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## Perioperative management for gynecological surgery in accelerated rehabilitation programme

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### Abstract

The Enhanced Recovery After Surgery (ERAS), or Fast Track Surgery, aims to minimise the physiological stress of surgery and optimise patient rehabilitation. However, data on surgical interventions in obstetrics and gynaecology are limited. The aim of the study was to analyse the use of elements of the ERAS programme in gynaecologic surgery clinics and to assess the benefits of this approach. Analytical processing was carried out on systematic reviews and meta-analyses, articles and scientific reports published before June 2023, found and available through the PubMed, EMBASE, Cochrane Central Register of Controlled Trials databases. The data were obtained from relevant published studies, including changes in quality of life, postoperative pain, use of opioids or anaesthesia, postoperative nausea and vomiting, rate of readmission, cost of hospitalisation, and clinically significant increase in patient satisfaction. The ERAS programme is a multimodal and multidisciplinary programme aimed at optimising perioperative treatment and improving postoperative outcomes in operative gynaecology by minimising the patient's stress response, promoting functional recovery and achieving rapid recovery, where the patient is in the field of view of a number of specialists. The presented publications demonstrate that this concept of FTS is a fundamentally new approach to the surgical treatment of gynaecological patients and covers all stages of perioperative therapy: preoperative, intraoperative and postoperative.

**Conclusions.** The initial stage of the surgeon's and anaesthetist's acquaintance with the patient is very important, as communication and rational presentation of information using illustrative and video material helps the patient understand the disease, consciously choose the proposed method of treatment, reduces anxiety, increases the role of the surgical team in treatment and satisfaction with its outcome, reduces the risk of dissatisfaction from false expectations (duration of the perioperative period, pain, changes in nutrition and mobility, sutures, etc.). The introduction of evidence-based medicine into the practice of operative gynaecology restructures classical approaches and principles of patient treatment, raises awareness of doctors and heads of surgical departments, and also contributes to the improvement of the outcome of operations.

**Key words:** hysterectomy, ERAS, complications, anaesthesia, rehabilitation

In recent years, surgical practice has undergone significant changes in the tactics of managing patients in the perioperative period. These changes are associated with the introduction of the concept of Fast Track Surgery, or the Enhanced Recovery After Surgery (ERAS) programme, which is designed to eliminate the pathogenic manifestations of the body's stress response to surgical invasion at all stages of surgical intervention.<sup>1-4</sup>

Surgery is the recommended treatment for many clinical conditions in gynaecology (uterine leiomyoma, cyst formations, emergencies, etc.), but it still has problems such as postoperative complications and slow recovery, which requires the implementation of an accelerated functional recovery programme.<sup>5-8</sup> The Enhanced Recovery After Surgery (ERAS), or Fast Track Surgery, aims to minimise the physiological stress of surgery and optimise patient rehabilitation,<sup>9</sup> as the perioperative period generally triggers a complex cascade of pathophysiological changes in the patient's body caused by psycho-emotional, endocrine, metabolic and inflammatory reactions.<sup>4,10,11</sup>

The published literature reports on ERAS programmes in colorectal surgery, general surgery and gynaecologic oncology surgery, which makes it difficult to evaluate the success of such programmes on the outcomes of gynaecologic surgery, although the sources reviewed indicate positive aspects in terms of shorter hospital stays, lower overall healthcare costs and increased patient satisfaction.<sup>9</sup>

The author of the Fast Track Surgery concept is an anaesthesiologist from the University of Copenhagen in Denmark, H. Kehlet, who, pursuing the goal of improving treatment outcomes, proposed a multi-component set of measures for optimal analgesia, early activation of patients and early enteral nutrition, aimed at reducing the body's stress response to surgical trauma.<sup>4,10,11</sup>

