skin, and has been given a strong grade of recommendation [2]. Knowledge dissemination and concerted effort among the care giving team will allow team co-ordination for adherence.

Various components of intra-operative phase such as use of air blankets to ensure normothermia, antibiotic prophylaxis, chlorhexidine skin preparation and use of DVT deterrents were well accepted as evidenced by 100 per cent compliance. Minimal access surgery was performed in 5 of 15 eligible patients due to costs involved with laparoscopic surgeries.

Post-operative recovery guidelines pertaining to early ambulation, DVT prevention bundle and maintenance of euglycaemia, were followed to a good extent. However, practical and cheap practices which speed up recovery of colonic motility such as gum chewing [18] and coffee consumption post-surgery were neglected. Caffeine antagonises adenosine receptors thus enhancing colonic motility [19, 20]. Factors proposed for this disparity could be surgeon’s ignorance or the mindset of surgeons and patients that gum chewing is a sign of disrespect in the Indian context. Early feeding was probably not followed due to a fear of inducing post-operative nausea and vomiting following extensive upper abdominal surgery or as a cautionary measure following bowel injury repair or resection anastomosis. Although these fears were due to “biased conventional wisdom”, majority of surgeons preferred slow restart to the feeding process as reflected in mean time of re-starting liquid and solid diet.

Naso-gastric (NG) tubes and intraperitoneal drains were not routinely used but were placed following bowel resection anastomosis. Decreasing drain output and patient clinical condition dictated the timing of removal of drains. The reasons for late removal of Foley’s catheter in this cohort were following radical hysterectomy for cervix cancer (3), intra-operative bladder injury and delayed removal of epidural catheter.

An opioid sparing multimodal pain relief approach is recommended to improve functional recovery [21, 22]. In this study, there was decreased usage of morphine, but there was increased pain scores on day 2. Epidural analgesia with bupivacaine or ropivacaine with adjuvants like fentanyl was used as a major pain relief. The raised pain scores could be attributed to probable lower levels of drug used or epidural catheter displacement or patchy analgesia. Dependence on diclofenac also was lower in this study which is attributed to well-known ill effects in patients with bowel anastomosis and concerns of renal disorders in elderly [23]. Early discharge [24–72 h] was reasonably achieved in 25 patients who underwent major cancer surgery.

As evident in the overall compliance chart (Fig. 3), there are areas of poor adherence which require addressal. Education of health personnel with regard to benefits of ERAS will help in change of attitude and allow practice of evidence-based medicine. As shown in different studies, implementation of ERAS reduced the costs, hospital stay duration, intravenous fluid usage and epidural complications and duration [24, 25]. Formation of a dedicated team will help in sharing the burden of ensuring compliance, increase centrality among providers and develop adaptive management skills as per regional, social and cultural practices which in turn will improve compliance. Formulating an ERAS protocol or a checklist for a dedicated team to follow will avoid disparity and variation in patient care among health care providers. Monetary backing is required to establish regular training and knowledge dissemination to the primary care givers and this should be considered as an investment. ERAS auditing tools like the RECOVER (Reporting on ERAS Compliance, Outcomes, and Elements Research) Checklist should be used to report accurate adherence [2].

The merit of the study is the unbiased retrospective recording of the events which was not disclosed to the treating team to avoid “Hawthorne Effect” [26]. This pilot study initiated to assess the department’s compliance to ERAS in the absence of an established programme or checklist has revealed inconsistencies in adherence to ERAS and the urgent need for development of documented protocol and formation of a dedicated team.

Conclusion

Essential for successful implementation of an ERAS programme is formulation of ERAS protocol, formation of a dedicated team with proper analysis and constant auditing to ensure adherence and maximum patient benefit. It is time we break conventional shackles to embrace these guidelines in order to improve our patient care.

Authors’ contribution KCB and VT contributed to the study conception and design, data analysis and manuscript preparation. KCB, DST, AS, AT, RC, AP and VT were involved with material preparation, data collection, manuscript revision and approval of final version of manuscript.

Declarations

Conflict of interest Karthik C. Bassetty, Dhanya Susan Thomas, Ajit Sebastian, Anitha Thomas, Rachel Chandy, Abraham Peedicayil and Vinotha Thomas declare that they have no conflict of interest.

Ethical Approval This material is the authors’ own original work, which has not been previously published elsewhere.

Informed Consent This research was conducted after institutional Institutional Review Board approval (IRB no: 13236). Patient informed consent was waived off by the IRB as this was a retrospective study. Its publication has been approved by all the authors.

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work, titled “ERAS: An audit of existing practices” won best paper award at the “Annual Update in Peritoneal Surface Oncology Conference”, held by Society of Peritoneal Surface Oncology, India, on 20th–22nd of February, 2020.

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