**CLINICAL PATHWAYS OF RECOVERY AFTER SURGERY FOR
ADVANCED OVARIAN/TUBAL/PERITONEAL CANCER – A NSGO-
MANGO INTERNATIONAL SURVEY IN COLLABORATION WITH AGO
AUSTRIA. A FOCUS ON SURGICAL ASPECTS.**

**Elisa Piovano MD PhD ¹, Annamaria Ferrero MD PhD ², Paolo Zola MD ³,
Christian Marth MD ⁴, Mansoor Raza Mirza MD ⁵, Kristina Lindemann MD PhD
⁶**

¹ Obstetrics and Gynecology Unit, Regina Montis Regalis Hospital, Mondovì (CN), Italy; MaNGO

² Academic Department of Gynaecology and Obstetrics, University of Torino, Mauriziano Hospital, Torino, Italy; MaNGO

³ Department Surgical Sciences, University of Torino, Torino, Italy and Città della Salute e della Scienza di Torino, S. Anna University Hospital, Torino, Italy; MaNGO

⁴ Department of Obstetrics and Gynecology, Innsbruck Medical University, Innsbruck, Austria; AGO Austria

⁵ Department of Oncology, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark; NSGO

⁶ Department of Gynaecological Cancer, Division of Cancer Medicine, Oslo University Hospital, Oslo, Norway and Institute of Clinical Medicine, Faculty of Medicine, University of Oslo, Oslo, Norway; NSGO

Corresponding author

Elisa Piovano

Obstetrics and Gynecology Unit, Regina Montis Regalis Hospital, via San Rocchetto 99, 12084 Mondovì (CN), Italy

+39 0174677467-470

piovano.elisa@gmail.com

Funding Statement

The participation in the survey was free. No external funding was required for this study.

Word count: 2780

Conflicts of Interest statement

EP: No conflicts of interest

AF: No conflicts of interest

PZ: No conflicts of interest

CM: No conflicts of interest

MRM: No conflicts of interest

KL: No conflicts of interest

Abstract

Objectives: This survey assessed the implementation of enhanced recovery after surgery (ERAS) for patients undergoing surgery for advanced ovarian cancer in three European cooperative study groups in Scandinavia, Italy, and Austria. The aim was to evaluate the landscape for future trials on ERAS pathways in ovarian cancer, as high-level evidence for such interventions is lacking.

Material and methods: In July 2017, a web-based questionnaire (SurveyMonkey Inc. Palo Alto, CA, USA) was sent to centres conducting surgery for advanced ovarian cancer within the Nordic Society of Gynecologic Oncology (NSGO), Mario Negri Gynecologic Oncology Group (MaNGO) and other Italian institutions, and the Association for Gynecologic Oncology Austria (AGO Austria) (n=100). The survey covered all aspects of an ERAS pathway including surgery, nursing and anaesthesia. We herein report on the survey findings relating to surgery, including nursing care issues; however, anaesthesiologic issues will be discussed in a separate report.

Results: The overall response rate was 62%. Only a third of the centres in Italy and Austria follow a written ERAS protocol compared to 60% of the Scandinavian centres. Only a minority of centres have completely abandoned bowel preparation, with the highest proportion in Scandinavia (36%). Two hours of fasting for fluids prior to surgery is routinely practiced in Scandinavia and Austria (67%–57%, respectively), but not in Italy (5%). Carbohydrate loading is routinely administered only in Scandinavia (67%). Peritoneal drainage is used by 22% routinely and by 61% in cases of bowel resection/lymphadenectomy/peritonectomy. Early feeding with a light diet on day 0 or 1 is the standard of care in Scandinavia and Austria, but not in Italy.

Conclusions: The degree of implementation of ERAS protocols varies across and within cooperative groups. The centralisation of ovarian cancer care seems to facilitate standardisation of perioperative protocols. Currently, the high heterogeneity in patterns of care may challenge an international approach to a clinical trial.

Keywords: Enhanced recovery, fast-track, ovarian cancer, perioperative care, survey

Introduction

Enhanced recovery after surgery (ERAS) protocols in colorectal surgery have resulted in shorter length of stay, fewer complications, fewer readmissions (1–2) and reduced costs (3). Despite these benefits, uptake outside clinical studies has been slow, piecemeal, and challenged by the poor adherence to established protocols (4–5).