The concept was further refined and expanded based on the principles of evidence-based medicine

and includes 18 components of the FTS programme: informing the patient about the operation, its course and possible risks and consequences, refusal to use mechanical colon cleansing, refusal to premedicate with benzodiazepines and opioids, prescribing probiotics before surgery, refusal of preoperative fasting and prescribing food carbohydrate mixtures 3-4 hours before surgery. During the operation, it is planned to use regional anaesthesia and short-acting analgesics, control and restriction of infusion of colloid and crystalloid solutions during the perioperative period, minimal invasive surgical access, prevention of hypothermia, and administration of high oxygen concentrations after surgery. At the postoperative stage, the use of opioid analgesics should be minimised, routine use of drains and nasogastric tubes should be discontinued, early removal of catheters and drains, administration of prokinetics and early postoperative enteral nutrition, early patient activation, and refusal of haemotransfusions should be avoided.<sup>4,11,12</sup>

Data on surgical interventions in obstetrics and gynaecology are limited and contradictory.<sup>13,14</sup> The few systematic reviews, published in the literature on Enhanced Recovery After Surgery (ERAS) after gynaecological procedures, performed as open surgery or minimally invasive gynaecological surgery (MIGS), have presented an assessment of the advantages of this approach.<sup>6,15-19</sup> We reviewed the published literature on ERAS programmes in gynaecology to assess outcomes and potential key elements for a successful programme, including preoperative patient counselling, no bowel preparation, a multimodal approach to pain management, rational fluid management, minimally invasive interventions, and early mobilisation and feeding. It is important to emphasise the interdisciplinary principle of teamwork and the active participation of the patient in the recovery process.<sup>20,21</sup>

This article is the result of an attempt to critically

evaluate the literature on the problem of finding ways to accelerate recovery after surgery, which would contribute to a clearer understanding of this need for practical operative gynaecology. The analytical study was conducted on systematic reviews and meta-analyses, articles and scientific reports published before June 2023, found and available through PubMed, EMBASE, the Cochrane Central Register of Controlled Trials. The presented publications demonstrate that this FTS concept is a fundamentally new approach to the surgical treatment of gynaecological patients and covers all stages of perioperative therapy: preoperative, intraoperative and postoperative.<sup>22</sup>

For example, Lashkul OS and a number of other researchers studied the impact of planned gynaecologic operations on the integral characteristics of physical, psychological, emotional, social and sexual functioning of women using FTS and without FTS in groups of patients with abdominal hysterectomy, vaginal hysterectomy and laparoscopic operations on the uterine appendages.

The author found that patients who underwent surgery using the multimodal FTS strategy, had the most significant increase in the physical component of health in the vaginal hysterectomy group, three months after the operation. After abdominal hysterectomy and after operations on the uterine appendages without FTS and with FTS, a significant improvement in the female sexual function index by 27.2% and 12.8% was observed.<sup>14,23</sup>

According to Trowbridge ER *et al.*, an analytically processed meta-analysis, which included nine studies, demonstrated an improvement in perioperative pain scores and a reduction in hospital costs without an increase in the proportion of complications when using the ERAS protocol compared to traditional patient management. According to the authors, this approach in patients undergoing pelvic reconstructive surgery, is associated with shorter hospital

stays, increased patient satisfaction, and reduced intravenous fluid and opioid use without increasing complications, readmissions, or hospital costs.<sup>24,25</sup>

Another publication by Peters A *et al.* presented the results of a scientific search for the course of the postoperative period in 410 women with improved recovery after surgery.<sup>26</sup> Special attention was paid to improved recovery after surgery, a 19-minute shorter stay in the post-anaesthetic department, reduction of postoperative nausea/vomiting. There were also a 57% reduction in the use of antiemetics, a 64% reduction ( $p < 0.001$ ) in the total use of narcotic drugs, and significantly lower pain scores two and three hours after anaesthesia ( $p < 0.001$ ). Several other reports also indicate a faster recovery after surgery, which led to an increase in the rate of same-day discharge and improved perioperative outcomes in women undergoing laparoscopic minimally invasive non-hysterectomy gynaecological procedures.<sup>26,27</sup>

