Prylińska Monika, Husejko Jakub, Skierkowska Natalia, Bieniek Daria, Rupniak Iga, Wycech Alicja, Gaborek Patryk, Osiak Joanna, Rozmarynowicz Ewa, Gajos Małgorzata, Topka Weronika, Kudanowska Agnieszka, Kędziora - Kornatowska Kornelia. ERAS protocol in the treatment of older people. Journal of Education, Health and Sport. 2019;9(3):279-289. eISNN 2391-8306. DOI
http://dx.doi.org/10.5281/zenodo.2596527
http://ojs.ukw.edu.pl/index.php/johs/article/view/6701
https://pbn.nauka.gov.pl/sedno-webapp/works/907885

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 15.02.2019. Revised: 15.02.2019. Accepted: 17.03.2019.

ERAS protocol in the treatment of older people

Monika Prylińska[2], Jakub Husejko[1], Natalia Skierkowska[1], Daria Bieniek[1], Iga Rupniak[1], Alicja Wycech[1], Patryk Gaborek[1], Joanna Osiak[1], Ewa Rozmarynowicz[1], Małgorzata Gajos[1], Weronika Topka[1], Agnieszka Kudanowska[1], Kornelia Kędziora - Kornatowska[1]

1. Faculty of Health Sciences, Department and Clinic of Geriatrics, Nicolaus Copernicus University, Bydgoszcz

2. Nicolaus Copernicus University in Toruń, Collegium Medicum in Bydgoszcz, Department of Hygiene, Epidemiology and Ergonomics, ul. M. Curie-Skłodowskiej 9, Bydgoszcz, Poland

Abstract

Background: The guidelines for elderly recommend nutritional assessment in order to prevent malnutrition and make fast recovery after operation and mobilization possible. The ERAS protocol shortens the length of hospital stay and reduces the complication rate.

Material and methods: A systematic review of published literature has been done for the factors reported to predict outcomes of enhanced recovery after surgery (ERAS) among the elderly patients.

Results: The improvement of treatment effects must be supported by a multidisciplinary medical team involved in the whole process with holistic approach which reduces time of regeneration and cost of health care

Conclusions: ERAS protocol implementation is highly beneficial for operated patients due to faster recovery and strong psychological support by providing information concerning the perioperative period and reducing stress caused by the surgery. However, must be supported by a team of professional medical staff.

Key words: enhanced recovery after surgery, perioperative care, older people

Introduction

The system of traditional perioperative protocols has been functioning for many years, but now ERAS (enhanced recovery after surgery) is becoming more and more popular. Differences between the ERAS protocol and conventional perioperative care methods are visible in every part of care and preparation, the course of surgery and return to full efficiency after its implementation.

The patients to be treated are consulted long before its implementation. Emphasis is placed on his mental condition (reduction of stress and mental preparation before surgery affect the acceleration of recovery) and physical (a patient should implement intense physical exercises before surgery). The patient's well-being is also influenced by the introduction of shorter starvation time and the opportunity to receive special high-carbohydrate beverages a few hours before the procedure, which minimizes the feeling of thirst and reduces insulin resistance [1]. As evidenced by the research, it is extremely important to abandon procedures of open surgery for laparoscopic surgery, which significantly reduce the patient's stay in the hospital. However, regardless of the method used (traditional vs laparoscopy), the protocol always gave positive results. Postoperatively, oral feeding is introduced faster than in the traditional case (traditionally about 3 days after surgery). It is also faster to start the patient. Research indicates faster recovery of the patient after the procedure. As a result, the risk of hospital-acquired infections is reduced, and in the case of oncological patients chemo-therapy can be introduced more quickly.It all affects the degree of post-operative survival. The use of ERAS is also important due to the financial point of view. According to the research, the introduction of this protocol allows to reduce medical costs by about 10% [2,3].

The effectiveness of the ERAS protocol depends directly on the percentage of its implementation-the higher the percentage, the more visible the effects of its introduction.It has been proved that increasing compliance with protocols from below 50% to above 70% significantly reduces reemissions and 30-day morbidity. In connection with the above-mentioned, we observe a significant shortening of the patient's stay in the hospital [4].

The evolution of perioperative procedures

The standards of perioperative management are constantly evolving. The priority goal for the modification of methods is to give patients the best possible care. The willingness to increase economic efficiency is also important. Research shows that nowadays it is moving away from conventional methods for multimodal treatment based on the latest scientific research, for which the name "fast track surgery" is widely accepted [5].

