Review Article

The role of nursing in enhanced recovery after surgery programs in accordance with spine surgery: A mini review

ABSTRACT

Spine surgery is typically having a relationship to high degrees of pain and immobility. It is a known fact that the implementation of an enhanced recovery after surgery (ERAS) approach has led to a paradigm shift in various surgical specialties. These protocols require doctors, nurses, anesthesiologists, patients, and their families to agree to strengthen communication with each other, and involve a long timeline and teamwork from start to finish. To our knowledge, the role of nursing in the ERAS of spine surgery has not been reported before. The purpose of this study is to summarize the role of nursing in ERAS programs in accordance with surgical periods. The methods applied for this review include literature review of the world's acknowledged databases such as Springer Link, PubMed, Embase, and Wanfang, especially in the period of 2000–2015. A total of 9 studies fulfilled the eligibility criteria and were included in the review. The findings confirm that the nursing work continued throughout the perioperative procedure, which plays a key role in the successful ERAS pathway. According to different nursing measures, ERAS nursing can effectively promote the postoperative recovery of spine surgical patients, with fewer postoperative complications and increased patient satisfaction.

Keywords: Enhanced recovery after surgery, enhanced recovery after surgery nursing, review, spinal operation

INTRODUCTION

In the year 2001, Professor Henrik Kehlet, a pioneer of fast-track surgery, was essentially responsible for the beginning, development, and implementation of the enhanced recovery after surgery (ERAS) programs in the Hospital Universitario Rigshospi-talet of Copenhagen (Denmark).[1,2] The ERAS protocol (also called fast-track, accelerated, or rapid recovery surgery) clinical pathway is a multimodal approach to patient care introduced, which uses a series of optimization measures with evidence-based medical research evidence for perioperative management to reduce the physical and psychological traumatic stress of surgical patients, improve patient outcomes, and enable patients to recover faster [Figure 1].[3-5] A growing body of evidence suggests that ERAS protocol has been successfully implemented and managed in patients with various surgically treated diseases, such as hepatocellular carcinoma, breast cancer, gastric cancer, musculoskeletal surgery, and cholecystectomy, especially following colorectal surgery.[6-8] In recent years, there is strong evidence to demonstrate that ERAS has been successfully adopted into major spinal surgery pathways.[9] Epstein[10] included citing protocols for the early mobilization of hospitalized patients undergoing spinal surgery, such as day of surgery, first postoperative day, reduced perioperative comorbidities, and length of stay. The clinical details

Qing-Qing HOU[1#], Xue LUO[1#], Hong-Mian LI[2], Ying HOU[1], Zhi ZHANG[3]

[1]Department of Spine Surgery, The Fifth Affiliated Hospital of Guangxi Medical University, Nanning, China; [2]Department of Cosmetic Surgery, The Fifth Affiliated Hospital of Guangxi Medical University, Nanning, China; [3]Department of Hepatobiliary Surgery, The Fifth Affiliated Hospital of Guangxi Medical University, Nanning, China

[#]Qing-Qing HOU and Xue LUO contributed equally to this work.

Address for correspondence: Zhi ZHANG, No. 89, Qixing Road, Qingxiu District, Nanning City, Guang Xi Province, China.
E-mail: zzhndx@aliyun.com

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provided by Mathiesen *et al*.[11] in their comparative study of introducing multilevel (median 10) instrumented spinal fusions treatment protocol to 44 consecutive patients undergoing major spinal surgery, it was demonstrated that compared to a historic group, treatment protocol significantly improved postoperative mobilization, accompanied by low intensities of nausea.

The key components of ERAS are multimodal approaches that lead to a major reduction in the undesirable sequelae from surgery and accelerate recovery following surgery. These new protocols require the multimodal intervention implementation and participation of all care-team members, including anesthetists, surgeons, nurses, and physiotherapists cooperating closely on this to ensure the success of the ERAS program[12] [Figure 1]. Nursing care is key to having a wider perspective of the entire ERAS approach, which is assessed daily for all patients to plan the nursing resource for the next following 24 h.[13] The growing demand for major spinal surgery in high-risk patients carries with the need for nurses responsible for interring professional communication, preoperative education, attenuation of the surgical stress response, clarification of doubts and abolishment of erroneous beliefs, early mobilization, and optimized nutrition where appropriate.[14]

METHODS

All the subject-related documents published were systematically searched from four databases: Springer Link, PubMed, Embase, and Wanfang data in October 2020.

