Enhanced Recovery After Surgery (ERAS) in gynecologic oncology: an international survey of peri-operative practice

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HIGHLIGHTS

- Implementation of ERAS guidelines varies around the world.
- Among those surveyed, 37% reported using ERAS; Asia and Africa had the lowest rates (19% and 10%, respectively).
- Poor adherence to guidelines on nutrition, bowel preparation, drains, and nasogastric tubes was seen globally.

ABSTRACT

Introduction Enhanced Recovery After Surgery (ERAS) programs have been shown to improve clinical outcomes in gynecologic oncology, with the majority of published reports originating from a small number of specialized centers. It is unclear to what degree ERAS is implemented in hospitals globally. This international survey investigated the status of ERAS protocol implementation in open gynecologic oncology surgery to provide a worldwide perspective on peri-operative practice patterns.

Methods Requests to participate in an online survey of ERAS practices were distributed via social media (WhatsApp, Twitter, and Social Link). The survey was active between January 15 and March 15, 2020. Additionally, four national gynecologic oncology societies agreed to distribute the study among their members. Respondents were requested to answer a 17-item questionnaire about their ERAS practice preferences in the pre-, intra-, and post-operative periods.

Results Data from 454 respondents representing 62 countries were analyzed. Overall, 37% reported that ERAS was implemented at their institution. The regional distribution was: Europe 38%, Americas 33%, Asia 19%, and Africa 10%. ERAS gynecologic oncology guidelines were well adhered to (>80%) in the domains of deep vein thrombosis prophylaxis, early removal of urinary catheter after surgery, and early introduction of ambulation. Areas with poor adherence to the guidelines included the use of bowel preparation, adoption of modern fasting guidelines, carbohydrate loading, use of nasogastric tubes and peritoneal drains, intra-operative temperature monitoring, and early feeding.

Conclusion This international survey of ERAS in open gynecologic oncology surgery shows that, while some practices are consistent with guideline recommendations, many practices contradict the established evidence. Efforts are required to decrease the variation in peri-operative care that exists in order to improve clinical outcomes for patients with gynecologic cancer globally.

INTRODUCTION

Enhanced Recovery After Surgery (ERAS) is a global surgical quality improvement program based on peri-operative guidelines that have been developed for several surgical specialties.[1 2] Pre-operative recommendations include permission of oral intake of clear fluids up to 2 hours before surgery, use of carbohydrate loading, and avoidance of mechanical bowel preparation. Intra-operative recommendations include deep vein thrombosis and antimicrobial prophylaxis, maintenance of euvolemia/normothermia, and select use of regional anesthesia. Post-operative recommendations include initiation of regular diet within 24 hours, avoidance of peritoneal drainage and nasogastric tubes, multimodal opioid-sparing analgesia, removal of the urinary catheter within 24 hours, and early active mobilization.[3–6] These peri-operative practice recommendations have been shown to accelerate patient recovery post-surgery, improve surgical outcomes, and reduce overall healthcare costs.[7] The ERAS Society undertook a review of peri-operative literature in gynecologic oncology in 2016 that led to the first set of guidelines by Nelson et al.[3 4] These guidelines were recently revised and updated in 2019.[5] The benefits of these ERAS pathways have been demonstrated in several recent studies from a small number of specialized centers in both gynecologic and gynecologic oncology patients.[8–10]

While there have been ERAS surveys conducted among national gynecologic oncology societies,[11–13] it is unclear to what degree ERAS is implemented in hospitals globally. This international survey investigated the status of ERAS protocol implementation in open gynecologic oncology surgery to provide a worldwide perspective on peri-operative practice patterns.

METHODS

We conducted a prospective online survey using Survey Monkey (www.surveymonkey.com). This consisted of a self-assessment interview questionnaire in the English language, adapted from a previously published study by Ore et al exploring the adoption of ERAS among members of the Society of Gynecologic Oncology in the USA.[14] Permission to use and adapt this questionnaire was obtained. Ethics approval for this study was granted by the Institutional Ethics Committee at Armed Forces Medical College, Pune, India (IEC/2020/30).