Recently, international ERAS Society guidelines for perioperative care in surgery for gynaecological cancer were published (6–7). Only a few randomised trials have been conducted (8–9), and full ERAS protocols have mainly been explored in observational studies that included a broad range of interventions and surgical procedures. Conclusions regarding the efficacy of these protocols have been further based on the comparison with historical controls (10) and are therefore highly susceptible to bias. Despite efforts to test single interventions, such as early feeding, in a randomised controlled trial design (11–17), the majority of the guideline recommendations only have a low or moderate level of evidence (6–7). There have been a growing number of reports from single centres that have also successfully implemented an ERAS protocol for patients undergoing cytoreductive surgery for ovarian cancer (18). However, there remains a lack of procedure-specific data on the perioperative management of patients with advanced ovarian cancer. A recently reported randomised controlled trial had major limitations: only a few ERAS components were implemented in the intervention arm, compliance was not reported, and only a minority of patients underwent complex procedures (8-9).

Common challenges in ovarian cancer patients management are poor nutritional status, fluid shifts, extensive surgery, and the risk of postoperative morbidity (19). The implementation of ERAS protocols in the care of these patients seems promising, since these patients potentially benefit most from enhanced recovery programmes. However, this requires a multidisciplinary team approach and resource-intensive implementation. Recent reports confirmed a wide variation of practice exists, and only a minority of ERAS interventions are held as the standard of care (20–23). Knowledge of the current patterns of care is crucial in order to achieve a multinational collaboration that improves

perioperative care. Our survey aimed to assess current preoperative, intraoperative, and postoperative care in patients with advanced ovarian cancer in three European cooperative study groups in Scandinavia, Italy, and Austria. We aimed to understand to what extent the surgical, nursing and anaesthesiologic aspects of ERAS principles have been implemented.

We hypothesised that there is currently no consistent standard of perioperative care for patients undergoing surgery for ovarian cancer across Europe. Furthermore, we expected centres would show high heterogeneity in their uptake of ERAS principles. We herein report on the survey findings relating to surgery, including nursing care issues; however, anaesthesiologic issues will be discussed in a separate report.

Material and methods

In June 2017, a web-based questionnaire (SurveyMonkey Inc. Palo Alto, CA, USA) was sent to centres conducting surgery for advanced ovarian cancer within the Nordic Society of Gynecologic Oncology (NSGO), Mario Negri Gynecologic Oncology Group (MaNGO) and other Italian institutions, and the Association for Gynecologic Oncology (AGO) Austria (n=100).

The survey invitation was sent to the directors of the gynaecology oncology services at each centre. It was left to their discretion whether to complete the survey themselves or delegate this to a colleague representing the unit's practice. For Scandinavia, the lead surgeon for ovarian cancer surgery at each centre was identified a priori and the invitation was sent directly to him/her.

All the survey items were developed based on the ERAS gynaecologic guidelines (6–7) and on a pilot survey among gynae-oncologists in Australia/New Zealand (20). In particular, we asked about preoperative counselling, use of bowel preparation and carbohydrate loading, preoperative fasting routines, premedication, prophylaxis of thromboembolism, antibiotic prophylaxis, prevention of hypothermia, type of anaesthesia, intra- and postoperative fluid management, postoperative nausea and vomiting prevention, use of drains, postoperative nutritional care, prevention of postoperative ileus, use of urinary catheter, postoperative analgesia, and mobilisation.

The questionnaire is provided in full in the online Appendix.

Several reminder emails were sent between June and July 2017. All responses were collected centrally, and data were analysed anonymously. Descriptive statistics were used.

As this was a quality improvement/program evaluation study with no risk to patients, ethics approval was not required.

Results

Overall response rate (RR) was 62% (62/100), including institutions in 52 cities across Europe. NSGO RR was 65% (15/23), RR for Italian centres was 63.5% (40/63) and RR for AGO Austria was 50% (7/14). The estimated number of patients treated with suspected advanced ovarian/tubal/peritoneal cancer per centre is given in Table 1.

Preoperative care

Only 37% of all centres follow a written ERAS protocol (Figure 1). However, more than 50% of the units in these countries state that they counsel their patients preoperatively based on ERAS principles (e.g., preoperative counselling with all team members about surgical and anaesthetic procedures, early postoperative feeding, early mobilisation, etc.). The majority of centres in all the countries surveyed advise patients to stop hormonal replacement therapy before surgery (60%, 86%, and 77% in Scandinavia, Austria, and Italy, respectively) as well as oral contraception (40%, 100%, and 75% in Scandinavia, Austria, and Italy, respectively) (data about compliance to individual ERAS recommendations are given by country in Table 2). The investigation and correction of anaemia before surgery is standard preoperative care in the majority of centres (80%, 86%, and 95% in Scandinavia, Austria, and Italy, respectively).

