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## Evidence or eminence in abdominal surgery: Recent improvements in perioperative care

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### Abstract

Repeated surveys from Europe, the United States, Australia, and New Zealand have shown that adherence to an evidence-based perioperative care protocol, such as Enhanced Recovery After Surgery (ERAS), has been generally low. It is of great importance to support the implementation of the ERAS protocol as it has been shown to improve outcomes after a number of surgical procedures, including major abdominal surgery. However, despite an increasing awareness of the importance of structured perioperative management, the implementation of this complex protocol has been slow. Barriers to implementation involve both patient- and staff-related factors as well as practice-related issues and resources. To support efficient and successful implementation, further educational and structural measures have to be made on a national or regional level to improve the standard of general health care. Besides postoperative morbidity, biological and physiological variables have been quite commonly reported in previous ERAS studies. Little information, however, has been obtained on

cost-effectiveness, long-term outcomes, quality of life and patient-related outcomes, and these issues remain important areas of research for future studies.

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**Key words:** Enhanced recovery; Surgery; Fast track; Perioperative management; Postoperative outcome

**Core tip:** There is a strong and evolving evidence base to support Enhanced Recovery After Surgery (ERAS) programs in abdominal surgery. Such pathways are safe and efficient in enhancing recovery and reducing morbidity. However, patient-related outcomes, cost effectiveness and long-term benefits from ERAS protocols need to be studied more carefully in the future. To support efficient and successful implementation, further educational efforts have to be performed on a national or regional level to improve the standard of care in the general population.

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### INTRODUCTION

Traditional perioperative care is heterogeneous and often based on regional and local traditions or even individual preferences of the surgeon, anesthesiologist or other staff. Enhanced Recovery After Surgery (ERAS) is an evidence-based, structured, multi-modal program for optimal perioperative care, initially described and developed by Professor Henrik Kehlet, Copenhagen, Denmark, for patients undergoing colonic surgery<sup>[1]</sup>. The ERAS recom-

**Table 1** Enhanced recovery after surgery elements

Preoperative	Pre-admission counseling Stopping smoking and alcohol abuse Optimize nutrition and glucose control No oral bowel preparation
Intra-operative	Preoperative carbohydrate loading Avoiding sedative premedication Thromboembolism and antimicrobial prophylaxis Epidural or other regional anesthesia Balanced fluid therapy avoiding overhydration Active warming Minimally invasive surgery PONV prophylaxis No abdominal drains or nasogastric drains
Postoperative	Multimodal analgesia to avoid opioids Early removal of urinary catheter Early oral feeding and intense mobilization No intravenous infusions Support of GI function (laxatives/prokinetics) Nutritional supplements Audit

PONV: Postoperative nausea and vomiting; GI: Gastrointestinal.

recommendations cover multiple aspects of the pre-, peri- and postoperative periods, with the aim of reducing surgical stress, maintaining physiological functional capacity, and facilitating postoperative recovery<sup>[2-4]</sup>. ERAS is a dynamic concept according to the best available evidence. The main items are: preadmission counseling, no bowel preparation, preoperative carbohydrate loading to avoid preoperative fasting and dehydration, balanced perioperative fluid management, multimodal analgesia avoiding opioids using epidural or other regional anesthesia, minimally invasive surgery, no abdominal or nasogastric drains and early removal of urinary catheter, early oral feeding, intense mobilization and support of gastrointestinal function (Table 1).

## ADVANTAGES OF THE ERAS CONCEPT

That the ERAS program, compared with traditional perioperative management, results in enhanced recovery, shorter hospital stays, and reduced postoperative morbidity has been convincingly shown in repeated randomized controlled trials and meta-analyses<sup>[5,6]</sup>.