After reading a number of documents, we use the following search string: "role of nursing" or "enhanced recovery after surgery" or "enhanced recovery after surgery (ERAS) and spine surgery" or "enhanced recovery after surgery (ERAS) nursing" or "enhanced recovery after surgery (ERAS) of spinal operation" or "enhanced recovery after surgery (ERAS)" and "spine surgical nursing." We searched for studies of any types of publications but limited to original articles in English. We also screened the reference lists of included papers, relevant systematic reviews or published clinical trials.

We included all the studies reporting data onto the role of nursing in ERAS programs in spine surgery. Data from included articles were extracted independently by two researchers using a standardized form, and any discrepancies were resolved by consensus. Eligible studies included the role of nursing in ERAS (e.g., nursing intervention, holistic nursing, and individuation nursing care) and ERAS protocols in spinal operation (e.g., reduced length of stay, reduced postoperative hospital stay, and increased satisfaction). These data have to report at least one of the above criteria to be included in this review. The exclusion criteria were: Repeat studies, overlapping cases, and studies that did not meet the above criteria. We used Endnote to retrieve to select articles. The concordance rate of the two reviewers was 96.8%. After screening all titles and removal of duplicates, a total of 9 studies fulfilled the eligibility criteria and were included in the review [Figure 2].

RESULTS AND DISCUSSION

Nursing role in major spinal surgery

The nurse's role within ERAS programs is visibly as part of the multidisciplinary team, and ERAS nursing can comply with ERAS processes, effectively promote the postoperative recovery for spine surgical patients [Figure 3].[15]

To ensure a smooth flow of medical processes of outpatient toward inpatient department

Spinal trauma is a common spine surgeon condition which is serious injuries, critical illness, with the high mortality and rate of deformity, it's important to chosen a prompt and proper treatment strategy for the patients.[16] The nurse takes on the tasks of protecting against complications and

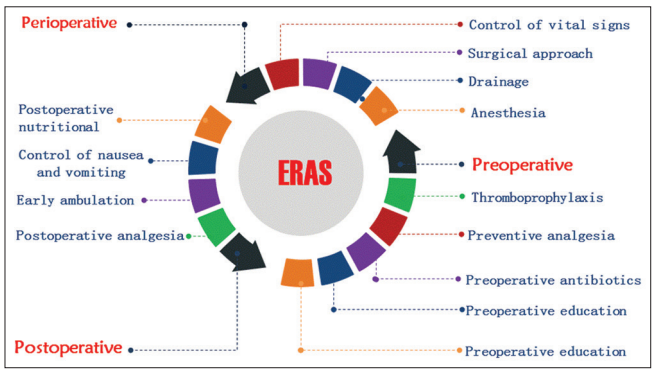


Figure 1: Enhanced recovery after surgery is a multimodal, multidisciplinary approach to the care of the surgical patients

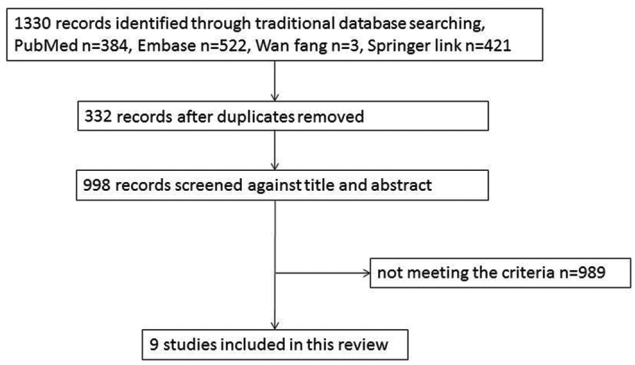


Figure 2: Search and selection of eligible studies

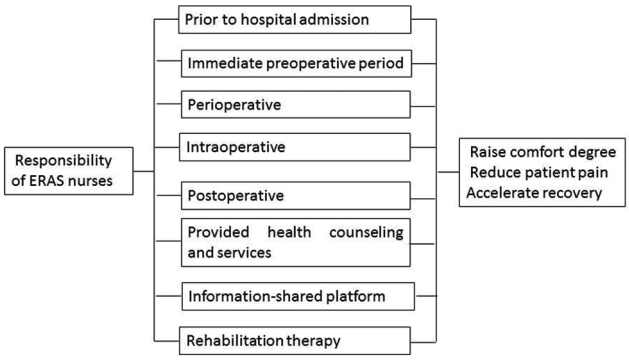


Figure 3: Enhanced recovery after surgery nursing follows enhanced recovery after surgery processes and effectively promotes the postoperative recovery for spine surgical patients

