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Enhanced Recovery After Surgery (ERAS) protocols decrease length of hospital stay and maintain functional independence in elderly patients undergoing colorectal surgery

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ABSTRACT A clinical decision report using

Ostermann S, Morel P, Chalé JJ, et al. Randomized controlled trial of enhanced recovery program dedicated to elderly patients after colorectal surgery. *Dis Colon Rectum*. 2019;62(9):1105-1116. <https://doi.org/10.1097/DCR.0000000000001442>¹

for an elderly patient undergoing colorectal surgery.

Keywords: *enhanced recovery after surgery, fast track surgery, colorectal surgery, elderly*

Clinical-Social Context

Carol Stevens [pseudonym] is an 80-year-old woman who presents for robotic partial colectomy of a mass discovered on recent colonoscopy. On presentation, Ms. Stevens reports some mild abdominal pain with associated nausea and vomiting. Aside from this, she has no other symptoms. Her medical history includes hypertension, coronary artery disease, and dyslipidemia, which are stable on medications.

Ms. Stevens is a pleasant woman who leads an active life. She greatly enjoys reading and spending time with family. Further, she prioritizes staying active by taking frequent walks around her neighborhood. Ms. Stevens is a retired teacher and resides alone in a second-floor apartment. She independently carries out all activities of daily living, including cooking, cleaning, and managing household finances. She has substantial familial support, especially with her medical care. Her family provides transportation to appointments and intend to assist her following her procedure. Having never had surgery in the past, Ms. Stevens notes some anxiety regarding the recovery process. She values her independence and is concerned that potential complications may prevent her from maintaining her household and enjoying her hobbies. It is a priority for her to return to her daily routine and she is interested in minimally invasive surgery and perioperative recommendations that will allow her to heal expeditiously.

Enhanced recovery after surgery protocols (ERAS), also referred to as “fast-track” surgery protocols, are a recent implementation in perioperative care that began in the 1990s and have become more prevalent over the past decade. They include a set of evidence-based guidelines designed to minimize pain, reduce the incidence of post-

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operative complications, decrease length of hospital stay, and improve overall patient outcomes by facilitating a more rapid recovery following surgery.¹ These protocols address aspects of preoperative, intraoperative, and postoperative care. Few studies, however, have focused on the benefit of these protocols in an older patient population. This report will examine the utility of ERAS protocols in elderly patients undergoing colorectal surgery, such as Ms. Stevens.

Clinical Question

Do enhanced recovery after surgery protocols decrease length of hospital stay and maintain functional independence in elderly patients undergoing colorectal surgery?

Research Article

Ostermann S, Morel P, Chalé JJ, et al. Randomized controlled trial of enhanced recovery program dedicated to elderly patients after colorectal surgery. *Dis Colon Rectum.* 2019;62(9):1105-1116. <https://doi.org/10.1097/DCR.0000000000001442>

Description of Related Literature

A literature review on the topic of ERAS strategies in patients undergoing colorectal surgery was conducted using the PubMed database. An initial search used the keywords “enhanced recovery” AND “surgery” AND “colorectal” in all fields and included all randomized controlled trials (RCTs) from 2011-2021. This search elicited 110 results. Synonymous terminology was then included into search criteria for completeness. For example, ERAS protocols are also commonly referred to as “fast track” protocols, which was subsequently added as a search term. The terms (“enhanced recovery” OR “fast track”) AND (“colorectal” OR “colon” OR “rectal”) AND “surgery” with filters applied for RCTs between 2011 and 2021 yielded 136 results. The same search was used within the MeSH database, which yielded no additional results. Finally, Google Scholar was used to search for related articles. The search terms were (“enhanced recovery” OR “fast track”) AND (“colorectal” OR “colon” OR “rectal”) AND “surgery” AND (“RCT” or “randomized controlled trial”) with a filter from 2011-2021. This yielded 50 results, of which all RCTs aligned with the PubMed search. Abstracts were then reviewed for relevance to Ms. Stevens’ clinical scenario. The RCTs evaluated for critical appraisal examined the utility of ERAS protocols in patients undergoing surgery for colorectal disease. Studies focusing on individual components of ERAS protocols or that did not examine outcomes such as postoperative complications, length of hospital stay, or maintenance of patient independence were not considered. This inquiry ultimately revealed an extensive body of research that has been conducted on ERAS protocols over the past decade. The following three studies demonstrate the established efficacy of these protocols and the direction of upcoming research on the topic.