For example, at present, the treatment of abdominal aortic aneurysm is carried out by two different methods: by the traditional surgery technique removing the aneurysm and the endovascular method. The procedure performed with the classical method is associated with many difficulties and is burdened with a high risk of intraoperative and postoperative complications. Removal of the aneurysm in this way causes a large burden for the patient due to the extent of the treatment, which additionally results in a lot of pain after surgery. General anesthesia is used during the operation, so the patient's intubation is necessary, and after the procedure the patient, depending on the health condition, spends up to three days in the intensive care unit. The Foley catheter is usually kept for four days. The liquid diet is given to the patient on the second day after the procedure. During a classic operation, the patient is hospitalized up to two weeks, but on the day of discharge still requires further rehabilitation [6].

Surgical treatment of gastric cancer consists of total or partial resection of the stomach. Similarly, surgical treatment of colorectal cancer corresponds to resection of the affected part of the large intestine. The traditional routine pre-operative procedure in both cases

is related to the standard informing the patient about the operation and the risks it brings, an appropriate diet regime excluding any meal for twelve hours before the procedure and the use of mechanical bowel preparation. A nasogastric tube and a urinary catheter are routinely installed. The course of the procedure depends on the decision of the attending surgeon and the type of anesthesia from the choice of anesthetist. There is no special emphasis to do as narrow incision as possible. There are no special guidelines for the prevention of the hypothermia when the patient is in the operating room. Activation of the patient after the surgery depends on the surgeon's recommendations, and the medical staff does not impose early mobilization on the patient. Opioid drugs are most commonly used for the reduction of post-operative pain [7, 8]. When the return of intestinal motility is confirmed, patient returns to enteral nutrition. Drains and catheters are normally left for a few days, often removed on the day before discharge from the hospital [9].

Traditional perioperative care methods have been used for decades despite the fact that not all of them are supported by scientific evidence. For several years, research has shown that some conventional treatment modalities are of little importance in perioperative procedures, and often even unnecessarily prolong patient hospitalization and worsen its condition. Such routine procedures include inter alia: insertion of the nasogastric tube, mechanical preparation of the intestines, long-term fasting and late implementation of physical activity after the procedure [5].

Assumptions of the ERAS protocol.

ERAS is the most famous abbreviation in surgeons dictionary and it comes from “Enhanced Recovery After Surgery”. Assumptions of this protocol is state unify perioperative standards and standardize the most beneficial procedure for the patient according to evidence-based care [10].

Main purpose is to minimized bodily stress reactions and inflammatory responses caused by injury by multidisciplinary treatments. Compliance with ERAS rules reduce complications and recovery time by 30–50% [11], shorten the duration of hospitalization and abridge the cost of health care.

There are many guidelines for perioperative care in specific departments (guidelines for elective colonic surgery, gynecologic/oncology surgery, gastrointestinal surgery, rectal/pelvic surgery, liver surgery, head and neck surgery, breast reconstruction: gastrectomy, cystectomy, pancreaticoduodenectomy [12]), but the assumptions are similar and a unified version is presented below.

Perioperative period time is devided into pre-, intra-, and postoperative care.

Preoperative careinclude:

Preadmission information and counseling about limiting smoking and alcohol abuse (minimum 4 weeks before surgery), improvement of nutritional status, recommendation of regular physical exercise, the need for specialist consultations and full information of a treatment plan. Clear explanation of expectations during hospitalization help patient to keep care pathway and that allows early recovery [13].

Preoperative starvation is not necessary. Even that some studies recommend intake of clear fluids until 2 hours before anesthesia and 6-hour fast for solid food [14]. The others studies shows the benefit of oral administration of a high-carbohydrate drink 2-3 hours before surgery [15].

Another preoperative care step is a preanesthetic medication. Earlier, 12h before the induction of anesthesia patient was emotionaly and physicalypreparated for the surgery by some drugs like pentobarbital, barbiturates, benzodiazepines. It helped reducing anxiety, tension and ensured good sleep before surgery [16]. Although, latest studies shows impaired

recovery (after long-acting benzodiazepines) which might delay discharge from hospital [17]. To reduce anxiety, it is enough to give patient full information about the planned treatment, avoid starvation and, if necessary, short-acting anxiolytics.