Requests for survey participation were distributed via electronic mail, WhatsApp groups, Twitter, and the International Gynecologic Cancer Society's new social media platform, Social Link. Additionally, four national gynecologic oncology societies agreed to distribute the study among their members: Association of Gynecologic Oncologists of India (AGOI), Turkish Society of Gynecologic Oncology (TRSGO), British Gynaecological Cancer Society (BGCS), and Polskie Towarzystwo Ginekologii Onkologicznej (Polish Gynecologic Oncology Society). The survey was targeted towards surgeons performing gynecologic oncology surgery. Responses received from non-surgical practitioners were excluded.

The study was conducted between January 15 and March 15, 2020. The survey (see online supplementary appendix) posed questions regarding pre-operative, intra-operative, and post-operative practices recommended in the ERAS gynecologic oncology guidelines. It also queried demographic information and individual attitudes to ERAS. Data from the survey were extracted in a comma-separated value (CSV) format.

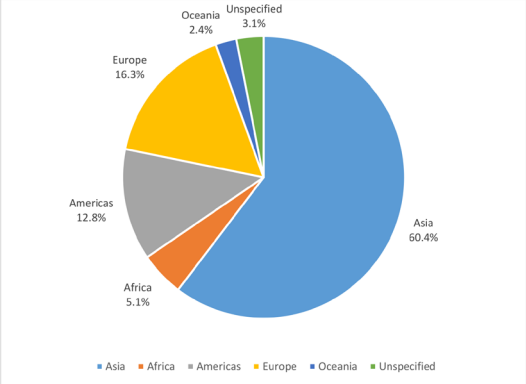
Statistical analysis was performed using Statistical Package for Social Sciences version 24 (SPSS 24, IBM, Chicago Illinois, USA) and Microsoft Office Excel 2016 for Windows (Microsoft, Redmond, Washington, USA). Values were expressed in absolute numbers as well as percentages of groups. The χ^2 test of significance and Fisher's exact test were used to compare differences between ERAS and non-ERAS groups. In accordance with the journal's guidelines, data can be provided if requested.

RESULTS

Respondent characteristics

During the study period, 464 responses were received. Ten responses were excluded from non-surgical practitioners, leaving 454 responses eligible for analysis. This included responses from practitioners from 62 countries: Asia 60% (n=274), Europe 16% (n=74), the Americas 13% (n=58), Africa 5% (n=23), Oceania 2% (n=11), 3% (n=14) with unspecified locations (World Bank Country and Lending Groups' classification). Figure 1 and Online supplementary world map shows the distribution of respondents by region and country (in descending order from countries with at least three responses). Respondent characteristics are shown in Table 1. The response rate was not calculated since the denominator could not be determined.

Among the respondents, 64% (n=290) were gynecologic oncologists, 17% (n=77) were gynecologists, 15% (n=70) were surgical oncologists, and 4% (n=17) were general surgeons. Nearly 80% of respondents were from academic or private institutions with academic affiliation. Overall, 37% reported that ERAS was implemented at their institution. The distribution of ERAS implementation by region was: Europe 38%, the Americas 33%, Asia 19%, and Africa 10%.



*List of countries with three or more respondents who participated in the study:

Asia: India, Turkey, Bangladesh, Philippines, Indonesia, Nepal, Malaysia, China, Taiwan
Europe: UK, Poland, Spain, Italy, Greece
Americas: USA, Brazil, Canada, Chile, Argentina, Colombia, Mexico
Africa: Nigeria, South Africa
Oceania: Australia

Figure 1 Distribution of respondents by region and country.*

Questionnaire responses for pre-operative and intra-operative components of ERAS gynecologic oncology guidelines for laparotomy are shown in Table 2. Bowel preparation was 'sometimes–always' reportedly used by 63% of respondents, 73% when ovarian cancer debulking was planned, and 80% when there was a concern for bowel surgery. Under bowel preparation, mechanical bowel preparation was reported by 48% of respondents, enema by 51%, antibiotics by 27%, and 12% reported using other agents. Pre-operative fasting for solids up to 8 hours before surgery was reported by nearly 61% of respondents; 5% of respondents said they allowed clear liquids up to 2 hours before surgery, 58% 2–6 hours before surgery, and 37% reported requiring more than 6 hours for clear fluids. Only 36% of respondents reported using oral carbohydrate loading pre-operatively.