Only a minority of centres have completely abandoned bowel preparation (BP) (Figure 1). Details on BP prescription are given in Table 3.

The adherence to contemporary fasting guidelines, with fluids permitted until two hours prior to surgery, is depicted in Figure 1. Prolonged fluid fasting for ≥ 6 hours prior to surgery is still common practice in Italy (79.5%), but less frequent in Scandinavia and Austria (27% and 29%, respectively). Carbohydrate loading (a carbohydrate-rich drink

given preoperatively) is only inconsistently administered (Figure 1). The timing of carbohydrate loading also varies, with centres in Austria administering carbohydrate loading the evening before surgery only, while centres in Italy and Scandinavia use carbohydrate loading both in the evening and 2–4 hours prior to the induction of anaesthesia.

All the centres surveyed prescribe thromboembolic prophylaxis with low molecular weight heparin (LMWE). In Austria, 100% of centres start preoperatively, as do 57% in Italy and 40% in Scandinavia. In addition to prolonged prophylaxis, the use of compressive stockings is the standard of care (Table 2). Pneumatic compressive devices are inconsistently used, ranging from 20% in Italy to 40% and 57% in Scandinavia and Austria, respectively.

For antibiotic prophylaxis, cephalosporine alone is used most frequently, sometimes in combination with metronidazole. In Scandinavia and Austria, most reporting centres routinely use this combination (80% and 71%, respectively), while most Italian centres surveyed administer a second generation (57.5%) or first generation (40%) cephalosporine only, excepting cases in which bowel resection is performed. Repeated intraoperative doses of antibiotics are commonly used for prolonged operations, obese patients, and in cases with severe blood loss (Scandinavia 67%, Austria 86%, Italy 80%).

Intraoperative care

In all cooperative groups, only a minority of centres routinely uses postoperative peritoneal drainages in advanced ovarian cancer patients (Scandinavia 14%, Austria 14%, Italy 26%) (Figure 1). The specific indications stated by participating centres are given in Figure 2. The same applies to nasogastric tubes, which are rarely routinely applied (Scandinavia 21%, Austria 14%, Italy 23%) (Figure 1). When applied, they are removed before the reversal of anaesthesia (60% in Scandinavia) or on day 1 (100% Austria and 50% Italy).

Postoperative care

Postoperative fluid administration varies both among and within cooperative groups. Oral intake of fluids drives the administration of IV fluids in most centres, but others report no specific guidelines about fluid management (Scandinavia 29%, Austria 14%, Italy 31%).

Early feeding with a light diet on day 0 or 1 is the standard of care in Scandinavia (50% day 0, 43% day 1) and Austria (100% day 1), while there is no consistent practice in Italy (2.5% day 0, 38.5% day 1, 20% day 2). Some Italian institutions delay oral intake until the presence of bowel movements or flatus (18% and 8%, respectively).

Several ERAS interventions are meant to reduce the risk of postoperative ileus. The routine use of prophylactic laxatives is common in Scandinavia and Austria (46% and 43%, respectively) but not in Italy (13%) (Table 2). Chewing gum is used to prevent postoperative ileus in 100% of institutions in Austria, while its use is not commonly used in Scandinavia (28.5%) or Italy (0%).

The early removal of urinary catheter may facilitate early mobilisation in ERAS protocols. Still, the timing of removal often seems to be dependent on whether epidurals are used. In Scandinavia, where regional anaesthesia is used in 78% of the centres, urinary catheter is mostly removed when epidural is stopped (64%, typically day 3). In Austria, however, with 83% of the institutions using epidural, the catheter is removed on day 1 in 71% and on day 2 in 14%. Data on epidural removal timing was not collected. In Italy the management of urinary catheter is highly variable, and the catheter is removed either on day 1 (36%), on day 2 (33%), upon flatus (15%) or in 15% depending on the type of surgery performed.

Most of these institutions lack a specific protocol for mobilisation (Scandinavia 43%, Austria 100%, Italy 67%), but early mobilisation is generally encouraged.

Discussion

This survey assessed the implementation of ERAS principles for patients undergoing surgery for advanced ovarian cancer in three European cooperative study groups in Scandinavia, Italy, and Austria. The aim was to evaluate the landscape for future trials

on enhanced recovery pathways in ovarian cancer, as high-level evidence for such interventions is lacking.