Analytical processing of the results of 11 studies with the participation of 1207 patients, conducted by Lv Z *et al.*, made it possible to indicate the absence of significant differences between the groups regarding the duration of the operation, estimated blood loss, postoperative pain, frequency of blood transfusion and re-hospitalization.<sup>18</sup>

A number of studies have aimed to determine whether Enhanced Recovery After Surgery (ERAS) and Fast Track Surgery (FTS) protocols are associated with a reduction in healthcare-associated infections.<sup>1,22,28-30</sup>

Another study by Ferrari F *et al.* aimed to test the ERAS protocol in gynaecological surgery for both benign and malignant diseases (endometrial cancer and advanced ovarian cancer), and to measure compliance with the items of the enhanced recovery protocol in a randomised trial. The authors presented the results of an association between the ERAS/FTS programme and a significant reduction in length of hospital stay (standardised mean difference = -0.83;

95% CI = -0.92 to -0.75;  $p < 0.0001$ ).<sup>31</sup>

The period before hospitalisation and the preoperative stage is often called the period of lost opportunities, and this is not without reason. The anaesthesiologist's preoperative examination should include an assessment of surgical risks, primarily the risk of death, the predictors of which are body mass index  $\geq 50 \text{ kg/m}^2$ , gender, hypertension, risk of pulmonary embolism, and age  $\geq 45$ .<sup>13,27,36,39</sup> In addition, special attention should be paid to the assessment of the respiratory tract and cardiovascular status of women.<sup>14,32-34</sup>

An important step in the implementation of the FTS concept is preoperative preparation, which includes the following items: risk stratification, smoking cessation, prevention of bacterial complications, fasting before surgery, colon preparation, refusal of premedication, and antimicrobial prophylaxis one hour before surgery is equally important.<sup>8,34</sup> This emphasis on prehospital preparation of the patient is the basis for a set of measures aimed at improving the patient's physical and mental health, which forms the pre-rehabilitation programme, reducing the workload of surgical inpatients, the likelihood of infection with hospital flora and the frequency of nosocomial infection.<sup>8,34</sup>

Adequate psychological preparation and patient awareness of pain relief can reduce the need for opioids and sedatives during the intraoperative and postoperative stages.<sup>35,36</sup> At the same time, it is advisable to assess the nutritional status of the woman, the presence of protein and energy deficiency, as well as the state of the erythrocyte sprout. Correction of anaemia at the preoperative stage and perioperative intravenous administration of iron supplements can reduce the probability of haemotransfusion, reduce treatment costs and length of hospital stay.<sup>34,37</sup>

One of the innovations of the recently published update is the proposal to integrate pre-rehabilitation (PREHAB) into the ERAS concept. Interesting

findings included the composition of the prehab programme (exercise, nutrition and psychological interventions), duration and outcome measures used to determine the impact of prehab as opposed to standard care.<sup>1,7,14,32,38</sup>

The first guideline of the Enhanced Recovery After Surgery (ERAS<sup>®</sup>) Society for primary and secondary hospitals in low-middle-income countries (LMICs) for elective abdominal and gynaecological care was the Guidelines for Perioperative Care in Elective Abdominal and Pelvic Surgery at Primary and Secondary Hospitals in Low-Middle-Income Countries (LMIC's): Enhanced Recovery After Surgery (ERAS) Society Recommendation.<sup>39</sup>

An interesting finding was the literature report on certain specific perioperative complications, among which the rare one is compartment syndrome (CS) of the lower leg. Bauer EC et al. presented data on the development of tibial CS, which is a rare but severe complication of operations in the lithotomy position after urological, gynaecological and general surgery.<sup>40</sup> The pathophysiology of this complication is still not fully understood, but it is believed that ischaemia due to increased compartment pressure and decreased perfusion pressure may be the underlying cause, i.e., the type of leg support and intraoperative hypotension have been discussed as risk factors. Since this body position is commonly used during various gynaecological invasive procedures, CS should be considered as a specific complication of gynaecological surgery in the lithotomy position. During the literature search, the authors found 16 reports on 19 cases of CS after gynecological surgery in the lithotomy position, the publication of which, without a doubt, will increase the awareness of the medical staff and provide thorough recommendations for perioperative management based on the available information.<sup>40</sup>