Pre-operative and intra-operative deep vein thrombosis prophylaxis was administered by 80% of respondents. Low molecular weight heparin was the most common modality used for this purpose (70%), while 45% of respondents reported using stockings and 40% pneumatic compression devices. In terms of fluid management intra-operatively, 54% reported that their institution employed an intra-operative fluid management protocol, at the discretion of the anesthesia team. Goal-directed fluid therapy via non-invasive monitoring was reported by only 18%. A total of 56% of respondents indicated that continuous core body temperature was monitored intra-operatively. Thoracic epidural analgesia was 'sometimes–always' used by 75% for laparotomy. Transversus abdominis plane (TAP) block was reported for post-operative analgesia in 48%.

Adherence to post-operative components of ERAS

Questionnaire responses for the post-operative components of ERAS gynecologic oncology guidelines for laparotomy are shown in Table 3. Nasogastric or orogastric tubes were reported used 'sometimes–always' after laparotomy by 56%. The nasogastric

Table 1 Respondent characteristics

Characteristic	n=454	%
Type of training		
Gynecologic oncologist	290	63.9
Gynecologist	77	17.0
Surgical oncologist	70	15.4
General surgeon	17	3.7
Region of practice		
Asia	274	60.4
Europe	74	16.3
Americas	58	12.8
Africa	23	5.1
Unspecified	14	3.1
Oceania	11	2.4
ERAS implementation present at institution	37%	
ERAS implementation by region		
Europe	61	37.9
Americas	53	32.9
Asia	30	18.6
Africa	17	10.6
Type of institution		
Academic	262	57.7
Private with academic affiliation	101	22.2
Private	38	8.4
Community	24	5.3
Military	15	3.3
Other	14	3.1
Work with trainees (type)		
Obst Gyn	322	70.9
Gyn Onc	296	65.2
Surg Onc	245	54.0
Surg	188	41.4
Years in practice		
0–5	119	26.2
5–10	95	20.9
10–15	70	15.4
>15	114	25.1
Unspecified	56	12.3

ERAS, Enhanced Recovery After Surgery.

tube was reportedly used after small bowel resection in 51%, 39% after large bowel resection, 10% after splenectomy, and 24% in short gastric vessel ligation. Intravenous fluids were stopped on the first day of surgery by 24% of respondents, while 40% indicated that they would terminate fluids when the patient started accepting fluids orally. Regular diet was started by 34% of respondents within 24 hours after laparotomy and on the second to third post-operative day by 40%. Chewing gum was chosen by 26% of respondents to

Table 2 Questionnaire responses for pre-operative and intra-operative components of ERAS gynecologic oncology guidelines

ERAS element	n=454	%
Pre-operative fasting solids		
6 hours	28	6.2
6–8 hours	247	54.4
>8 hours	177	39.0
Missing	2	0.4
Pre-operative fasting liquids		
2 hours	23	5.1
2–6 hours	262	57.7
>6 hours	167	36.8
Missing	2	0.4
Carbohydrate loading pre-operatively		
Yes	165	36.3
No	282	62.1
Missing	7	1.5
Pre-operative and intra-operative DVT prophylaxis		
Yes	364	80.2
No	84	18.5
Maybe	3	0.7
Missing	3	0.7
Intra-operative fluid management protocol		
Yes, at discretion of anesthesia team	245	54.0
Yes, goal-directed therapy protocol – invasive (ie, esophageal Doppler)	13	2.9
Yes, goal-directed therapy protocol – non-invasive monitoring (ie, blood pressure, urinary output)	82	18.1
No	73	16.1
Not sure	34	7.5
Missing	7	1.5
Core temperature measured in operating theater		
Yes	256	56.4
No	137	30.2
Unsure	49	10.8
Maybe	1	0.2
Missing	11	2.4
Bowel preparation use (sometimes–always)*		
For laparotomy	288	63.2
Planned ovarian cancer debulking	333	73.3
Concern for potential bowel surgery	362	79.7