The implementation of ERAS protocols varied across cooperative groups. The highest degree of implementation was seen in Scandinavia, where more than half of the centres had a written procedure. To a large degree, they followed the main principles of shorter fasting times, avoidance of drains and nasogastric tubes, and early oral feeding. While Austrian and Italian centres also report the avoidance of drains and tubes, unnecessarily long fasting hours and reluctance to feed early postoperatively are still common, at least in Italy.

The observed difference in implementation may be due to the historical interest of Nordic countries in ERAS principles. This concept of a multimodal approach to improve recovery after surgery was developed in Denmark by Henrik Kehlet and his group (24). These colorectal surgeons were the first to describe a "stress-free" colonic resection for neoplastic disease by a combination of laparoscopically assisted surgery, epidural analgesia, and early oral nutrition and mobilisation (25). The first ERAS study group was formed in 2001, and included surgeons from Sweden, Norway, and Denmark as well as the United Kingdom and the Netherlands. They further developed ERAS by initiating clinical studies and organising educational symposia (20), leading up to the formal foundation of the ERAS Society.

In addition to this early interest in ERAS principles, the centralisation of care for ovarian cancer surgery in Nordic countries may have facilitated the standardisation of perioperative protocols. This centralisation in Scandinavia is underlined by the given volume of the participating centres (Table 1). Here, most institutions performed 60–100 debulking surgeries per year. By contrast, in Austria and Italy, most patients with suspected advanced disease are treated in institutions with ≤ 30 –59 cases per year. The development and implementation of an ERAS protocol require a multidisciplinary approach of dedicated staff members committed to an on-going process of monitoring and auditing with the aim of constant improvement of care (20). The development of such teams may be easier at institutions with a high caseload and which focus on the management of these patients.

The survey also illustrates that surgical principles are still subject to traditional beliefs. High-level evidence is available for antibiotic and thromboembolic prophylaxis, interventions with the highest adherence across all groups. However, shorter fasting hours and early feeding have also been proven to be safe and beneficial (6–7), but these aspects of perioperative care are still not part of routine care in all institutions. The personal beliefs of the surgeon or anaesthetist still seem to be rated higher than the available evidence, while a key part of ERAS implementation is breaking through the traditional beliefs of the surgeon, anaesthesiologist, and nursing caregivers and to achieve cross-disciplinary collaboration. The implementation of ERAS protocols may therefore benefit from a multicentric approach, where a protocol is defined on the basis of available evidence and consensus. The involvement of the National and Regional Healthcare Systems in these initiatives could facilitate this process. Among individual ERAS components, omission of bowel preparation, intravenous fluid management after surgery, use of carbohydrate loading, postoperative ileus prevention, and the early removal of urinary catheter are interventions with a high degree of variation even in countries with strong commitment to ERAS (Table 2). These specific recommendations are all based on a moderate or low level of evidence and often are not derived from studies in ovarian cancer patients. Surgeons may be uncertain about the generalisability of evidence derived from other surgical disciplines, because of the peculiarity of ovarian cancer surgery and the typical comorbidities of patients with advanced ovarian cancer (10).

Previous surveys about ERAS and gynaecological patients have been reported from Canada (23), Germany (22), and ANZGOG (Australia/New Zealand) (21). Only the latter focused specifically on advanced ovarian cancer patients. Results in Canada were characterised by a high level of variation between centres and the rather traditional patterns of care with high rates of routine bowel preparation and long preoperative fasting for solids and fluids. Results were similar in Germany, but the survey was limited by the poor response rate of 22%. Bowel preparation was much less common in Australia and New Zealand; however, fasting time data were similar to data from Canada. Pooled data from our survey underline the widespread use of bowel

preparation, as in the surveys from Canada and Germany. The prolonged preoperative fasting for solids and fluids remains common and is in line with all previous surveys. The omission of bowel preparation and short preoperative fasting may in particular require multidisciplinary collaboration and consensus with colorectal surgeons and anaesthetists. These aspects may therefore be difficult to implement. This underlines the necessity of a broad embedment of ERAS, involving all relevant disciplines. The more consistent attitude towards the omission of drains and nasogastric tubes and early feeding reported from other surveys is in line with our findings, especially in Scandinavia. These aspects are more likely to be guided by the attending surgeon's personal decision and are less dependent on multidisciplinary collaboration. Our approach of assessing patterns of care with a survey has limitations. Institutions already engaged in ERAS protocols may have been more likely to respond to the survey and our results may be more representative of institutions with a general interest in ERAS. Data were self-reported and may not mirror real patterns of care. Therefore, our results may overestimate the degree of ERAS implementation in these European countries. Practice may vary between surgeons and the results may not entirely represent the unit's practice. However, in Scandinavia, Italy and Austria, even in those units without an ERAS perioperative protocol, perioperative management is often detailed in specific institutional guidelines, shared by surgeons, anaesthesiologists and nurses. These protocols help to standardize clinical practice in all patients and to reduce failures, even when different surgeons and nurses take care of the patients during their hospitalization. Responses to the survey at least to a large degree should mirror these protocols in the centres represented and not an individual approach. Still, we cannot rule out that some of the results reported here mirror individual, rather than centre-wide practices. The assessment of anaesthetic principles in an ERAS pathway was included as a survey topic but these results were considered beyond the scope of this report. Despite these limitations, this survey brings awareness to the implementation of standardised, evidence-based perioperative care. It hopefully facilitates a process of evaluating existing standards, not only in the participating groups but also beyond them to the field at large. The fact that a growing number of ovarian cancer centres are