The intraoperative period, one of the crucial points of the FTS concept, is a combination of surgical

and anaesthetic skills, including the prevention of infectious and thrombotic complications, the use of minimally invasive techniques, as the introduction of endosurgery in recent decades allows to reduce the inflammatory component of the stress response, endocrine and catabolic metabolic reactions, reduce the effect of pain factor, improve the cosmetic effect and psychological comfort of the patient, provides for aspects that reduce trauma and duration of the operation and prevent specific complications.<sup>3,11,41,42</sup>

Spinal and general anaesthesia are commonly used techniques for vaginal surgery for pelvic floor disease, with insufficient evidence of superiority between the two. A randomised controlled trial evaluating the effect of anaesthetic regimen during vaginal surgery on operative outcomes, patient-reported outcomes, and length of hospital stay found no statistically significant differences between groups in terms of pain, nausea, quality of life, functional outcomes, length of stay in the postoperative intensive care unit, as well as the use of analgesia after surgery.<sup>27,43-45</sup>

According to Hryshchenko MH and Lakhno IV, the issue of choosing drugs for multimodal analgesia remains quite relevant today, as the quality of recovery after surgery depends on the level of pain.<sup>3</sup> Literature data suggest that the combined use of paracetamol, dexametopfen, nalbuphine, and ropivacaine or bupivacaine allows to implement the concept of multimodal analgesia and optimise the recovery process after surgery. STEP-UP analgesia, according to the multimodal approach, involves the use of drugs from different groups to synergistically reduce the intensity of pain; it also affects all parts of the process of pain impulse generation and propagation, which allows to reduce the dose of each drug and the risk of side effects.<sup>10,46-49</sup>

Yevsieieva V et al. introduced a new technique of regional anaesthesia to reduce perioperative pain during multiple abdominal operations with ultrasound-guided transverse abdominal block (USG-

TAP-block), primarily in obese patients undergoing laparoscopic surgery in the lower abdomen and pelvis.<sup>17</sup> The data on magnesium therapy in the analgesia programme remain controversial.<sup>50</sup>

The complex of anaesthetic support provides protection against surgical stress and intraoperative monitoring and includes, along with the prevention of hypothermia, limiting the volume of infusion, the use of multimodal anaesthesia with protective ventilation, which is an effective measure for early awakening, extubation of the patient and prevention of respiratory complications.<sup>51</sup> It has been proven that hypothermia occurs in half of patients during surgery and leads to an increase in wound infections and cardiovascular complications after surgery. Therefore, keeping the patient warm and administering warm infusion solutions should be undeniable. Smith CE et al. in their report evaluated the following – women who received intravenous fluids at body temperature had significantly higher internal temperatures during and after outpatient gynaecologic surgery compared to room-temperature fluids, but there were no differences in the time to discharge from the post-anaesthesia care unit or the incidence of shivering between the groups. This allowed the authors to conclude that fluid warming in combination with standard heat preservation measures was effective in maintaining normothermia during outpatient gynaecologic surgery.<sup>51</sup>

The creation of optimised perioperative pathways, known as Enhanced Recovery After Surgery, simultaneously improves patient outcomes and reduces costs. Every surgical team should consider the principles of pre-anaesthesia optimization: patient education, appropriate treatment of existing comorbidities, optimization of preoperative nutrition and drug use, opioid need and postoperative complications, as well as antibiotic therapy and thromboembolism prophylaxis for 100%, adoption of a preoperative diet that maintains euvolemia and

energy reserves to optimise healing, and avoidance of bowel preparation for patients undergoing benign gynaecologic surgery and minimally invasive gynaecologic surgery.<sup>32</sup>