Resignation of mechanical bowel preparation (MBP) was used to dispose of solid fecal from large bowel and to lower the bacterial load, however study shows that made liquefied faeces may cause anastamostic leakage, wound infections, increased incidence of intra-abdominal abscesses and extradigestive complications. Additionally MBP cause more metabolic and electrolyte imbalance, dehydration, abdominal pain/bloating and fatigue after surgery [18].

Venous thromboembolism prevention (VTE) was a common postoperative complication, but effective prophylactic strategies have reduced its prevalence. Patients at risk of VTE should receive appropriate dose and timing of prophylaxis with either LMWH or heparin, preoperatively and continued post-operatively, combined with early mobilization, what help to prevent of VTE [19].

Antimicrobial prophylaxis and skin preparation is highly recommended (including skin antiseptic with chlorhexidine–alcohol, antibiotic prophylaxis 60 min before skin incision and hair clipping) [20].

Intraoperative care:

At the circumspection of the anesthesiologist according to ERAS protocol is to observance the standard of anesthetic protocol, prevent postoperative nausea and vomiting, avoid routine nasogastric intubation, prevent intraoperative hypothermia, take care of perioperative fluid balance.

Surgeons should always consider minimally invasive surgery. For example in colonic resection laparoscopy accelerates recovery, decrease postoperative complications, pain and hospital stay. Also surgeons should know when it is necessary to set up drains. There is recommendation for avoiding routine drainage of the peritoneal cavity because that probably impairs mobilization, but on the other hand, transurethral bladder drainage for 1–2 days is recommended.

Postoperative care consist of:

Postoperative thromboembolism prophylaxiswith both non-pharmacological (pneumatic compression stockings) and pharmacological methods (heparine). Combine methods bring better results. Postoperative intravenous fluid therapy (where crystalloid solutions are preferred to 0.9% normal saline) should be terminated within 24 h, because patients can drink immediately after surgery and furthermore there are recommended flavored high energy protein drinks and early feeding within the first 24 h after surgery**.** Effects these action include faster return of bowel activity, which is associated with shorter length of stay in hospital.

Prevention of postoperative ileus (POI) is required, because POI is the most frequent reason for prolonged hospital stay (even as much as 5 days) and increased hospitalization costs. Although prokinetic agents have no proven effect on POIs, there are other methods whose effectiveness is documented, such as: mid-thoracic epidural analgesia instead of intravenous opioid analgesia, prevention of fluid overloading during and after surgery, avoidance of nasogastric decompression, less invasive operation methods (laparoscopic colonic resection leads faster return of bowel function than open surgery), some drugs (oral magnesium oxide, bisacodyl, alvimopan) or even perioperative use of chewing gum has a positive effect on postoperative duration of ileus [21].

ERAS also include postoperative analgesia and postoperative analgesia with early mobilization within 24 h of surgery, that help to reduce venous thromboembolic, decreased insulin resistance, caused less muscle atrophy and reduced length of hospital stay.

Perioperative care for a geriatric patient - the possibility of using the ERAS protocol

Adults age 65 and older are the fastest growing segment of the United States population, and their number is expected to double to 89 million between 2010 and 2050 [22]. Based on these evolving demographics, it is expected that there will be a concurrent rise in the demand for a variety of surgical services, including vascular surgery (with a projected growth of 31%) and general surgery (with a projected growth of 18%) [23].

Surgical risk increases with age, primarily from loss of cardiac and pulmonary reserve. Complications are tolerated poorly by the elderly, emphasizing the importance of their prediction and prevention. Surgical risk in this population is significant, but with careful preoperative assessment and perioperative management acceptable morbidity and mortality are possible.

ERAS protocol (Enhanced Recovery After Surgery) presents evidence based, multimodal, perioperative care pathway, which is also adapted to elderly people [24]. Fast-track or enhanced-recovery programs integrate a range of perioperative interventions proven to maintain physiological function and facilitate postoperative recovery [25]. This new recommended protocol in perioperative care include: preadmission information and counseling, preoperative preparation (such as fluid and electrolyte application, which is particularly important in elderly patients), preanesthetic medication using short-acting anxiolytics instead long-acting anxiolytics, prophylaxis against thromboembolism, antimicrobial prophylaxis with antibiotics, laparoscopy-assisted surgery when it is possible, preventing intraoperative hypothermia, perioperative fluid management, postoperative analgesia and nutrition care and early mobilization after surgical operation. These elements are independent, but are directed toward the same goal: reducing surgical stress and optimizing recovery [26]. ERAS primarily allows to significantly reduce the time of hospitalization and improves the post-operative condition of patients, that is why elderly people can have special benefits from this protocol. ERAS has been the most tested and proven for colorectal and gastric surgery.