Patient-related symptoms<sup>[7,8]</sup>, quality of life<sup>[9]</sup> and cost-effectiveness<sup>[10]</sup> have been less commonly reported but are likely to be improved by ERAS when compared with traditional care. Laparoscopic and minimally invasive procedures will further improve outcomes compared with open surgery in ERAS pathways<sup>[11]</sup>, although remarkably early recovery can also be obtained after open abdominal surgery<sup>[12]</sup>. Limited data are available on post-discharge and late postoperative outcomes. Studying the process of implementation will provide valuable information on the importance of individual items on outcomes from surgery, and issues related to ERAS implementation and evidence-based perioperative medicine on a broader basis in general health care. Structured implementation of ERAS

in the Breakthrough project, which included a third of all hospitals in the Netherlands, was reported to be successful and resulted in an improved standard of care and a 3-d reduction in length of stay<sup>[13]</sup>. National incentives, such as in the Netherlands<sup>[13]</sup> and the NHS Enhanced Recovery partnership program in England<sup>[14]</sup> to support the implementation of ERAS on a national basis, are imperative to obtain a major improvement in general health care.

## ADOPTION OF ERAS BY OTHER SURGICAL DISCIPLINES

The convincing data from colorectal surgery has encouraged an accelerating spread of the ERAS concept to other surgical disciplines. Published guidelines from the ERAS Society cover recommendations for perioperative care, not only for colorectal surgery<sup>[3,4]</sup>, but also pancreaticoduodenectomy<sup>[15]</sup> and radical cystectomy for bladder cancer<sup>[16]</sup>. In addition, enhanced recovery protocols have safely and successfully been implemented for other major elective abdominal procedures such as liver resections<sup>[17]</sup>, esophagectomy<sup>[18,19]</sup>, gastrectomy<sup>[20]</sup>, bariatric surgery<sup>[21]</sup>, hysterectomy<sup>[22]</sup>, and emergency surgery<sup>[23,24]</sup>.

## PATIENT PERSPECTIVE

A recent systematic review studied how recovery outcomes were reported when comparing fast track pathways with traditional care<sup>[25]</sup>. The studies focused on in-hospital biological and physiological variables such as the return of gastrointestinal function and postoperative complications. In contrast, patient-reported symptoms, functional status, and quality of life were less commonly studied, in particular post-discharge. Nevertheless, when patient satisfaction and quality of life were reported in randomized trials, fast track programs were either superior or equal to traditional care, but never inferior<sup>[26-33]</sup>. The use of heterogeneous measures, however, hinders comparisons across studies. Recently, the SF-36 was also validated as a measure of postoperative recovery after colorectal surgery<sup>[34]</sup>. The need for better outcome measures, including the patient's experiences (*i.e.*, core outcome sets or composite outcomes), has been emphasized<sup>[8,35]</sup>.

## ADHERENCE TO THE ERAS PROTOCOL

Despite increasing awareness of the importance of structured perioperative management, implementation of this complex protocol has been slow<sup>[36]</sup>. Several large surveys have been performed to study the adoption of the concept in different countries. The surveys report a wide variation in adherence to fast track protocols, and methods that are harmful for the patient and prolong postoperative recovery are still commonly used. Nevertheless, a somewhat higher acceptance of evidence-based methods seems to be reported in questionnaires concerning the surgeon's preferences than in surveys based on the actual registration of clinical parameters and ERAS items. One

**Table 2** Key points in this paper

Key points
Traditional unstructured perioperative care is still common
The ERAS protocol is an evidence-based structured perioperative regime
The ERAS program improves postoperative recovery and reduces morbidity
More research is needed on cost-effectiveness, long-term outcomes, quality of life, and patient-related outcomes
Regional and national strategies to support the implementation of evidence-based perioperative care in general health care are warranted

could speculate that questionnaire surveys may reflect what physicians believe should be done rather than what they actually would do in clinical practice. In two previous surveys among surgeons and anesthesiologists in five countries in Europe<sup>[37,38]</sup>, prevailing routines for colonic surgery deviated considerably from the best available evidence, with a wide variation between countries. In another survey on colonic surgery, conducted in 295 hospitals in the United States and Europe (United Kingdom, France, Germany, Italy and Spain), most centers still adhered to traditional perioperative care<sup>[39]</sup>. Bowel cleansing methods, for example, were used in > 85% of cases and nasogastric tubes were retained for several days postoperatively in 40% *vs* 66% of the patients in the United States and Europe, respectively. Traditional perioperative care was reflected in the postoperative length of stay; over 10 d in the European countries and 7 d in the United States. This could be compared with discharge from hospital 2-5 d after colonic surgery, reported from trials performed in dedicated centers with a successful implementation of fast track programs<sup>[40,41]</sup>.