In their RCT, Li et al.² examined the application of ERAS protocols in patients undergoing laparoscopic surgery for colorectal cancer. Participants were randomly assigned to either an ERAS or conventional protocol for their perioperative care. The ERAS protocol included specialized education about the perioperative process, no bowel preparation, reduced duration of preoperative fasting, intraoperative warming, reduced fluid administration, multimodal analgesia, and early postoperative ambulation. The authors examined operation time, blood loss, first exhaust and defecation times, extubation time, complication rates, postoperative pain (via visual analog scale), and nutritional status (via albumin and total protein) as primary outcomes. They found that the ERAS group demonstrated significantly shorter first exhaust, defecation, and extubation times. Further, the ERAS group had a significantly lower incidence of overall complications and significantly higher albumin and protein levels compared to the conventional group. While this study demonstrates the efficacy of an ERAS protocol in laparoscopic colorectal surgery, inclusion criteria was limited to participants aged 55-65.

In the RecoverMI trial, Bednarski et al.³ examined the use of enhanced recovery protocols for patients undergoing minimally invasive colorectal resection for neoplasms. Highlights of their enhanced recovery protocol featured mechanical bowel preparation with oral antibiotics, anesthesia without narcotics, and optimized fluid management. They additionally incorporated a telemedicine program titled “TeleRecovery” within their protocol to further improve the patient experience. The goal of the study was to determine if combining minimally invasive surgery, an enhanced recovery protocol, and TeleRecovery could shorten total 30-day length of hospital stay by 50%. They found that this combination was able to successfully reduce 30-day length of hospital stay while



simultaneously maintaining patients' quality of life. This study provides another example of the efficacy of ERAS protocols for patients undergoing colorectal surgery while demonstrating the utility of telemedicine in perioperative care. As Ms. Stevens did not participate in telemedicine program, however, the study was not the most suitable for critical appraisal.

van Rooijen et al.⁴ proposed a multimodal prehabilitation to improve functional capacity and reduce postoperative complications in patients undergoing surgery for colorectal cancer. All patients in the study will receive care within an ERAS protocol, however those randomly assigned to the intervention group will undergo four weeks of prehabilitation before surgery. This multimodal program includes an exercise regimen, nutritional intervention, smoking cessation treatment, and psychological intervention. The primary outcomes of this study will be functional capacity (via the six-minute walk test) and postoperative status (via the Comprehensive Complication Index, or CCI). van Rooijen et. al. note that many interventions to reduce postoperative complications target the period after surgery for rehabilitation.

While this study is still underway, it will offer a unique perspective of the potential utility for preoperative interventions in facilitating the recovery of patients such as Ms. Stevens. Further, use of ERAS protocols in both arms of the study highlight its use as standard of care in perioperative practice.

While these studies demonstrate the efficacy of ERAS protocols in a general adult population, few studies have examined their use in an elderly population. A final search was conducted with the terms ("enhanced recovery" OR "fast track") AND ("elderly[title]" OR "older adult[title]") AND ("colorectal" OR "colon" OR "rectal") AND "surgery" to further narrow the inquiry. Four RCTs were elicited from this search and three were considered for critical appraisal, as one had been retracted. Of note, these three studies were the only RCTs included in a recent systematic review and meta-analysis on the topic by Tan et al. in 2021.⁵

Wang et al.⁶ investigated both the efficacy and safety of fast-track rehabilitation in patients over the age of 65 after laparoscopic surgery for colorectal cancer. Their fast-track rehabilitation intervention included aspects of pre-operative, intra-operative, and post-operative care, while the control group received standard care. They concluded that the fast-track program facilitated a more rapid recovery with fewer complications for its participants. The fast-track group had a significantly decreased time until ambulation, passage of flatus, bowel movement and fluid diet compared to the control group. Further, length of hospital stay was significantly decreased with a median stay of five and a half days in the fast-track group compared to seven in the control group. While this study matches the clinical scenario of Ms. Stevens, the small sample size of 78 patients and availability of a more recent RCT rendered it not the most suitable analysis for this report.

Jia et al.⁷ also published a RCT examining the impact of fast-track surgery in preventing post-operative delirium and complications in elderly patients at or above the age of 75 undergoing open surgery for colorectal cancer. Their fast-track protocol was comparable to that of Wang et al. The authors found that the fast-track group had a significantly shorter length of stay, lower incidence of post-operative delirium, and lower post-operative IL-6 levels, and quicker return to bowel function than the control group. This study was conducted solely in patients undergoing open surgery, unlike Ms. Stevens.

Ostermann et al. published a RCT in 2019 focusing on the feasibility and efficiency of an enhanced recovery program in elderly patients undergoing elective colorectal surgery. The patients in this study were 70 years of age or older and undergoing elective open or laparoscopic colorectal surgery. The enhanced recovery program was similar to the prior two RCTs. The study concluded that the enhanced recovery program led to reduced morbidity, less complications, and a shorter hospital stay as compared to traditional care. This RCT encompasses Ms. Stevens' clinical picture and desire for preserved independence.