Nutrition of the elderly according to the ERAS protocol

Nutritional treatment is the basic element of nutrition in the elderly in treatment wards. It consists in introducing the patient into anabolism, thus reducing the number of perioperative complications. The ERAS protocol is aimed at medical treatment, which aims to quickly diagnose malnutrition and immediately include nutrition in patients with catabolism. Every patient admitted to the hospital, as part of financing from the National Health Fund (NFZ), must be assessed for the risk of malnutrition. POLSPEN (Polish Society for Parenteral, Enteral and Metabolism Nutrition) recommends using the NRS 2002 or SGA scale [27]. The results of the screening assessment are passed to the Nutrition Team working in the hospital. A patient who has an increased energy requirement and can be fed orally should have a card to control the amount and quality of food intake. It is necessary to control the caloric values of served meals, their protein content, as well as vitamins and microelements. All deficiencies should be supplemented with oral industrial diets.

According to the ERAS protocol, which belongs to the canons of current medical knowledge, patient starvation in the perioperative period is not good. As recommended by ESPEN (European Society of Clinical Nutrition and Metabolism), the patient should be allowed to eat solid food up to 6 hours before the planned treatment and be allowed to drink up to 2 hours before the procedure. In addition, the patient should receive an oral

carbohydrate solution 2 hours before the planned surgery [28, 29]. As the review of the literature indicates, a longer stay in a hospital correlates with an increased risk of nosocomial infections, malnutrition and impairment of daily activity. The principles of the ERAS protocol are based on the proper functioning of the body in the perioperative period. Assuming that we have a healthy person to whom we will give laxatives and carry out decontamination, thereby disturbing the composition of the intestinal flora, then immobilize it and leave it on an empty stomach for 5-6 days, which corresponds to the duration of pre-operation preparation and starvation, giving only intravenous infusions (liquids and electrolytes). Such a volunteer will develop huge catabolism. It should be remembered that even greater metabolic disorders will develop a person who is undergoing a disease process and who will be subjected to an operational injury [30].

Nutrition, like any other form of treatment given in the wrong dose, in the wrong infusion, in the wrong position or the wrong way may be ineffective in the fight against the disease, and even harmful. Nutrition should be immediately included in patients who can not be fed via the oral route for at least 5 days or fail to cover their metabolic demand for at least 60%. Nutrition included at least 10 days before the planned surgery improves the patient's efficiency, which has been proven in studies [28, 31, 32].

The adult's need for energy is about 20-25 kcal/kg. The gold standard is to determine the patient's demand for energy and macronutrients using indirect calorimetry. However, in surgical wards, simplified formulas that allow estimating metabolic demand are much more often used. In adults, the need for protein is about 1,5 h/kg, however, in obese patients or in severe catabolism these values may increase. It is estimated that, based on the total energy supply, the protein, fat and carbohydrate ratio should be 20: 30: 50%, respectively. One should not forget about adequate supply of water and electrolytes, as well as micronutrients and trace elements [33, 34].

Disadvantages of using the ERAS

The proinflammatory cytokines like TNF-alfa or IL-1, IL-6 are produced to activate neutrophils and macrophages in response to a surgery-caused trauma. Those cytokines affect the hepatocites to modify the levels of acute phase proteins like CRP, albumin, ferritin, transferrin, fibrynogen. According to reports, the CRP and the IL-6 are connected to SIR (systemic inflammatory response) in a potent way. Several surveys were conducted in which every ERAS component was examined for its impact on the SIR among patients undergoing colorectal surgery by using CRP and IL-6 levels. In a examination in group of 170 patients Wang et al reported that when the ERAS protocol was used, the levels of CRP and IL-6 were lower on 1 and 3 day after the surgery, but there was no significance what type of operation it was. Having examined a group of 79 patients, Veenhof et al reported that the changes in postoperative levels of CRP or IL-6 are not strictly connected to the use of ERAS protocol. There is few evidence to prove that each of the ERAS protocol components, except laparoscopic surgery, take part in reducing the stress response after colorateral surgery [35].