gaining experience with an ERAS pathway may encourage an international discussion and consensus.

The currently high heterogeneity in patterns of care across, and even within, groups may challenge a multicentre, international approach to a clinical trial. Well-designed cohort studies and novel trial designs (platform trial, stepped wedge cluster randomised controlled trial) may be alternatives to randomised controlled trials of individual interventions. Education and research on implementation may further enhance the dissemination of available protocols. Efforts should be undertaken to coordinate the work of those institutions willing to revise their perioperative protocols and cooperative trial groups could be a suitable platform to facilitate this process.

Acknowledgments

Thanks to ENYGO (European Network of Young Gynae Oncologists) for connecting us for this project. We also acknowledge the contribution of the 62 participating institutions. A special thanks to Roldano Fossati, Elena Biagioli, and Emanuele Negri from Mario Negri Institute in Milan and from MaNGO for the suggestions provided on how to conduct the survey in Italy.

Survey participants

From Scandinavia:

Maarit Anttila - Kuopio University Hospital

Charlotte H. Sjøgaard - Aarhus University Hospital

Sami Saarelainen - Tampere University Hospital

Berit Jul Mosgaard - Rigshospitalet Copenhagen

Elisabeth Berge Nilsen - Stavanger University Hospital

Johanna Hynninen - Turku University Hospital

Pernille Jensen - Odense University Hospital

Pernilla Dahm Kahler - Sahlgrenska University Hospital Goteborg

Karin Stalberg - Uppsala University Hospital

Brynhildur Eyjolfssdottir - The Norwegian Radiumhospital, Oslo University Hospital

Paivi Pakarinen - Helsinki University Hospital

- 347 Elisabeth Araya - St Olavs Hospital HF Trondheim
- 348 Martin M Lindblad - Universitetssykehuset Nord-Norge Tromsø
- 349 Line Bjørge - Haukeland University Hospital Bergen
- 350 Preben Kjolhede - Linköping University Hospital
- 351 **From Austria:**
- 352 Karl Tamussino - Medical University of Graz
- 353 Gerhard Bogner - PMU Salzburg
- 354 Manfred Mortl - Clinical Center Klagenfurt
- 355 Christian Marth - University Hospital Innsbruck
- 356 Alexander Reinhaller - Medical University of Vienna
- 357 Lukas Hefler - Ordensklinikum Linz
- 358 Paul Sevelde - General Hospital Hietzing Vienna
- 359 **From Italy:**
- 360 Alessandro Buda – San Gerardo Hospital Monza
- 361 Giorgio Giorda - CRO Aviano (PN)
- 362 Tiziano Maggino - Ospedale dell' Angelo Mestre (VE)
- 363 Pierandrea De Iaco – Policlinico S.Orsola Bologna
- 364 Vincenzo Dario Mandato - IRCCS-ASMN Reggio Emilia
- 365 Annamaria Ferrero and Guido Menato - Mauriziano Hospital Torino
- 366 Commerci Giuseppe - S. Maria delle Croci Hospital Ravenna
- 367 Antonino Ditto - Fondazione IRCCS Istituto Tumori Milano
- 368 Enrico Breda - San Giovanni Calibita Hospital Roma
- 369 Stefano Prigione - Ospedale Civile Santi Antonio e Biagio Alessandria
- 370 Stella Capriglione and Roberto Angioli - University Campus Biomedico of Rome
- 371 Francesco Plotti - University Campus Biomedico of Rome
- 372 Gianluca Gregori - Città della Salute e della Scienza di Torino, S.Anna Hospital Torino
- 373 Francesca Falcone - National Cancer Institute G. Pascale Foundation Napoli
- 374 Graziana Ronzino - Vito Fazzi Hospital Lecce
- 375 Chiara Cassani - Fondazione IRCCS Policlinico San Matteo Pavia
- 376 Dionyssios Katsaros - Città della Salute e della Scienza di Torino, S.Anna University
Hospital Torino