preventing secondary injury of the spinal cord.[17] This may be noticeable for established readiness centers, and allow nurse participation, the intention of outpatient/inpatient department into one integral whole, which is corresponding to the completion of preoperative preparation of ERAS approach.[18] These programs include: preoperative regular examinations, preoperative health education, and preoperative nutrition preparation.[19] Often, this can also help shorten the wait times at a hospital, stabilize patient's emotion, and reduce their stress reaction/anxiety, which is advantageous to maintain body nutrition, to reduce postoperative complication, so as to help them get through the operative period more smoothly.[20]

Accomplishment of enhanced recovery after surgery approach requiring coordination of multidisciplinary team members

Patients presenting with spinal trauma may have any combination of traumatic brain injury, hepatic or splenic injuries, limb fractures, pressure ulcers, diabetes, hypertension, and heart disease.[21] Therefore, multidisciplinary treatment (MDT) was especially important for patients who had spine surgery with comorbid disorders, especially with diagnostic ambiguity, which can help explore the best treatment method to patients.[22,23] During the MDT period, the nurses carry out actions such as: responsible for organization of meetings, arrangement of the department, rehabilitation nursing and mental nursing, and making individualization nursing plan.[24-26] In addition, there is evidence that ERAS protocols are most effective when they use an MDT strategy, in improving the efficiency, accuracy and security of the spinal operation, reducing the length of stay, and increasing satisfaction.[27]

Whole-process nursing intervention, holistic nursing, and individualization nursing care are supposed to provide

There is plenty of evidence proved that spinal surgery had these characteristics in patients: big surgical trauma, long hospital stay, high hospitalization costs, and high risk of complications. Recently, more and more evidences suggest that introducing ERAS principles to spine surgery pathways can improve surgical outcomes.[28,29] Furthermore, there is strong evidence that nursing acquires an essential role in the application of ERAS components to major spinal surgery[30-32] [Table 1].

Implementation of the hospital-community integrated nursing techniques

Recent studies found that while the application of ERAS modeled on major spine surgery can reduce the hospitalization day, but in some cases also can lead to higher hospital readmission rates and other costly interventions.[8,31,59] Therefore, successful implementation of the ERAS pathway in major spine surgery requires the collaboration of all members of the surgical team, and rehabilitation treatment and nursing is far more significant after discharge.[60] ERAS program focused on reducing the stress response, nevertheless, the key points are how to deal with lifting the patient's worries and actively cooperate with treatment. Therefore, it is important to establish convenient clinic in community hospitals for patients after undergoing major spine surgery with ERAS pathways. A rehabilitation treatment team of nurses and physiatricians is the key part of the convenient clinic, and their chief responsibility is to implement early rehabilitative treatment, involving wound care, phlebitis care, emotional support, muscle soreness, and fatigue care.[61]

Furthermore, a continuous medical service should be offered to the outpatient trying to provide individualized services for patients and improve patient satisfaction.

Nurses involvement in creating the multidisciplinary information sharing platform

It is very important to create an information-shared platform, which will provide a common information platform for treatment for the ERAS pathway.[12] The platform is to provide patient's concrete conditions for doctors to plan in time appropriate treatment program, by active treatment, and alleviate the symptoms quickly. All these activities are aimed at making patients quite satisfied with treatment.

Clinical nurses in charge of recording data onto per patient will do more to provide convenience for surgeon who can get started early to make decisions on scheduled operation, in accordance with personal situation, physiological and biochemical indices, and mental health situation. There's a lot of evidence that introducing data-base management for information technology to assist nurses to deal with numbers of cases and remote consultations can save a lot of time for multidisciplinary team project implementation.[62] Otherwise, information sharing platforms can further provide health

Table 1: The role of nursing in enhanced recovery after surgery programs in accordance with surgical periods