Continued

Table 2 Continued

ERAS element	n=454	%
Bowel preparation use (type)*		
Mechanical	220	48.5
Antibiotics	123	27.1
Enema	232	51.1
Other	55	12.1
Pre-operative and intra-operative DVT prophylaxis*		
Unfractionated heparin	40	8.8
Low molecular weight heparin	319	70.3
Stockings	207	45.6
Pneumatic compression device	181	39.9
Others	5	1.1
None	36	7.9
Regional pain management (sometimes–always use)*		
Thoracic epidural analgesia	340	74.9
Transversus abdominis plane (TAP) block	217	47.8

*Respondents had the option to choose more than one response thus % may exceed 100.
DVT, deep vein thrombosis; ERAS, Enhanced Recovery After Surgery.

hasten the return of bowel activity, with bisacodyl, milk of magnesia, and other agents being chosen in a smaller number of respondents. Nearly 50% of respondents indicated that they did not routinely employ substances to prevent post-operative ileus.

Post-operative urinary catheterization was chosen by 90% of respondents, with catheters being removed within 24 hours after laparotomy in 42% and within 48 hours in 43%. Patients were ambulated on the day of surgery by 30% of respondents, while 62% reported that patients typically ambulated on the first post-operative day. Peritoneal drain use was reportedly common: 75% in cases of bowel surgery, 73% after urological procedures, 62% after splenectomy, 69% after liver resection, and 52% when lymphadenectomy was performed. Post-operative deep vein thrombosis prophylaxis for laparotomy in the setting of malignancy was reportedly used overall by almost 88% of respondents. With regard to the duration of deep vein thrombosis prophylaxis, 31% of respondents reported that they would use only during surgery, 38% would use it for 1 month or more post-operatively, and 21% for less than a month post-operatively. If laparotomy was performed for benign indications, 60% of respondents would administer deep vein thrombosis prophylaxis only during surgery and 25% for less than a month.

Attitudes to ERAS

Attitudes regarding ERAS practice are shown in Table 4. Overall, 42% felt that ERAS protocols are a useful tool but 'difficult to implement', and 45% felt that ERAS protocols decreased both unscheduled hospital visits and re-admission rates. Most respondents (78%) reported that ERAS protocols were safe. ERAS practices improved overall patients' satisfaction according to 75% of respondents, and 80% felt that ERAS pathways improved patient outcomes.

Table 3 Questionnaire responses for post-operative components of ERAS gynecologic oncologic guidelines

ERAS element	N	%
Nasogastric tube used post-operatively		
Overall use (sometimes–always)	254	56
Small bowel surgery	233	51.3
Large bowel surgery	177	39
Ligation short gastric vessels	108	23.8
Splenectomy	46	10.1
Never	104	22.9
Other	64	14.1
Post-operative DVT prophylaxis		
Yes	399	87.9
No	40	8.8
Unsure	6	1.3
Maybe	1	0.2
Missing	8	1.8
Post-operative DVT prophylaxis (duration)		
During surgery only	140	30.8
<1 month	94	20.7
1 month	152	33.4
>1 month	22	4.8
Missing	46	10.1
Post-operative intravenous fluids stopped		
<12 hours after surgery	46	10.1
12–24 hours after surgery	65	14.3
>24 hours after surgery	150	33
When patient accepts fluids orally	182	40
Unsure	11	2.4
Urinary catheter removed post-laparotomy		
Within 24 hours	193	42.5
24–48 hours	197	43.4
48–72 hours	54	11.9
Missing	10	2.2
Post-operative ambulation (average start time)		
Day of surgery	135	29.7
Post-operative day 1	284	62.6
Post-operative day 2	25	5.5
Missing	10	2.2
Prevention of post-operative ileus		
None	224	49.3
Chewing gum	119	26.2
Others	69	15.2
Bisacodyl	60	13.2
Milk of magnesia	23	5.1
Mu opioid antagonist	14	3.1

Continued

Table 3 Continued

ERAS element	N	%
Erythromycin	4	0.9
Post-operative regular diet initiation		
<24 hours	156	34.4
24–48 hours	19	4.2
48–72 hours	181	39.9
>72 hours	87	19.2
Missing	11	2.4
Peritoneal drain use (sometimes–always)		
Bowel surgery	344	75.0
Urological procedures	324	73.6
Liver resection	313	68.9
Splenectomy	283	62.3
Lymphadenectomy	237	52.2

For each question valid responses are shown out of total respondents (454). However, percentages are taken with respect to 454, hence sum may not be 100%.
DVT, deep vein thrombosis; ERAS, Enhanced Recovery After Surgery.