378 Silvia Corso - Alessandro Manzoni Hospital, Lecco
379 Giuseppe Vizzielli and Giovanni Scambia - Policlinico Gemelli Roma
380 Marco Camanni and Elena Delpiano - Gradenigo Humanitas Hospital Torino
381 Andrea Puppo - Regina Montis Regalis Hospital Mondovì (CN)
382 Angiolo Gadducci - Azienda Ospedaliera Universitaria Pisana Pisa
383 Alberto Daniele and Eugenio Volpi - Ospedale Santa Croce e Carle Cuneo
384 Marocco Francesco and Riccardo Ponzzone – Istituto di Candiolo IRCCS Candiolo (TO)
385 Michele Peiretti - University Hospital of Cagliari
386 Flavia Sorbi e Massimiliano Fambrini - Careggi University Hospital Firenze
387 Ilaria Pezzani - Treviso Hospital
388 Daniela Gatti - Manerbio Hospital (BS)
389 Paolo Sala - Policlinico San Martino Genova
390 Paolo Zola - Città della Salute e della Scienza di Torino, S.Anna University Hospital
391 Torino
392 Giuseppe Scibilia and Paolo Scollo - Cannizzaro Hospital Catania
393 Simona Frezzini - Istituto Oncologico Veneto Padova
394 Gennaro Cormio - Bari University Hospital
395 Manuel Maria Ianieri and Marcello Ceccaroni - Ospedale Sacro Cuore Don Calabria
396 Negrar (VR)
397 Gerardo Rosati – S. Carlo Hospital Potenza
398 Stefano Greggi - Istituto Nazionale Tumori di Napoli
399 Roberto Berretta - Parma University Hospital
400 Giovanni Aletti - European Institute of Oncology Milano
401 Ilaria Spagnoletti - Fatebenefratelli Hospital Benevento
402 Martina Ratti and Enrico Sartori - ASST Spedali Civili Di Brescia
403
404

References

1. Gustafsson UO, Hausel J, Thorell A, et al. Enhanced Recovery After Surgery Study Group. Adherence to the enhanced recovery after surgery protocol and outcomes after colorectal cancer surgery. *Arch Surg*. 2011;146(5): 571-577.
2. ERAS Compliance Group. The impact of enhanced recovery protocol compliance on elective colorectal cancer resection: results from an international registry. *Ann Surg*. 2015;261(6):1153- 1159.
3. Nelson G, Kiyang LN, Crumley ET, et al. Implementation of Enhanced Recovery After Surgery (ERAS) across a provincial healthcare system: the ERAS Alberta colorectal surgery experience. *World J Surg*. 2016;40(5):1092-1103.
4. Maessen J, Dejong CH, Hausel J, et al. A protocol is not enough to implement an enhanced recovery programme for colorectal resection. *Br J Surg*. 2007 Feb;94(2):224-31.
5. Nelson G, Dowdy SC, Lasala J, et al. Enhanced recovery after surgery (ERAS®) in gynecologic oncology - Practical considerations for program development. *Gynecol Oncol*. 2017 Dec;147(3):617-620.
6. Nelson G, Altman AD, Nick A, et al. Guidelines for pre- and intra-operative care in gynecologic/oncology surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations--Part I. *Gynecol Oncol*. 2016 Feb;140(2):313-22.
7. Nelson G, Altman AD, Nick A, et al. Guidelines for postoperative care in gynecologic/oncology surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations--Part II. *Gynecol Oncol*. 2016 Feb;140(2):323-32
8. Dickson EL, Stockwell E, Geller MA, et al. Enhanced recovery program and length of stay after laparotomy on a gynecologic oncology service: a randomized controlled trial. *Obstet Gynecol* 2017;129: 355–62
9. Nelson G, Ramirez PT, Ljungqvist O, et al. Letter to the editor. Enhanced Recovery Program and Length of Stay After Laparotomy on a Gynecologic Oncology Service: A Randomize Controlled Trial. *Obstet Gynecol*. 2017 Jun;129(6):1139.
10. Lindemann K, Kok PS, Stockler M, et al. Enhanced Recovery After Surgery for Advanced Ovarian Cancer: A Systematic Review of Interventions Tried. *Int J Gynecol Cancer*. 2017 Jul;27(6):1274-1282