A study was carried out in which the indicators of nutritional serum and the immune level were compared within an ERAS protocol or under the Standard program among patients aged over 70 who were undergoing a planned colorectal laparoscopic surgery. As part of a bigger randomized trial, 83 patients who had to undergo a colorectal laparoscopic surgery were included into the study and divided into 2 groups: 40 of them into ERAS group and 43 into the Standard group. Before the operation and on the 1, 3 and 5 day after the surgery the surgical stress parameters were gathered. Preoperatively and on the 1 and 5 day after surgery the nutritional parameters were collected. The IL-6 level notably increased after the surgery in both groups, but on 1, 3 and 5 days after the surgery, the IL-6 levels were lower in the ERAS group. On the 3 day after the operation those levels returned to their rate from before the

surgery among patients from this group . The level of the C-reactive protein also significantly increased after the surgery in both groups. It was lower in the Enhanced group on the 1, 3, 5 day after the operation. On the 5 day after the surgery the prealbumin serum level in the ERAS group was much higher than among patients from the standard group.

The prealbumin level displays the inflammatory status and the hepaticsynthesis of the patients who undergo a operation. This seems to accelerate the end of the catabolic phase which was induced by the surgery. That affects the ERAS protocol in a positive way. Regarding White Blood Cell Count, Cortisol and Prolactin levels – there was no significant difference between the test results of the patients in both groups. The same for Albumin, Triglyceride and Transferrin levels [36].

Discussion

The significance of the ERAS protocol can be seen in a special degree in the field of oncological surgery, where appropriate perioperative care has a noticeable effect on the patient's life expectancy after surgery. Considering the fact that the average survival time of a cancer patient from the moment of diagnosis is relatively short [37], any procedure increasing the number of days experienced by the patient will be noticeable, which gives the opportunity to evaluate the effectiveness of the ERAS protocol. This fact was used in a study conducted at the Ernst Hospital in Stockholm (Sweden), which assessed the impact of the protocol on the 5-year survival of patients operated on for colorectal cancer. The project covered 911 people undergoing surgery in 2002-2007, and in the case of death within five years of the operation, it was assessed whether the cause of death was the cancer. According to the results of the study, the use of the ERAS protocol may reduce the risk of death in a 5-year period by up to 42% [38], which suggests a very high effectiveness of the discussed intervention and the chances of dominating the ERAS protocol in the clinical practice of perioperative care in the future.

An important problem that was required in the context of large clinical trials was the timing of the introduction of the ERAS protocol during perioperative care. This issue was addressed in a study conducted at the Jagiellonian University (Kraków), where the impact of the early application of the ERAS protocol on the survival of patients operated on for colorectal cancer was assessed. The project involved 92 patients operated by the laparoscopic method, who were then divided into three subgroups (30 people each) - differing in the time of introducing the discussed protocol in perioperative care. After the intervention, it was observed that the least complications were found in persons belonging to a subgroup with the longest duration of treatment in accordance with the ERAS protocol [1]. It follows that these procedures should be introduced as early as possible in perioperative care.

The group particularly exposed to complications related to surgery is the elderly, and therefore they require special attention when applying the ERAS protocol. Research on the issue formulated above was conducted at the Jagiellonian University within the aforementioned project. The group of 92 people was divided into two subgroups this time: consisting of respondents under 65 years of age and consisting of respondents over 65 years of age. The time of introduction of the ERAS protocol during perioperative care did not differ in both groups. The results of the study suggest the possibility of using the protocol in question regardless of age, and its positive effect on health after surgical procedures is also noticed in the elderly [39].

The introduction of perioperative care principles consistent with the ERAS protocol, despite numerous evidence of their effectiveness, turns out to be extremely difficult in everyday clinical practice. The reasons for this state of affairs should be sought in the need of close cooperation of medical personnel, which must be properly specialized in the application of the discussed protocol, which is often time-consuming and cost-intensive [40]. The

dominance of the ERAS protocol in perioperative care can therefore take place only in the relatively distant future, however the positive effects of its introduction encourage further dissemination activities.

Conclusions

For many years, an ideal scheme for perioperative care has been sought - the one that will be displayed in the faster return of patients to health. ERAS (enhanced recovery after surgery) protocol development is a great step in unifying patient management before, during and after surgery around the world. As many analyzes show, this protocol allows, among other things, to reduce stress caused by surgery or to reduce perioperative complications. It also contributes to lowering the cost of health care.