Differences between ERAS and non-ERAS respondents

Respondents were stratified according to using ERAS versus non-ERAS, with statistically different responses shown in Table 5. Less bowel preparation was used among ERAS respondents compared with non-ERAS practitioners for laparotomy, ovarian cancer surgery, and bowel surgery and less use of peritoneal drains was found among those practicing ERAS compared with non-ERAS practitioners for lymphadenectomy and for bowel surgery. There was higher use of intra-operative core temperature measurement, administration of deep vein thrombosis prophylaxis for 1 month or longer, initiation of regular diet within 24 hours, and ambulation on the day of surgery among surgeons following ERAS.

DISCUSSION

While some gynecologic oncology surveys have been conducted to attempt to describe the uptake of ERAS guidelines nationally,[11–13] there is no study to date that has examined the degree of ERAS uptake at an international level. In this survey we found that ERAS was reportedly more widely adopted in Europe (38%) and the Americas (33%) compared with Asia (19%) and Africa (10%). This could be because the ERAS Society originated in Europe,[15] and ERAS has been widely promoted in the USA, Canada, and Latin America through national organizations such as ERAS USA, Enhanced Recovery Canada, and ERAS LATAM, respectively. Explanations for lower uptake of ERAS in Asia and Africa could be due to disparities in surgical care across different nations including insurance status, proximity to tertiary care hospitals, racial, and ethnic factors.[16 17 18]

ERAS programs have been suggested to offer a pragmatic and patient-centered way to eliminate disparities and achieve equitable surgical care.[19] It is also possible that institutions without ERAS have challenges creating an effective 'ERAS team' (surgeon, anesthesia, and nursing champions), which is required for the implementation of ERAS.[6] Multidisciplinary international scientific events targeted towards lower uptake countries may allow for increased adoption of ERAS in these regions.

Table 4 Respondents' attitudes towards ERAS practices

ERAS	N	(%)
Great but difficult to implement		
Agree–strongly agree	193	42.5
Undecided	153	33.7
Disagree–strongly disagree	77	16.9
Reduces unscheduled visits		
Agree–strongly agree	205	45.1
Undecided	55	12.1
Disagree–strongly disagree	168	37
Reduces re-admission rates		
Agree–strongly agree	207	45.5
Undecided	60	13.2
Disagree–strongly disagree	165	36.3
Increases complication risk		
Agree–strongly agree	49	10.7
Undecided	308	67.8
Disagree–strongly disagree	72	15.8
Is a safe procedure		
Agree–strongly agree	354	77.9
Undecided	15	3.4
Disagree–strongly disagree	63	13.8
Improves patient satisfaction		
Agree–strongly agree	339	74.6
Undecided	19	4.1
Disagree–strongly disagree	76	16.7
Improves patient outcome		
Agree–strongly agree	366	80.6
Undecided	13	2.8
Disagree–strongly disagree	55	12.1

For each question (Likert scale) valid responses are shown out of total respondents (454). However, percentages are taken with respect to 454, hence sum may not be 100%.
ERAS, Enhanced Recovery After Surgery.

Our survey found that the ERAS gynecologic oncology guidelines[3–5] were well adhered to across several domains, most notably deep vein thrombosis prophylaxis (pre-operative and intra-operative use 80%, post-operative use 88%), early removal of urinary catheter (86% within 24–48 hours after surgery), and early introduction of ambulation (>90% by post-operative day 1).