Time period in surgery	Role of nursing in ERAS components
1. Prior to hospital admission (preadmission)	Preoperative evaluation,[31,33] healthcare education,[31] cessation of tobacco and alcohol,[33] preoperative nutritional screening (nutritional optimization),[34] and medical optimization of chronic disease[35]
2. Immediate preoperative period[36]	Appropriate diet,[37] start of thromboembolism prophylaxis,[38] control of vital signs,[25] preoperative hair removal,[39] preoperative prophylaxis against infection,[39] administer vasopressors (support blood pressure control),[40] control of body temperature (with a thermal blanket and fluid heater),[41] restrictive use of surgical drains,[42] and maintaining fluid balance (avoid over or under hydration)[43]
3. Perioperative	Preoperative hair removal (1 h before surgery),[39] preoperative prophylaxis against infection,[39] carbohydrate drink supplement (2 h before surgery),[44] preoperative prophylaxis against thrombosis (using compression stockings or intermittent pneumatic compression),[45] preoperative prophylaxis against infection (rationally using antibiotics),[46] and control of vital signs[25]
4. Intraoperative	Urinary catheterization (if required),[47] oxygen therapy,[48] standardized anesthesia (to avoid long-acting opioids),[49] maintaining fluid balance (to avoid over or under hydration),[43] no nasogastric tube (as required),[50] prophylaxis of postoperative nausea and vomiting,[51] administer vasopressors (support blood pressure control),[40] control of body temperature (with a thermal blanket and fluid heater),[41] restrictive use of surgical drain,[43] removal of nasogastric tubes (before reversal of an anesthesia),[50] and surgical wound healing (as required)[52]
5a. Postoperative 1st day	Start of oral tolerance (6 h after surgery),[2] start of mobilization (8 h after surgery),[53] restrictive fluid therapy,[54] nutritional supplements (according to selected cases),[55] thromboembolism prophylaxis (according to guideline),[45] control of vital signs,[25] and control of nausea and vomiting (multimodal approach)[51]
5b. Postoperative 2nd day	Removal of urinary catheters and intravenous fluids,[56] normal diet (intake of protein and energy-rich nutritional),[51] thromboembolism prophylaxis (using compression stockings or intermittent pneumatic compression),[45] and use of laxatives and intravenous analgesia (no opiates)[8]
5c. Postoperative: During the remainder of hospital stay	Normal diet (intake of protein and energy-rich nutritional),[51] thromboembolism prophylaxis (using compression stockings or intermittent pneumatic compression),[45] control of vital signs,[25] active mobilization (bed/chair/starting to walk),[57] oral analgesia (no opiates)[8]
6. On discharge	Maintenance of thromboprophylaxis (according to prescribed guideline),[45] and telephone control after discharge[58]

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counseling and services for the discharged patients, to achieve the maximum utilization of the medical resources, improve patient safety and patient satisfaction.

CONCLUSION

The ERAS pathways focus on combining and coordinating the types of health resources, dedicated to providing our patients with quality and efficient nursing services, which develops with the goal of promoting the recovery of the patients, reducing in-hospital days and preventing subsequent complications.

Evidence shows that ERAS pathways to procedures can improve surgical outcomes, and has obvious treatment effects on the recovery process.[63] Moreover, there is strong evidence to support the wide adoption of ERAS pathways in spinal surgery.[8] Obviously, the nursing staff is crucial to the success of an ERAS program, although the patients' clinical effectiveness depends on many factors, the patients were discharged on time, based on the program principles.

With the development of surgical care, nursing staff and multidisciplinary teams should work together, which is as the basic connotation and requirement of the ERAS program should be. Accordingly, during the execution of ERAS pathways, the nursing staff should focus on dynamic clinical observation and evaluation of patients' condition as the main content of the recovery process. Furthermore, nursing staff needs to communicate with surgeons, and provide patients' concrete condition for doctors to plan appropriate treatment program, so as to alleviate the symptoms quickly, raise patients' comfort degree, reduce patient pain and accelerate recovery.