During these few years since the introduction of the ERAS protocol, numerous analyzes and studies on the functioning of this system have been carried out. At various places in the world, the effectiveness of the introduced changes and the actual impact on the patient's condition as well as other aspects which were supposed to affect this protocol were examined.

Thanks to this protocol, we are now leaving the old perioperative methods. Recent studies have shown that the traditional methods used often prolong hospitalization of patients and, consequently, worsen their condition. Examples of such activities include, inter alia, the long post or late implementation of physical activity after the procedure.

Regarding the ERAS protocol, it assumes a reduction of complications and shortens the time of regeneration and reduces the cost of health care. The perioperative period described in ERAS is divided into pre- and perioperative care. Pre-operative care assumes, among others fully inform the patient about how to proceed before the operation and the fact that previously used preoperative fasting is not necessary, and even as it turns out, it has a negative impact on the end point.

ERAS also draws attention to the use of short-acting anti-anxiety drugs and shows how important it is not to use them for too long, because it can adversely affect the patient's condition. According to ERAS, you should give up MBP (mechanical bowel preparation). However, attention is drawn to the importance of antithrombotic prophylaxis. ERAS in intraoperative care is mainly focused on the anesthesiologist and the promotion of laparoscopic surgical methods. The main post-operative assumptions pay attention to the faster implementation of food supply and mobilization for physical activity and many other effective activities.

The analysis of laboratory data of various parameters is also favorable for the ERAS protocol. As regards the examination of numerous parameters, it turns out that they also reflect the success of the introduction of the ERAS protocol. These results indicate faster mobilization of the body and recovery.

And what about the older people? The aging of the population is associated with the simultaneous increase in the performance of surgical procedures in the elderly. As we know, the risk of surgery is much higher in such patients. As it turns out, the ERAS protocol is also adapted to care for geriatric patients! He draws attention to the importance of, among others, giving patients fluids and electrolytes before surgery, prevention of thrombosis or selection of laparoscopic surgery when possible. Regarding geriatric patients, the authors of the ERAS protocol also made sure that their nutrition was taken into account. Specially selected guidelines put emphasis on the introduction of these patients into anabolism, especially in the case of malnourished patients. Each patient admitted to the hospital is assessed for malnutrition. ERAS shows how important nutrition is and how great it affects the patient's condition after surgery and its time of re-curable.

ERAS gained great approval from the medical community all over world. The implementation of its assumptions was reflected in the patients' condition and their faster convalescence. After so many years, it is known that faster mobilization of the patient causes that he returns much faster to his former life. And ERAS has also included many profiling methods, which translate into lower mortality after surgery. The reduction of health care costs is also important. This protocol is undoubtedly an apt medical achievement and a set of information that unifies and improves the perioperative care system around the world.