There were, however, many practices identified in the survey which would be considered to be in contradiction with the ERAS gynecologic oncology guidelines. Bowel preparation interestingly is reportedly still very high overall (63%–80% found in the present survey). However, ERAS providers reported using it to a lesser degree (53% vs 70% in non-ERAS practitioners on sub-analysis), which was encouraging. This finding is similar to other surveys

Table 5 Differences between ERAS and non-ERAS respondents

ERAS element		ERAS n=169 (%)	Non-ERAS n=285 (%)	P value
Pre-operative fasting for solids	<6 hours	19 (11.2)	9 (3.2)	<0.001
Pre-operative fasting for liquids	<2 hours	21 (12.4)	2 (0.7)	<0.001
Pre-operative carb loading	Yes	105 (62.5)	60 (21.5)	<0.001
Pre-operative/intra-operative DVT prophylaxis	Yes	150 (88.8)	214 (75.9)	<0.001
Intra-operative fluid management protocol	Yes, at discretion of anesthesia team	86 (51.2)	159 (57.0)	<0.001
Intra-operative core temperature measured	Yes	131 (78.4)	125 (45.3)	<0.001
Post-operative DVT prophylaxis	Yes	161 (95.3)	238 (85.9)	<0.001
Intravenous fluid terminated	<12 hours after surgery	29 (17.2)	17 (6.1)	<0.001
Regular diet after surgery	<24 hours	80 (47.3)	76 (27.4)	<0.001
Urinary catheter removal	<24 hours	95 (56.2)	98 (35.6)	<0.001
Post-operative ambulation	Day of surgery	73 (43.2)	62 (22.5)	<0.001
Bowel preparation				
For laparotomy	Never–rarely	80 (47.3)	87 (30.5)	<0.001
For ovarian cancer surgery	Never–rarely	59 (35.3)	59 (20.8)	<0.001
For bowel surgery	Never–rarely	48 (28.2)	40 (14.3)	<0.001
Peritoneal drainage				
For lymphadenectomy	Never–rarely	95 (56.5)	107 (39.5)	<0.001
For bowel resection	Never–rarely	51 (30.5)	43 (15.9)	<0.001
For urologic procedure	Never–rarely	50 (30.9)	45 (17.5)	<0.001
For liver resection	Never–rarely	43 (27.0)	31 (13.6)	<0.001

DVT, deep vein thrombosis; ERAS, Enhanced Recovery After Surgery.

among gynecologic oncologists in national surveys, with mechanical bowel preparation usage ranging from 30% to 90%.[11–13] The ERAS gynecologic oncology guidelines are unambiguous that mechanical bowel preparation is discouraged before gynecologic oncology surgery (including when bowel surgery is planned), especially within an established ERAS pathway.[3 5] High-level evidence from colorectal studies and ERAS colorectal guidelines have supported the avoidance of mechanical bowel preparation,[19] particularly due to adverse outcomes such as hypovolemia and dehydration and the fact that it does not decrease post-operative morbidity. Despite this, the practice remains, which may be due to controversies related to large retrospective studies based on National Surgical Quality Improvement Program (NSQIP) data and the debate around including oral antibiotics with or without the preparation.[20 21] In a recent meta-analysis, the benefit of mechanical bowel preparation combined with oral antibiotics correlated with reduced organ-space surgical site infection in colorectal surgery patients; however, this was in the context of surgical site infection reduction bundles.[22]

Only 5% and 6% of respondents stated that they would allow clear fluids up to 2 hours and solids up to 6 hours, respectively, prior to surgery despite clear guidelines for 'modern fasting rules' (6 and 2 rule), which are endorsed by many anesthesia societies worldwide.[3 23 24] This goes against Cochrane evidence[25] and recommendations in the ERAS guidelines.[3 9] It is encouraging, however, to see that 58% and 54% would allow clear fluids 2–6 hours and solids 6–8 hours, respectively, prior to surgery. In a similar vein, only 36% of respondents reported using carbohydrate loading despite benefits. Pre-operative carbohydrate loading has been found to be associated with attenuated post-operative insulin resistance, improved metabolic response, enhanced peri-operative well-being, and improved clinical outcomes.[3 9 26]

High rates of nasogastric tube (56%) and peritoneal drainage (52%–75%) use were reported, although there is no evidence for benefit and these practices may be harmful. Nasogastric intubation is associated with patient discomfort, increases the risk of post-operative respiratory infection after elective abdominal surgery, and does not reduce the risk of wound dehiscence or anastomotic leak.[3–5 27] Routine peritoneal drain placement has not been found to be useful following bowel resection in patients with ovarian cancer.[28]

Only 56% of respondents indicated that temperature was monitored continuously intra-operatively. Normothermia has been found to be associated with reduced surgical site infections and is endorsed as a category 1A recommendation by the Centers for

Disease Control (CDC).[5 29] Failure of temperature monitoring cannot ensure normothermia.