The body of literature presented may be considered Grade A strength of recommendation based on SORT criteria.⁸ As such, it is based on consistent and good quality patient-oriented evidence.

Critical Appraisal

Osterman et al. conducted a non-blinded RCT of an enhanced recovery program in elderly patients following colorectal surgery. In total, 150 patients were enrolled in the trial. Participants were at or over 70 years of age, scheduled for open or laparoscopic surgery for colorectal disease, and recruited from a single, high-volume university hospital. Exclusion criteria included emergency or



multiorgan surgery and contraindication to systemic lidocaine. The trial was registered with ClinicalTrials.gov and is level 1 evidence according to the SORT criteria as a high quality individual randomized controlled trial.⁸ The authors report no funding or support.

Study participants were randomly assigned to either the enhanced recovery program (ERP) group or the standard care (SC) group via a pre-established institutional block-randomized table. Upon admission, patients were sent to either an ERP or an SC unit to avoid crossover by the care team. Blinding was not possible in this study due to the obvious nature of the perioperative care protocols. Nevertheless, it may have introduced bias in both the patients and care teams involved in the research.

Unique features of the ERP were preoperative counseling, multimodal analgesia with systemic lidocaine used intra-operatively, individualized and goal-directed fluid therapy, early postoperative feeding, and rapid postoperative mobilization out of bed. The primary outcome evaluated was 30-day postoperative morbidity, which was assessed using the validated Clavien-Dindo classification. Secondary outcomes were length of stay in the hospital (time from surgery to discharge), total hospital stay (including readmission and rehabilitation), maintenance of independence (evaluated by any modification of preoperative independence), requirement of rehabilitation, rate of readmission, post-operative pain, consumption of opioids, one-year survival, and compliance with the ERP protocol.

Statistical analysis was conducted using SPSS software. An intention-to-treat analysis was carried out in both the ERP and SC groups, which each included 75 patients. No patients were lost to follow up and patient age, sex, and health characteristics were similar between both the ERP and SC groups. Statistical measures utilized included χ^2 or Fisher exact test for dichotomous outcomes, t-tests of Wilcoxon rank-sum tests for continuous and normally distributed variables. Due to the influence of covariates on outcomes, covariate-adjusted odds ratios were used to evaluate morbidity and complication severity and a Cox proportional hazards model was used for hospital stay and survival. Statistical significance was set at a p value <0.05 for this analysis.

The study found that 30-day postoperative morbidity was 47% lower in the ERP group compared to the SC group ($p = 0.0003$). Both length of hospital stay and total hospital stay were significantly decreased in the ERP group compared to the SC group ($p = 0.001$ and $p = 0.003$, respectively). The median length of hospital stay in the ERP group was 7 days compared to 12 days in the SC group, and median total hospital stay was 8 days in the ERP group and 15 days in the SC group. The ERP group also displayed better maintenance of independence than the SC group, with 87% discharged home without rehabilitation compared to 67% of the SC patients ($p = 0.005$). Of note, there was a similar 30-day rate of readmission between the two groups. ERP patients had less total opioid consumption compared to the SC group. Lastly, 1-year survival did not vary significantly between the two groups. The mean protocol compliance was 77.2%.

The authors also conducted a multivariate analysis to evaluate for independent factors that influence evaluation of morbidity, which is important in contextualizing the impact of the ERP protocol. Independent factors predictive of increased morbidity included Charlson comorbidity index >3, American Society of Anesthesiology (ASA) score greater than or equal to 3, preoperative anemia, advanced cancer, and open surgery. Factors predictive of longer hospital stay included severe complications, advanced cancer, open surgery, low body mass index (BMI), operative time over four hours, and rectal surgery. Lastly, factors predictive of poorer survival included postoperative morbidity, severe complications, anemia, male sex, and advanced cancer.

The authors of this study state that enhanced recovery protocols should be the standard of care for elderly patients undergoing colorectal surgery. This assessment aligns with the two prior RCTs on this topic along with a broader body of research demonstrating the benefit of enhanced recovery protocols. Further research, however, is required to begin implementing these strategies in a feasible way for both institutions and patients. Upcoming studies should be directed at determining the most effective changes within enhanced recovery protocols that make the greatest positive impact on patient outcomes. Initial implementation of enhanced recovery protocols for elderly patients is a resource-intensive and expensive endeavor for many institutions. By first implementing the most effective elements of an enhanced recovery protocol, patient care can benefit while institutions determine how best to incorporate these programs as a whole. Additionally, future enhanced recovery programs can be tailored to best suit individuals' needs and circumstances from both a health and socioeconomic standpoint. Ultimately, this research has shown that enhanced recovery programs are indeed beneficial for reducing length of hospital stay and maintaining independence in elderly patients.