- 436 11. Minig L, Biffi R, Zanagnolo V, et al. Reduction of postoperative complication rate
437 with the use of early oral feeding in gynecologic oncologic patients undergoing a major
438 surgery: a randomized controlled trial. *Ann Surg Oncol.* 2009;16:3101Y3110.
- 439 12. Minig L, Biffi R, Zanagnolo V, et al. Early oral versus “traditional” postoperative
440 feeding in gynecologic oncology patients undergoing intestinal resection: a randomized
441 controlled trial. *Ann Surg Oncol.* 2009;16:1660Y1668.
- 442 13. Pearl ML, Valea FA, Fischer M, et al. A randomized controlled trial of early
443 postoperative feeding in gynecologic oncology patients undergoing intra-abdominal
444 surgery. *Obstet Gynecol.* 1998;92:94Y97.
- 445 14. Pearl ML, Frandina M, Mahler L, et al. A randomized controlled trial of a regular
446 diet as the first meal in gynecologic oncology patients undergoing intraabdominal
447 surgery. *Obstet Gynecol.* 2002;100:230Y234.
- 448 15. Cutillo G, Maneschi F, Franchi M, et al. Early feeding compared with nasogastric
449 decompression after major oncologic gynecologic surgery: a randomized study. *Obstet*
450 *Gynecol.* 1999;93:41Y45.
- 451 16. Feng S, Chen L, Wang G, et al. Early oral intake after intra-abdominal
452 gynecological oncology surgery. *Cancer Nurs.* 2008;31:209Y213.
- 453 17. Baker J, Janda M, Graves N, et al. Quality of life after early enteral feeding versus
454 standard care for proven or suspected advanced epithelial ovarian cancer: results from
455 a randomised trial. *Gynecol Oncol.* 2015;137:516Y522.
- 456 18. Meyer LA, Lasala J, Iniesta MD, et al. Effect of an Enhanced Recovery After
457 Surgery Program on Opioid Use and Patient-Reported Outcomes *Obstet Gynecol.* 2018
458 Aug;132(2):281-290
- 459 19. Kumar A, Torres ML, Cliby WA, et al. Inflammatory and Nutritional Serum
460 Markers as Predictors of Peri-operative Morbidity and Survival in Ovarian Cancer.
461 *Anticancer Res.* 2017 Jul;37(7):3673-3677
- 462 20. Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: A Review.
463 *JAMA Surg.* 2017 Mar 1;152(3):292-298.
- 464 21. Lindemann K, Kok PS, Stockler M, et al. Enhanced Recovery After Surgery for
465 Suspected Ovarian Malignancy: A Survey of Perioperative Practice Among

Gynecologic Oncologists in Australia and New Zealand to Inform a Clinical Trial. *Int J Gynecol Cancer*. 2017 Jun;27(5):1046-1050

22. Muallem MZ, Dimitrova D, Pietzner K, et al. Implementation of Enhanced Recovery After Surgery (ERAS) Pathways in Gynecologic Oncology. A NOGGO-AGO survey of 144 Gynecological Departments in Germany. *Anticancer Res*. 2016 Aug;36(8):4227-32

23. Altman AD, Nelson GS; Society of Gynecologic Oncology of Canada Annual General Meeting, Continuing Professional Development, and Communities of Practice Education Committees. The Canadian Gynaecologic Oncology Perioperative Management Survey: Baseline Practice Prior to Implementation of Enhanced Recovery After Surgery (ERAS) Society Guidelines. *J Obstet Gynaecol Can*. 2016 Dec;38(12):1105-1109

24. Bardram L, Funch-Jensen P, Jensen P, et al. Recovery after laparoscopic colonic surgery with epidural analgesia, and early oral nutrition and mobilisation. *Lancet*. 1995;345(8952): 763-764.

25. H. Kehlet, Multimodal approach to control postoperative pathophysiology and rehabilitation, *Br. J. Anaesth*. 78 (1997) 606–617.

Legends of Tables and Figures

Figure 1: Key components of perioperative surgical management

Figure 2: Use of peritoneal drainage in different countries

Table 1: Distribution of patients with suspected advanced ovarian / tubal / peritoneal cancer treated with debulking surgery (upfront or interval) per unit/per year participating in the survey, per year

Table 2. Compliance to ERAS recommendations in different countries, the expected target effects and relative level of evidence and recommendation grade. Critical issues (level of evidence moderate or high and compliance <50%) are in bold.