There was quite a spectrum concerning post-operative regular diet initiation. Early feeding (presenting solid food in the first 24 hours after surgery) was chosen by 34%, while 44% introduced a solid diet at 24–72 hours after surgery and 19% did not feel comfortable introducing regular diet until after 72 hours post-operatively. It is unclear what the concern is regarding early feeding, as this is supported by high-level evidence in our specialty.[5]

Interestingly, 75% of respondents indicated that thoracic epidural analgesia and 48% that TAP block were used for post-operative analgesia. While there does not exist strong level I evidence for either of these modalities[5] in our specialty, it may at least point to the fact that practitioners are favoring a narcotic sparing analgesia approach. Epidural analgesia has been shown to effectively reduce post-operative pain and stress but can be associated with a 30% risk of failure, hypotension, and delayed early mobilization.[5] While some may actively avoid epidural analgesia for these reasons, others have advocated its use, particularly given its association with improved survival in advanced ovarian cancer.[30]

While the majority of respondents' attitudes were in favor of ERAS, there was still a sizeable number of individuals who indicated that they felt that ERAS was associated with adverse outcomes such as increased re-admissions, complications, and lacking safety. To date, this is not the case with many studies demonstrating that, with increasing compliance to ERAS, improved outcomes are seen (decreased length of stay and complications) and without increased re-admission rates.[31–33] Furthermore, increasing ERAS compliance has been shown to be associated with improved survival in colorectal surgery[34] and orthopedics.[35]

The major strength of this study is that it is the first to be conducted on a global scale, including over 454 respondents from 62 countries. It provides a snapshot of clinicians' preferred peri-operative practices and the extent to which the concepts underlying ERAS are already practiced. The information gleaned from this survey will allow the targeting of interventions to increase uptake in low adopting regions. A major limitation of this survey is that, while we had multinational representation, many countries had fewer than three respondents. This means that country-specific analyses could not be performed. The survey was available in English language only, which is a possible barrier to achieving higher response rates. A further limitation of the study relates to the inherent bias and reporting error which exists with surveys. Respondents were asked to choose the best option reflecting their usual peri-operative practice patterns. Actual peri-operative care received by patients may diverge from the responses given; therefore, this survey does not replace regular audit. The 2019 updated ERAS gynecologic oncology guidelines introduced the concept of 'ERAS Audit and Reporting'.[5] It has been found in several studies that the extent of audited compliance to ERAS protocols is directly correlated with improvements in outcomes and healthcare costs.[8–10 31] It thus calls for regular analysis of institutional data to audit protocol compliance.

This survey does, however, provide a glimpse of the extent of adoption of ERAS guidelines in many nations. The low levels of adherence to many of the tenets of ERAS suggest that there is significant room for improvement. While many surgeons indicate that they have adopted an evidence-based practice such as ERAS, it can be a challenge for some to translate the guideline recommendations directly into their clinical practice. This could be since, historically, surgeons' beliefs and peri-operative practices have emanated from several sources including surgical training, practical experience, and 'expert' opinion.

ERAS protocols are relevant now during the COVID-19 pandemic and after, when a large surgical backlog will exist, pushing the healthcare system over capacity. The question is where will hospitals find increased capacity to address the surgical backlog? ERAS protocols will be the answer to increasing capacity as they offer faster recovery for surgical patients (hence increased throughput), and allow for hospital staff and resources to be focused on those who need it most during this time of global need.[36]

CONCLUSION

This international survey of ERAS in open gynecologic oncology surgery demonstrates that, while some practices are consistent with guideline recommendations, many practices are in contradiction to the established evidence. Efforts are required to decrease the variation in peri-operative care that exists in order to improve clinical outcomes for gynecologic cancer patients globally.

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Correction notice This article has been corrected since it was published Online First. The regional distribution of ERAS stated in the main text incorrectly uised the N values instead of the percentage values.

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