The nursing staff should possess care ability to take specific interventions in preoperative, intraoperative, and postoperative period, then make the multidisciplinary team function well and increase the patients' satisfaction. This is the reason that nursing staff held the important position in ERAS protocols. However, with the progress development of ERAS protocols, nursing staff is also facing new challenges and difficulties. A strong and supportive environment is needed for their development, and more high quality research is necessary to confirm this protocol.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Kehlet H. ERAS implementation-time to move forward. Ann Surg 2018;267:998-9.
2. Yin X, Zhao Y, Zhu X. Comparison of fast track protocol and standard care in patients undergoing elective open colorectal resection: A meta-analysis update. Appl Nurs Res 2014;27:e20-6.
3. Cavallaro P, Bordeianou L. Implementation of an ERAS pathway in colorectal surgery. Clin Colon Rectal Surg 2019;32:102-8.
4. Simpson JC, Bao X, Agarwala A. Pain management in enhanced recovery after surgery (ERAS) protocols. Clin Colon Rectal Surg 2019;32:121-8.
5. Steenhagen E. Enhanced recovery after surgery: It's time to change practice! Nutr Clin Pract 2016;31:18-29.
6. Li L, Zhang J. Application value of ERAS in perioperative period of precise hepatectomy for hepatocellular carcinoma patients. J BUON 2020;25:965-71.
7. Jogerst K, Thomas O, Kosiorek HE, *et al.* Same-day discharge after mastectomy: Breast cancer surgery in the era of ERAS®. Ann Surg Oncol 2020;27:3436-45.
8. Dietz N, Sharma M, Adams S, *et al*. Enhanced recovery after surgery (ERAS) for spine surgery: A systematic review. World Neurosurg 2019;130:415-26.
9. Soffin EM, Vaishnav AS, Wetmore DS, *et al.* Design and implementation of an enhanced recovery after surgery (ERAS) program for minimally invasive lumbar decompression spine surgery: Initial experience. Spine (Phila Pa 1976) 2019;44:E561-70.
10. Epstein NE. A review article on the benefits of early mobilization following spinal surgery and other medical/surgical procedures. Surg Neurol Int 2014;5:S66-73.
11. Mathiesen O, Dahl B, Thomsen BA, *et al.* A comprehensive multimodal pain treatment reduces opioid consumption after multilevel spine surgery. Eur Spine J 2013;22:2089-96.
12. Ashok A, Niyogi D, Ranganathan P, *et al.* The enhanced recovery after surgery (ERAS) protocol to promote recovery following esophageal cancer resection. Surg Today 2020;50:323-34.
13. Li Y, Yan C, Li J, *et al.* A nurse-driven enhanced recovery after surgery (ERAS) nursing program for geriatric patients following lung surgery. Thorac Cancer 2020;11:1105-13.
14. Seow-En I, Wu J, Yang LW, *et al.* Results of a colorectal enhanced recovery after surgery (ERAS) programme and a qualitative analysis of healthcare workers' perspectives. Asian J Surg 2021;44:307-12.
15. Kapritsou M, Papathanassoglou ED, Konstantinou EA, *et al.* Effects of the enhanced recovery program on the recovery and stress response in patients with cancer undergoing pancreatoduodenectomy. Gastroenterol Nurs 2020;43:146-55.
16. Frassanito L, Vergari A, Nestorini R, *et al.* Enhanced recovery after surgery (ERAS) in hip and knee replacement surgery: Description of a multidisciplinary program to improve management of the patients undergoing major orthopedic surgery. Musculoskelet Surg 2020;104:87-92.
17. Tipper GA, Chiwera L, Lucas J. Reducing surgical site infection in pediatric scoliosis surgery: A multidisciplinary improvement program and prospective 4-year audit. Global Spine J 2020;10:633-9.
18. Smith TW Jr., Wang X, Singer MA, *et al*. Enhanced recovery after surgery: A clinical review of implementation across multiple surgical subspecialties. Am J Surg 2020;219:530-4.
19. Kaye AD, Chernobylsky DJ, Thakur P, *et al.* Dexmedetomidine in enhanced recovery after surgery (ERAS) protocols for postoperative pain. Curr Pain Headache Rep 2020;24:21.