References

1. Pędziwiatr M., Kisialeuski M., Wierdak M., Stanek M., Natkaniec M, Matłok M, Major P., Małczak P., Budzyński A. Early implementation of Enhanced Recovery After Surgery (ERAS) protocol – Compliance improves outcomes: A prospective cohort study. *International Journal of Surgery*, 2015, 21: 75-81.
2. Cakir, H. , Stijn, M. F., Lopes Cardozo A. M., Langenhorst, B. L., Schreurs, W. H., Ploeg, T. J., Bemelman, W. A. and Houdijk, A. P. (2013), Adherence to Enhanced Recovery After Surgery and length of stay after colonic resection. Colorectal Dis, 15: 1019-1025.
3. Gustafsson UO, Hausel J, Thorell A, et al. Adherence to the Enhanced Recovery After Surgery Protocol and Outcomes After Colorectal Cancer Surgery. *Arch Surg.* 2011;146(5):571–577.
4. Miller TE, Thacker JK, White WD. , et al; Enhanced Recovery Study Group. Reduced length of hospital stay in colorectal surgery after implementation of an enhanced recovery protocol. *Anesth Analg* 2014; 118 (05) 1052-1061.
5. Chopra S. S., Schmidt S. C., Fotopoulou C., Sehouli J., Schumacher G. (2009). Evidence-base Perioperative Management: Strategic Shift in Times of Fast Track Surgery. *Anicancer research*, 29, 2799-2802.
6. Piotrkowska R., Terech S., Książek J. (2014) Opieka pielęgniarska nad chorym z tętniakiem aorty brzusznej w zależności od metody leczenia i trybu przyjęcia do szpitala. *Problemy Pielęgniarstwa*, 22(3), 406-411.
7. Bu J., Li N., Huang X., He S., Wen J., Wu X. (2015). Feasibility of Fast-Track Surgery in Elderly Patients with Gastric Cancer. *Journal Gastrointestinal Surgery*, 19, 1391-1398.
8. Wang G., Jiang Z., Xu J., Gong J., Bao Y., Xie L., Li J. (2011). Fast-track rehabilitation program vs conventional care after colorectal resection: A randomized clinical trial. *World Journal of Gastroenterology*, 17(5), 671-676.
9. Nanavati A. J., Prabhakar S., (2014). A comparative Study od 'Fast-Track' Versus Traditional Peri-Operative Care Protocols in Gastrointestinal Surgeries. *Journal Gastrointestinal Surgery*, 18, 757-767.
10. Pędziwiatr, M., Mavrikis, J., Witowski, J., Adamos, A., Major, P., Nowakowski, M., & Budzyński, A. (2018). Current status of enhanced recovery after surgery (ERAS) protocol in gastrointestinal surgery. Medical Oncology, 35(6), 95.
11. Ljungqvist, O. &Hubner, *Enhanced recovery after surgery—ERAS—principles, practice and feasibility in the elderly* M. Aging Clin Exp Res (2018) 30: 249.
12. ERAS Society recommendation. http://erassociety.org/guidelines/list-of-guidelines/. Access 10.03.2019.
13. Halaszynski T.M., JudaR, Silverman D.G. Optimizing postoperative outcomes with efficient preoperative assessment and management. *Crit Care Med* 2004;32 (4) ((suppl)) S76- S86.
14. Brady M., Kinn S., Stuart P., Ness V.Preoperative fasting for adults to prevent perioperative complications. *Cochrane Database Syst Re*v 2003; (4) CD004423.

15. Jones C., Badger S.A., Hannon R. The role of carbohydrate drinks in preoperative nutrition for elective colorectal surgery. *Ann Coll Surg Engl.* 2011 Oct; 93(7): 504–507.
16. Bandt A. L.; OAKES, F. D. P*REANESTHESIA MEDICATION: double-blind study of a new drug*s. Anesthesia & Analgesia: January-February 1965.
17. Smith A.F., Pittaway A.J. *Premedication for anxiety in adult day surgery.* Cochrane Database Syst Rev. 2000;(3):CD002192.
18. MelnykM.,. Casey R. G, Black P., Koupparis A, J., *Enhanced recovery after surgery (ERAS) protocols: Time to change practice?* 2011 Oct; 5(5): 342–348.
19. Nelson, G., Altman, A. D., Nick, A., Meyer, L. A., Ramirez, P. T., Achtari, C., Antrobus, J., Huang, J., Scott, M., Wijk, L., Acheson, N., Ljungqvist, O., Dowdy, S. C. *Guidelines for pre- and intra-operative care in gynecologic/oncology surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations — Part I.*
20. Hübner M., Scott M., Champagne B. | Postoperative Ileus: Prevention and Treatment. W: The SAGES / ERAS® Society Manual of Enhanced Recovery Programs for Gastrointestinal Surgery. Springer International Publishing Switzerland, 2015: pp 133-146.
21. Gustafsson UO, Scott MJ, Schwenk W, Demartines N, Roulin D, Francis N, McNaught CE, Macfie J, Liberman AS, Soop M, Hill A, Kennedy RH, Lobo DN, Fearon K, Ljungqvist O; Enhanced Recovery After Surgery (ERAS) Society, for Perioperative Care; European Society for Clinical Nutrition and Metabolism (ESPEN); International Association for Surgical Metabolism and Nutrition (IASMEN). World J Surg. 2013 Feb;37(2):259-84.
22. Werner, C. The Older Population: 2010. U.S. Census Bureau, Washington, DC; 2011
23. Dall, T.M., Gallo, P.D., Chakrabarti, R. et al. An aging population and growing disease burden will require a large and specialized health care workforce by 2025. Health Aff (Millwood). 2013; 32: 2013–2020.
24. Ergina, P. L., Gold, S. L., &Meakins, J. L. (1993). Perioperative care of the elderly patient. *World journal of surgery*, *17*(2), 192-198.
25. Lassen, K., Soop, M., Nygren, J., Cox, P. B. W., Hendry, P. O., Spies, C., ... &Ljungqvist, O. (2009). Consensus review of optimal perioperative care in colorectal surgery: Enhanced Recovery After Surgery (ERAS) Group recommendations. *Archives of surgery*, *144*(10), 961-969.
26. Yamada, T., Hayashi, T., Cho, H., Yoshikawa, T., Taniguchi, H., Fukushima, R., &Tsuburaya, A. (2012). Usefulness of enhanced recovery after surgery protocol as compared with conventional perioperative care in gastric surgery. *Gastric cancer*, *15*(1), 34-41.
27. Wells JC: Obesity as malnutrition: the dimensions beyond energy balance. *Eur J ClinNutr* 2013 May; 67 (5): 507-512.
28. Lochs H, Valentini L, Schütz T et al .: ESPEN Guidelines on adult enteral nutrition. *Clinical Nutrition* 2006; 25: 177-360.
29. Yuill KA, Richardson RA, Davidson HI: The administration of an oral carbohydrate-containing fluid prior to major elective upper gastrointestinal surgery preserves skeletal muscle mass postoperatively - a randomized clinical trial. *ClinNutr* 2005; 24: 32-37.
30. Henriksen MG, Hessov I, Dela F et al .: Effects of preoperative oral carbohydrates and peptides on postoperative endocrine response, mobilization, nutrition and muscle function in abdominal surgery. *ActaAnaesthesiolScand* 2003 Feb; 47 (2): 191-199.