The basis of the final postoperative stage consists of oxygen therapy, prevention of hypothermia, restriction of infusion volume, prevention of nausea and vomiting, early enteral nutrition, rapid refusal to prescribe opioids, removal of catheters and drains as soon as possible, and early patient activation. Continuous pulse oximetry monitoring allows timely correction of postoperative hypoxia, which is the main predictor of postoperative respiratory, cardiac, gastrointestinal disorders, and well-defined restrictive infusion approaches help to avoid overloading the small circulation.<sup>9,30,42,52-54</sup>

One of the first Enhanced Recovery After Surgery (ERAS) guidelines, dedicated to standardising and optimising perioperative care for women undergoing minimally invasive gynaecological surgery, was carefully formulated by a working group of the American Association of Gynaecologic Laparoscopists, consisting of gynaecologic surgeons from the USA and Canada.<sup>38</sup> It is based on the ERAS Society's 2016 guidelines for perioperative care in gynaecologic/oncologic surgery, serving as a more comprehensive reference for minimally invasive endoscopic and vaginal surgery for both benign and malignant gynaecological diseases. For example, the section on preoperative optimisation includes more specific recommendations derived from the ambulatory surgery and anaesthesia literature for the management of anaemia, hyperglycaemia, and obstructive sleep apnoea, and the recommendations on multimodal analgesia take into account the FDA warnings about respiratory depression from gabapentinoids, as well as controversial issues in minimally invasive surgery, such as thromboprophylaxis.<sup>38</sup>

Venous thromboembolism is the third most common vascular disease and a rather dangerous post-

operative complication, with inpatients, long-term care patients, people with minor injuries and long-distance travellers being at increased risk.<sup>55</sup>

Anderson DR et al. presented conditional thromboprophylaxis recommendations for patients undergoing major surgery: mechanical prophylaxis instead of no prophylaxis, graduated compression stockings to prevent pneumatic compression through and against inferior vena cava filters.<sup>55</sup> A number of sources provide conditional recommendations not to use routine venous thrombosis prophylaxis in long-term patients or outpatients with minor risk factors, and to use graduated compression stockings or low-molecular-weight heparin for long-distance travellers only if they are at high risk of venous thrombosis.<sup>55-57</sup> Travieso J et al. recommend the addition of pharmacological prophylaxis to mechanical prophylaxis in benign hysterectomy, which is associated with a longer operation duration, regardless of the surgical approach, and consider it appropriate to encourage individual rather than routine use of pharmacological prophylaxis in patients undergoing benign hysterectomy and receiving mechanical prophylaxis.<sup>57</sup>

The role of the anaesthetist in perioperative haemostatic control is attracting increasing attention.<sup>58</sup> However, at the moment there are only few publications devoted to the perioperative features of the fibrinolytic system.<sup>59</sup>

Tranexamic acid is a synthetic antifibrinolytic agent used in various surgical disciplines to reduce blood loss, blood transfusion, ecchymosis and haematoma formation. Currently, there is no universal standard for the most effective dose and route of administration of TXA, which limits its routine use in many centres. The Heyns M study evaluated the available evidence on the efficacy and safety of a single preoperative dose of TXA for surgical blood loss. The authors analysed 1906 articles; most of the included studies were related to orthopaedics

(27), obstetrics and gynaecology (16), maxillofacial surgery and otolaryngology (10), cardiology (3), and 1 plastic surgery study focused on acute burn reconstruction. For all surgical specialties, a reduction in preoperative estimated blood loss in patients receiving TXA, a 72% reduction in the likelihood of haemotransfusions, and no difference in the incidence of venous thromboembolic events were obtained, which expands the positive potential implications for the use of preoperative TXA for routine daytime surgical procedures.<sup>60</sup>