20. Kennedy GT, Hill CM, Huang Y, *et al*. Enhanced recovery after surgery (ERAS) protocol reduces perioperative narcotic requirement and length of stay in patients undergoing mastectomy with implant-based reconstruction. Am J Surg 2020;220:147-52.
21. Ong B, Wilson JR, Henzel MK. Management of the patient with chronic spinal cord injury. Med Clin North Am 2020;104:263-78.
22. Kreutzträger M, Voss H, Scheel-Sailer A, *et al*. Outcome analyses of a multimodal treatment approach for deep pressure ulcers in spinal cord injuries: A retrospective cohort study. Spinal Cord 2018;56:582-90.
23. Barzilai O, Bilsky MH, Laufer I. The role of minimal access surgery in the treatment of spinal metastatic tumors. Global Spine J 2020;10:79S-87S.
24. Ni Y, Liu S, Li J, *et al.* The effects of nurse-led multidisciplinary team management on glycosylated hemoglobin, quality of life, hospitalization, and help-seeking behavior of people with diabetes mellitus. J Diabetes Res 2019;2019:9325146.
25. O'Connor DT, Rawson H, Redley B. Nurse-to-nurse communication about multidisciplinary care delivered in the emergency department: An observation study of nurse-to-nurse handover to transfer patient care to general medical wards. Australas Emerg Care 2020;23:37-46.
26. Wallace I, Barratt H, Harvey S, *et al*. The impact of clinical nurse specialists on the decision making process in cancer multidisciplinary team meetings: A qualitative study. Eur J Oncol Nurs 2019;43:101674.
27. Curtin M, Piggott RP, Murphy EP, *et al.* Spinal metastatic disease: A review of the role of the multidisciplinary team. Orthop Surg 2017;9:145-51.
28. Shah SA, Guidry R, Kumar A, *et al*. Current trends in pediatric spine deformity surgery: Multimodal pain management and rapid recovery. Global Spine J 2020;10:346-52.
29. Gerbershagen HJ, Aduckathil S, van Wijck AJ, *et al*. Pain intensity on the first day after surgery: A prospective cohort study comparing 179 surgical procedures. Anesthesiology 2013;118:934-44.
30. Bibi S, Rasmussen P, McLiesh P. The lived experience: Nurses' experience of caring for patients with a traumatic spinal cord injury. Int J Orthop Trauma Nurs 2018;30:31-8.
31. Kim E, Lee B, Cucchiaro G. Perioperative surgical home: Evaluation of a new protocol focused on a multidisciplinary approach to manage children undergoing posterior spinal fusion operation. Anesth Analg 2017;125:812-9.
32. Sevillano-Jiménez A, Romero-Saldaña M, Molina-Recio G. Nursing role on rapid recovery programmes fast-track. Enferm Clin 2017;Enferm Clin, 2017;S1130-8621(17)30098-0.
33. Foss M, Bernard H. Enhanced recovery after surgery: Implications for nurses. Br J Nurs 2012;21:221-3.
34. Yeung SE, Hilkewich L, Gillis C, *et al*. Protein intakes are associated with reduced length of stay: A comparison between enhanced recovery after surgery (ERAS) and conventional care after elective colorectal surgery. Am J Clin Nutr 2017;106:44-51.
35. Ali ZS, Ma TS, Ozturk AK, *et al.* Pre-optimization of spinal surgery patients: Development of a neurosurgical enhanced recovery after surgery (ERAS) protocol. Clin Neurol Neurosurg 2018;164:142-53.
36. Modesitt SC, Sarosiek BM, Trowbridge ER, *et al.* Enhanced recovery implementation in major gynecologic surgeries: Effect of care standardization. Obstet Gynecol 2016;128:457-66.
37. Kaska M, Grosmanová T, Havel E, *et al.* The impact and safety of preoperative oral or intravenous carbohydrate administration versus fasting in colorectal surgery – A randomized controlled trial. Wien Klin Wochenschr 2010;122:23-30.
38. Chiang HA, Cheng PJ, Speed JM, *et al.* Implementation of a perioperative venous thromboembolism prophylaxis program for patients undergoing radical cystectomy on an enhanced recovery after surgery protocol. Eur Urol Focus 2020;6:74-80.
39. Batchelor TJ, Rasburn NJ, Abdelnour-Berchtold E, *et al.* Guidelines for enhanced recovery after lung surgery: Recommendations of the Enhanced Recovery after Surgery (ERAS®) society and the European Society of Thoracic Surgeons (ESTS). Eur J Cardiothorac Surg 2019;55:91-115.
40. Casans Francés R, Ripollés Melchor J, Calvo Vecino JM, *et al*. Is it time