31. Kudsk KA, Croce MA, Fabian TC et al .: Enteral versus parenteral feeding. Effects on septic morbidity after blunt and penetrating abdominal trauma. *Ann Surg* 1992; 215: 503-511.
32. Meyenfeldt von M, Meijerink W, Roufflart M et al .: Perioperative nutritional support: a randomized clinical trial. *ClinNutr 1992*; 11: 180-186.
33. Cano NJM, Aparicio M, Brunori G et al .: ESPEN Guidelines for adult parenteral nutrition. *Clinical Nutrition* 2009; 28: 359-479.
34. Sobocki J.: Nutritional treatment in burgery. *Post N Med*. 2016; XXIX(3): 187-189.
35. Watt, D.G., McSorley, S.T., Horgan, P.G., McMillan, D.C. (2015). ENHANCED RECOVERY AFTER SURGERY: WHICH COMPONENTS, IF ANY, IMPACT ON THE SYSTEMIC INFLAMMATORY RESPONSE FOLLOWING COLORECTAL SURGERY?: A SYSTEMATIC REVIEW. *Medicine Baltimore,* 94(36), e1286.
36. Mari, G., Costanzi, A., Crippa, J., Falbo, R., Miranda, A., Rossi, M., Berardi, V., Maggioni, D. (2016). SURGICAL STRESS REDUCTION IN ELDERLY PATIENTS UNDERGOING ELECTIVE COLORECTAL LAPAROSCOPIC SURGERY WITHIN AN ERAS PROTOCOL. *Chirurgia (Bucur),* 111(6), 476-480.
37. Brenner, H. Long-term survival rates of cancer patients achieved by the end of the 20th century: a period analysis. *Lancet*, 2002, 360(9340): 1131-1135.
38. Gustafsson, U. O., Oppelstrup, H., Thorell, A., Nygren, J., Ljunggvist, O. Adherence to the ERAS protocol is Associated with 5-Year Survival After Colorectal Cancer Surgery: A Retrospective Cohort Study. *World Journal of Surgery*, 2016, 40(7): 1741-1747.
39. Kisialeuski, M., Pędziwiatr, M., Matłok, M., Major, P., Migaczewski, M., Kołodziej, D., Zub-Pokrowiecka, A., Pisarska, M., Budzyński, P., Budzyński, A. Enhanced recovery after colorectal surgery in elderly patients. *Videosurgery and Other Miniinvasive Techniques*, 2015, 10(1): 30-36.
40. Kahokehr, A., Sammour, T., Zargar-Shoshtari, K., Thompson, L., Hill, A. G. Implementation of ERAS and how to overcome the barriers. I*nternational Journal of Surgery*, 2009, 7(1): 16-19.