A systematic review and meta-analysis were conducted to identify non-hormonal interventions, perioperative surgical interventions, and devices to minimise blood loss during hysterectomy for leiomyoma. Surgical blood loss, postoperative haemoglobin (Hb) drop, haematoma, transfusion, and major and minor complications were analysed and summarised in a meta-analysis of 2016 unique studies. The authors presented that perioperative use of misoprostol in abdominal hysterectomy was associated with a lower postoperative haemoglobin drop ( $p < 0.01$ ) and blood loss ( $p < 0.01$ ) compared with placebo. Protection of the uterine vessels at the site of their origin during laparoscopic hysterectomy was associated with a reduction in intraoperative blood loss. Ligation of the uterine artery before ovarian/utero-ovarian dissection was associated with less surgical blood loss compared with standard ligation ( $p < 0.01$ ).<sup>61,62</sup>

Another report by Abu-Zaid A and Gingold JA presented the results of a meta-analysis of randomised controlled trials examining the efficacy and safety of preoperative misoprostol compared to placebo during abdominal hysterectomy. The authors noted a reduction in mean intraoperative blood loss, mean difference in haemoglobin drop, and mean length of hospital stay in favour of the misoprostol group compared to the placebo group. However, there were no significant differences between the two groups in

terms of mean operative time, rate of perioperative blood transfusion, and rate of drug-related adverse events (i.e., nausea, vomiting, diarrhoea, headache, chills, and fever).<sup>58,61</sup>

Low-quality evidence exists in the literature to support uterotonics, especially oxytocin, and peripheral vasoconstrictors as effective options for reducing blood loss and transfusion requirements during minimally invasive myomectomy. Oxytocin is the most effective intervention for minimally invasive myomectomy. For open myomectomy, a combination of uterotonics and peripheral vasoconstrictors is required to effectively reduce blood loss.<sup>63</sup>

Minimising intraoperative blood loss during hysterectomy is crucial to reduce perioperative morbidity. The aim of the Hafidh B study was to conduct a systematic review and meta-analysis of seven randomised controlled trials comparing vasopressin and saline for controlling intraoperative blood loss during vaginal and abdominal hysterectomy. A lower mean estimated intraoperative blood loss was demonstrated in favour of the vasopressin group compared to the control group. However, there was no significant difference between the two groups in terms of mean operative time, mean postoperative haemoglobin change, mean length of hospital stay, incidence of fever, pelvic infections, perioperative blood transfusion, and perioperative complications.<sup>63</sup>

According to Ferrari F. et al., the use of an enhanced recovery protocol after gynaecologic surgery leads to a shorter length of stay, regardless of the surgical access and type of gynaecological disease.<sup>31,64</sup> The issue of probes and drains during surgery remains controversial, and the consensus suggests abandoning a routine approach to these procedures.

Thus, in the postoperative period, the main measures are rehabilitation and the patient's return to normal life, where adequate analgesia and early activation are crucial. Dynamic monitoring and follow-up of the patient on an outpatient basis allows for timely

diagnosis of infectious complications, nutritional deficiencies and possible psychological problems.

**Conclusions.** The ERAS programme is a multi-modal and multidisciplinary programme aimed at optimising perioperative treatment and improving postoperative outcomes in operative gynaecology by minimising the patient's stress response, promoting functional recovery and achieving rapid recovery, where the patient is in the field of view of a number of specialists. A reliable foundation should be laid at the initial stage of the surgeon's and anaesthetist's acquaintance with the patient, where communication and rational presentation of information using illustrative and video material helps the patient understand the disease, consciously choose the proposed method of treatment, reduces anxiety, increases the role of the surgical team in treatment and satisfaction with its outcome, reduces the risk of dissatisfaction from false expectations (duration of the perioperative period, pain, changes in nutrition and mobility, sutures, etc.). The introduction of evidence-based medicine into the practice of operative gynaecology restructures classical approaches and principles of patient treatment, raises awareness of doctors and heads of surgical departments, and also contributes to the improvement of the outcome of operations.

#### Participation consent

Written information consent was obtained from the patients.

#### Data availability

Further data are available from the corresponding author on reasonable request.

#### Conflict of interest

The authors declare no conflict of interest.

#### Article publication

The authors declare that the materials presented

in the article are original and have not been previously published or submitted for publishing.

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