Table 3: Prescription attitude and type of bowel preparation

Figures

Figure 1: Key components of perioperative surgical management

Figure 2: Use of peritoneal drainage in different countries

BR: bowel resection

* extensive surgery – extensive peritonectomy

Tables

Table 1: Distribution of patients with suspected advanced ovarian / tubal / peritoneal cancer treated with debulking surgery (upfront or interval) per unit/per year participating in the survey

No. of patients with suspected advanced ovarian cancer treated with debulking surgery, per year	No. of units
Scandinavia (Norway, Sweden, Finland, Denmark)	
<= 30 patients	1
31 -59	3
60-89	4
90-100	5
more than 100	2
Austria	
<= 30 patients	4
31 -59	3

60-89	-
90-100	-
more than 100	-
Italy	
<= 30 patients	18
31 -59	11
60-89	5
90-100	3
more than 100	3

N: number

Table 2. Compliance to ERAS recommendations in different countries, the expected target effects and relative level of evidence and recommendation grade. Critical issues (level of evidence moderate or high and compliance <50%) are listed in bold.

	Target Effect ⁽¹⁹⁾	LoE*	Recommendation grade*	Compliance Scandinavia	Compliance Austria	Compliance Italy
Preoperative counselling on ERAS	Reduce anxiety, involve the patient to improve compliance with protocol	low	strong	86%	57%	60%
Preoperative optimization	Reduce complications	high-moderate	strong	HRT 60% OC 40% anaemia 80%	HRT 86% OC 100% anaemia 86%	HRT 77% OC 75% anaemia 95%
IV antibiotic prophylaxis	Reduce infection rates	high	strong	70%	78%	76%
No routine preoperative bowel preparation even when bowel resection is planned	Reduce dehydration	moderate	strong	33%	28%	15%
No long preoperative fasting (clear fluids allowed up to 2 hours prior to induction of anesthesia – up to 6 hours for solids)	Support energy supply, reduce starvation-induced insulin resistance, reduce dehydration	high	strong	Fluids 67% Solids 20%	Fluids 57% Solids 71%	Fluids 5% Solids 23%
Use of carbohydrate loading	Reduce insulin resistance, improve well-being, possibly faster recovery	moderate	strong	67%	43%	10%
Thrombo-prophylaxis (LMWE started preoperatively –prolonged prophylaxis 4 weeks-	Reduce thromboembolic complications	high	strong	40-93-80%	100-100-100%	57-69-82%

compressive stockings)						
Stop IV fluids within 24 hours after surgery	Support energy and protein supply, reduce starvation-induced insulin resistance	moderate	strong	7%	14%	23%
Early postoperative feeding	Support energy and protein supply, reduce starvation-induced insulin resistance	high	strong	93%	100%	41%
No routine use abdominal drains including for patients undergoing lymphadenectomy or bowel surgery	Support mobilization, reduce pain and discomfort, no proven benefit of use	moderate	strong	64%	57%	33%
No routine use nasogastric tube	Reduce the risk of pneumonia, support oral intake of solids	high	strong	71%	86%	69%
Routine prevention of postoperative ileus	Support oral intake of solids	low	weak	46%	43%	13%
Early removal of urinary drainage (preferably < 24 h postop)	Support ambulation and mobilization	low	strong	21%	71%	36%
Procedures for early postoperative mobilization	Support return to normal movement	low	strong	100%	100%	100%

ERAS: Enhanced recovery after surgery

LoE: level of evidence

HRT: preoperative stop to hormonal replacement therapy

OC: preoperative stop to oral contraceptives

Anemia: preoperative correction of anemia

*LoE and recommendation grade both according to ERAS guidelines (GRADE system for rating quality of evidence: *G.H. Guyatt, A.D. Oxman, G.E. Vist, R. Kunz, Y. Falck-Ytter, P. Alonso-Coello, et al., GRADE: an emerging consensus on rating quality of evidence and strength of recommendations, BMJ 336 (7650) (2008) 924–926*)

534

535 **Table 3:** Prescription attitude and type of bowel preparation

	Scandinavia (%)	Austria (%)	Italy (%)
Indication for bowel preparation			
BP routinely prescribed	27	43	47.5
BP only in case a bowel resection is planned	40	28.5	35
BP never prescribed	33	28.5	17.5
Type of bowel preparation*			
BP with oral antibiotic	0	20	6
BP with oral laxatives	22	20	51.5
BP with rectal enema	56	20	15
BP with both oral laxatives and rectal enema	22	40	30

536 BP: bowel preparation

537 * more than one answer was allowed