to integrate patient blood management in ERAS guidelines? Rev Esp Anestesiol Reanim 2015;62:61-3.
41. Bernard H. Patient warming in surgery and the enhanced recovery. Br J Nurs 2013;22:319-20, 322-5.
42. Kisielewski M, Rubinkiewicz M, Pędziwiatr M, *et al.* Are we ready for the ERAS protocol in colorectal surgery? Wideochir Inne Tech Maloinwazyjne 2017;12:7-12.
43. Committee on Gynecologic Practice. ACOG Committee Opinion No. 750: Perioperative pathways: Enhanced recovery after surgery. Obstet Gynecol 2018;132:e120-30.
44. Jiang W, Liu X, Liu F, *et al.* Safety and benefit of pre-operative oral carbohydrate in infants: A multi-center study in China. Asia Pac J Clin Nutr 2018;27:975-9.
45. Mohn AC, Egge J, Rokke O. Low risk of thromboembolic complications after fast-track abdominal surgery with thrombosis-prophylaxis only during hospital stay. Gastroenterology Res 2011;4:107-13.
46. Xu X, Zheng C, Zhao Y, *et al*. Enhanced recovery after surgery for pancreaticoduodenectomy: Review of current evidence and trends. Int J Surg 2018;50:79-86.
47. Pędziwiatr M, Pisarska M, Kisielewski M, *et al.* Is ERAS in laparoscopic surgery for colorectal cancer changing risk factors for delayed recovery? Med Oncol 2016;33:25.
48. Fujikuni N, Tanabe K, Tokumoto N, *et al.* Enhanced recovery program is safe and improves postoperative insulin resistance in gastrectomy. World J Gastrointest Surg 2016;8:382-8.
49. Piccioni F, Ragazzi R. Anesthesia and analgesia: How does the role of anesthetists changes in the ERAS program for VATS lobectomy. J Vis Surg 2018;4:9.
50. Miralpeix E, Nick AM, Meyer LA, *et al.* A call for new standard of care in perioperative gynecologic oncology practice: Impact of enhanced recovery after surgery (ERAS) programs. Gynecol Oncol 2016;141:371-8.
51. Chiu C, Aleshi P, Esserman LJ, *et al.* Improved analgesia and reduced post-operative nausea and vomiting after implementation of an enhanced recovery after surgery (ERAS) pathway for total mastectomy. BMC Anesthesiol 2018;18:41.
52. Wolk S, Distler M, Müssle B, *et al*. Adherence to ERAS elements in major visceral surgery-an observational pilot study. Langenbecks Arch Surg 2016;401:349-56.
53. Pisarska M, Pędziwiatr M, Małczak P, *et al.* Do we really need the full compliance with ERAS protocol in laparoscopic colorectal surgery? A prospective cohort study. Int J Surg 2016;36:377-82.
54. Boersema GS, van der Laan L, Wijsman JH. A close look at postoperative fluid management and electrolyte disorders after gastrointestinal surgery in a teaching hospital where patients are treated according to the ERAS protocol. Surg Today 2014;44:2052-7.
55. Kingma BF, Steenhagen E, Ruurda JP, *et al*. Nutritional aspects of enhanced recovery after esophagectomy with gastric conduit reconstruction. J Surg Oncol 2017;116:623-9.
56. Grass F, Slieker J, Frauche P, *et al.* Postoperative urinary retention in colorectal surgery within an enhanced recovery pathway. J Surg Res 2017;207:70-6.
57. Wolk S, Meißner T, Linke S, *et al.* Use of activity tracking in major visceral surgery-the enhanced perioperative mobilization (EPM) trial: Study protocol for a randomized controlled trial. Trials 2017;18:77.
58. Khorgami Z, Petrosky JA, Andalib A, *et al*. Fast track bariatric surgery: Safety of discharge on the first postoperative day after bariatric surgery. Surg Obes Relat Dis 2017;13:273-80.
59. Wang MY, Chang PY, Grossman J. Development of an enhanced recovery after surgery (ERAS) approach for lumbar spinal fusion. J Neurosurg Spine 2017;26:411-8.
60. Oosterhuis T, Costa LO, Maher CG, *et al*. Rehabilitation after lumbar disc surgery. Cochrane Database Syst Rev 2014;2014:CD003007.
61. Yilmaz G, Akça A, Aydin N. Enhanced recovery after surgery (ERAS) versus conventional postoperative care in patients undergoing abdominal hysterectomies. Ginekol Pol 2018;89:351-6.
62. Huang ZD, Gu HY, Zhu J, *et al.* The application of enhanced recovery after surgery for upper gastrointestinal surgery: Meta-analysis. BMC Surg 2020;20:3.
63. Lambaudie E, Mathis J, Zemmour C, *et al.* Prediction of early discharge after gynaecological oncology surgery within ERAS. Surg Endosc 2020;34:1985-93.