Similar to colonic surgery, traditional approaches in perioperative care were common for rectal surgery in a large survey covering 461 institutions in Germany and Austria from 2006<sup>[42]</sup>. In a more recent survey among colorectal surgeons in Great Britain and Ireland published in 2008, it was concluded that routine adherence to ERAS was relatively high, indicating a general trend among colorectal surgeons to comply with ERAS interventions. There remained, however, a potential for improvement<sup>[43]</sup>. In a survey from 2011 in New Zealand and Australia, some, but not all, ERAS interventions were routinely used according to a questionnaire recently distributed to colorectal surgeons<sup>[44]</sup>.

All members of the health care/multidisciplinary team must be included in the repeated educational efforts necessary for successful implementation of the ERAS concept<sup>[45]</sup>. A recent survey among senior anesthesiologists from mainly European countries showed a low level of knowledge about ERAS pathways<sup>[46]</sup>. Current routines differed from the ERAS guidelines in > 50% of the centers concerning fluid infusion policy, fasting, postoperative opioids, premedication, and the use of prokinetics.

## BARRIERS TO IMPLEMENTATION

Today, it is still the case that the change in practice from

a more traditional approach to evidence-based perioperative care appears to be slow<sup>[40]</sup>. On its own, a protocol is not sufficient to introduce necessary fast track recovery routines<sup>[36]</sup>. Some studies have, therefore, explored possible barriers to ERAS protocol compliance. A qualitative interview-based study identified four key areas important for the implementation process: patient-related factors, staff-related factors, practice-related issues, and resources<sup>[47]</sup>. This highlights the need for multidisciplinary efforts to reach a high level of compliance and the involvement of hospital management. In a questionnaire survey from Toronto, surgical residents reported some barriers to the early discharge of patients, which included patient and family expectations, surgeon preferences, and the beliefs of the health care team<sup>[48]</sup>. Other reported issues were that some ERAS items may seem to be too time consuming, and there was a lack of co-specialty and institutional support<sup>[49]</sup>.

## ADHERENCE AND OUTCOME

At our own institution, the ERAS program has been chosen for all patients undergoing colorectal surgery since 2002. In 2004-2005, a second round of educational efforts was made, as were other measures to enforce the process of implementation<sup>[50]</sup>. Thus, as published by Gustafsson *et al.*<sup>[50]</sup> compliance with the ERAS protocol at our institution improved from 43% to 71%. Interestingly, in this cohort of 953 patients undergoing major colorectal cancer surgery, improved adherence to the ERAS protocol was significantly associated with improved clinical outcomes<sup>[50]</sup>.

In addition to patient perspective and physiological outcomes, evaluation of the possible economic advantages of enhanced recovery pathways is warranted. A cost reduction from the decrease in morbidity and hospital length of stay may promote the implementation of fast-track programs and increase adherence to the protocol. Available data are sparse, but do support the cost-effectiveness of fast-track programs<sup>[51,52]</sup>.

## CONCLUSION

Key points in this paper are summarized in Table 2. There is a strong and evolving evidence base to support ERAS programs in abdominal surgery. Such pathways are safe and efficient in enhancing recovery and reducing morbidity. The implementation of ERAS pathways in new surgical procedures needs to be audited and carefully evaluated in clinical studies since the evidence base for different ERAS items may vary depending on the selected surgical procedure. To support efficient and successful implementation, further educational efforts have to be performed on a national or regional level to improve the standard of care in the general population. Patient-related outcomes, cost effectiveness and long-term benefits from ERAS protocols need to be studied more carefully in the future.

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