While the authors consider this a large RCT based on its sample size, one drawback of the recruitment process for this study is the selection of patients from a single medical center. It is possible that study participants were recruited from a homogenous population. Various social factors affect a patient's ability to participate and benefit from an enhanced recovery protocol. These include, but are not limited to, education level and ability to understand the enhanced recovery process, access to transport or technology for preoperative counseling and postoperative follow up, and social support during the perioperative period. The paper did not discuss the socioeconomic demographics of participants, which would have been helpful in this context.

Clinical Application

As an older adult undergoing minimally invasive colorectal surgery, Ms. Stevens had the option to choose between conventional practices or enhanced recovery practices for her perioperative care. Due to her desire for expeditious recovery and maintenance of independence, enhanced recovery practices were explained to her during the informed consent process for surgery. After explaining the efficacy of ERAS protocols in the general adult population, the team outlined the enhanced recovery procedures that would be applied to her care should she choose this option. This included multimodal analgesia, lack of drain placement, early initiation of clear liquids and diet, early ambulation, and urinary catheter removal on day one. The enhanced recovery option was then compared to traditional postoperative care. The team informed Ms. Stevens that while ERAS protocols had been shown to be efficacious in middle-aged adults, fewer studies had examined them in an elderly population. Thus, there was a risk she may not benefit to the same extent as an individual in a younger, more studied age range. Despite this, Ms. Stevens was enthusiastic about the proposal and opted to proceed with enhanced recovery practices. She felt reassured by her familial support and did not express any reluctance or concerns prior to moving forward.

Following implementation of the enhanced recovery protocol, Ms. Stevens progressed well and was discharged home a few days following her procedure. At her first follow up in clinic, she endorsed a full recovery and return to independence after a brief period of assistance from her relatives. She spoke highly of her experience and credited the enhanced recovery practices with her quick return to full functionality. Her post-operative course aligned with participants within the enhanced recovery protocol in Ostermann et al., further demonstrating the positive impact of these fast-track interventions on elderly patients.

New Knowledge Related to Clinical Decision Science

Ostermann et al. note that 15-18% of the Western population are elderly individuals at or over the age of 70 and that population comprises roughly 50% of patients undergoing colorectal surgery. Thus, it is of utmost importance to ensure that research on enhanced recovery after surgery protocols includes and is applicable to this patient population. While Ms. Stevens had a positive outcome with enhanced recovery practices applied to her perioperative care, she was fortunate to benefit from a high socioeconomic status and substantial familial support. The enhanced recovery protocol outlined in Ostermann et al. was primarily conducted during hospital admission, similar to Ms. Stevens' experience. Studies such as Bednarski et al. and van Rooijen et al., however, incorporate out-of-hospital components such as telemedicine and prehabilitation into their protocols. As ERAS programs become more robust and grow to include more preoperative components, this could present difficulties for patients of lower socioeconomic status with less support. For example, patients may not be able to find or afford reliable transportation to preoperative appointments or access technology that facilitates their participation in telemedicine. Further, elderly patients who are less familiar with technology may encounter difficulties navigating telemedicine platforms. These factors must be considered as research on ERAS protocol implementation in the elderly continues. On a broader scale, the implementation of these protocols in institutions with financial and resource-related constraints should also be addressed in future research.

As evidence demonstrating the efficacy of ERAS protocols has grown, their application has been continuously developed in hospitals worldwide.² There still exists, however, hesitancy in adopting their use in elderly patients. Concerns include, but are not limited to, increased burden of comorbidities, increased care requirements, and difficulty complying with certain ERAS aspects such as early ambulation and early oral intake.⁵ While these considerations are certainly valid, patients such as Ms. Stevens demonstrate that the decision to participate in an enhanced recovery protocol can be made on a case-by-case basis with collaboration between patients, their support system, and care teams.



Further research aimed on tailoring these programs to an elderly population will further promote their incorporation into daily clinical practice.

Because the elements of ERAS are clearly delineated in the research literature, individual clinicians caring for patients such as Ms. Stevens can “audit” their own hospital environment to identify how many of the interventions can be incorporated into the care of their own patients. Given nation-wide nursing shortages, the individual, personal relationship with nursing staff responsible for making ERAS interventions should be leveraged. Often by emphasizing the shared goals of improved patient care, the competency of Systems-Based-Care is maximized. For longer term clinical decisions, physicians can advocate for Quality Improvement Programs at their individual hospital to demonstrate both a clinical benefit and a financial benefit to the institution, which would have a greater impact within the institutional context that care is provided. Quality Improvement Programs require all stakeholders to be identified and thus lessen the burden on individual doctors to advocate for better patient care.

Conflict Of Interest Statement

The author declares no conflicts of interest.

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