Editorial



# Enhanced recovery after surgery: past, present and future

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Received: 27 July 2019; Accepted: 15 August 2019; Published: 23 August 2019.
doi: 10.21037/dmr.2019.08.03
**View this article at:** http://dx.doi.org/10.21037/dmr.2019.08.03

## Past

In the 1990's the average length of hospital stay for patients undergoing colonic surgery across Europe and North America was routinely greater than 10 days. Surgery was almost exclusively via an open approach and in addition the established wisdom with regards to perioperative care included recommending prolonged starvation times, bed rest, copious IV fluids, opiate-based analgesia and the routine use of surgical drains, nasogastric tubes and bowel preparation. Postoperative morbidity was high with ileus, sepsis, venous thromboembolism and anastomotic leak all relatively commonplace. It was to this back drop that a group of gastrointestinal surgeons from Denmark, led by Professor Henrik Kehlet, positing that delays in postoperative recovery were influenced by pain, surgical stress and elements of postoperative care, published a small case series in the *Lancet* (eight patients) demonstrating a reduction in hospital stay to just 2 days through use of a combination of laparoscopically-assisted surgery, epidural analgesia and early oral nutrition and mobilisation (1). This proved to be the beginning of a revolution in the perioperative care of surgical patients and the birth of what would become the enhanced recovery after surgery (ERAS) approach. Perhaps understandably, these initial results were received with a degree of scepticism by some members of the clinical community, particularly towards the idea of early postoperative feeding and mobilising which went against long-established surgical dogma. It would take a number of years and many more clinical studies to clearly demonstrate the benefits of the ERAS approach on patient outcomes and bring about widespread implementation of ERAS pathways.

The term enhanced recovery after surgery (ERAS) was coined by two surgeons—Kenneth Fearon and Olle Ljungqvist, who after meeting in London at a nutrition symposium, decided to create a collaborative group with the goal of producing a set of evidence-based guidelines for the peri-operative care of patients undergoing colorectal surgery. This group ultimately became the ERAS® Society. They also introduced a system of audits to continually identify challenges to implementation and improve compliance. The ERAS® Society was officially created and registered in Sweden in 2010 (www.erassociety.org), and is an international, non-profit, medical academic society with members from across a range of different professions involved in surgical care. Recognising that the care of patients undergoing colorectal surgery varied greatly across Europe (2) the group set about finding consensus on what constituted the best perioperative practice via extensive review of the current available evidence and expert opinion, and in 2005 the ERAS society published its first consensus protocol for patients undergoing colonic surgery (3). Whilst the development of these guidelines represented a significant step forward in perioperative care, questions remained over the practicality of implementing them in clinical practice and whether they would indeed produce the improvements in patient outcomes expected. Between 2005 and 2009 a group of researchers from Holland piloted the implementation of these first guidelines in 33 hospitals across the Netherlands, reporting dramatic improvements in both recovery time and quality (4).

As the evidence for ERAS in colorectal surgery grew and more and more centres across Europe began to implement ERAS pathways for their patients, the ERAS society embarked upon developing guidelines for other surgical specialties/ procedures. This drive led to the production of guidelines

for pancreatic surgery (5), rectal and pelvic surgery (6), gastric resections (7) and more recently urology (8), gynae-oncology surgery (9), oesophageal resection (10), liver resection surgery (11) and obstetric surgery (12) and work is underway to produce ERAS protocols for lower extremity joint replacements and thoracic noncardiac surgery amongst others. These guidelines and any subsequent updates can be found directly on the ERAS® Society website and are provided free of charge (www.erassociety.org).

Initially adoption of ERAS pathways took place in multiple single centres, often only for specific surgical procedures, with varying success. It required national initiatives such as the Enhanced Recovery Partnership Programme (ERPP) in the UK to produce wider uptake across hospitals and surgical specialties. Through working in collaboration with NHS Improvement, the National Cancer Action Team and the NHS Institute for Innovation and Improvement and with individual local strategic health authorities the ERPP was able to move closer to the goal of whole scale adoption of ERAS across the NHS.

## Present

From those relatively modest beginnings the ERAS approach has gained widespread recognition and currently ERAS pathways are being used for the perioperative care of surgical patients undergoing a variety of surgical procedures around the globe. There are now national ERAS chapters across Europe and further afield in the USA, Mexico, Argentina, Brazil, the Philippines, Singapore and South Africa and others. As mentioned, the number of surgical specialities included has increased. Originally pioneered in colorectal surgery, ERAS pathways have been shown to be beneficial in cardiothoracic, hepatobiliary, urology, gynae-oncology and even paediatric surgery amongst others. As the development and implementation of new ERAS pathways increases, so does the available evidence, allowing for a process of continuous review and where necessary, revision of guidelines.

In a study that echoed that which took place following the introduction of the first ERAS guidelines for colonic resection, a multi-national group of researchers from ten hospitals across Europe and North America sought to prospectively validate the new gynaecology/oncology guidelines (13). Data from over 2,000 patients was uploaded via the web-based ERAS Interactive Audit System and demonstrated an association between increasing compliance with the elements and a shorter length of stay together with a reduced complication rate.

Multiple systematic reviews and metanalyses have repeatedly demonstrated the multiple short-term benefits of ERAS including reduced length of stay and reduced morbidity (14-16) and despite some variation in the reported costs of implementing ERAS pathways, they have repeatedly been shown to be highly cost effective (17-19). They have also shown to improve quality of life compared with standard care (20).

The situation is such that in the UK and Western Europe at least, it could be argued that what once was 'ERAS' has now become routine perioperative care. However, barriers to implementation and maintenance remain and previously successful programmes can falter. There are a number of reasons why this may happen. Firstly, adoption of ERAS principles requires a change in organisational culture, and it can be easy to slip back into traditional ways of thinking. There are often limited resources to support ERAS on the ward, and the demands on nursing staff may mean that pushing ERAS goals is not always the foremost priority. The production and distribution of ERAS protocols within individual hospitals may often be sub-optimal meaning that junior staff have nothing to refer to when caring for these patients. Staff turnover may be high, in particular the junior surgical staff meaning that a constant education and training cycle is required—another facet not always considered. Lastly continuous audit of compliance and outcomes—a key factor in any successful ERAS pathway—is often overlooked. A common misconception is that just having an ERAS protocol is adequate, whereas in truth the implementation and maintenance of a successful ERAS programme requires strong clinical and managerial leadership and multi-professional collaboration.

## Future

Many of the early studies of ERAS pathways utilised length of hospital stay as their primary outcome. Whilst reducing lengths of stays is an attractive prospect, and certainly straightforward measure, hospital length of stay is often influenced by factors other than the patients' speed/quality of recovery. For this reason, many researchers have also included markers of functional recovery from surgery—how quickly patients could mobilise, how quickly they returned to oral feeding—as well as the incidence of postoperative morbidity. In addition to the impact that a postoperative complication may have on length of stay, cost, quality of recovery and 30-day mortality it has been demonstrated

that the occurrence of a postoperative complication in the perioperative period can also significantly reduce long-term survival (21). As we move into an era where ERAS programmes have been running for a number of years in some centres, so the longer-term benefits of ERAS are beginning to emerge. A number of studies have now shown an improvement in long-term survival, particularly where compliance with ERAS elements is high (22-24). Reducing postoperative complications may be even more beneficial in cancer surgery as in addition to increasing long-term survival, a faster, uncomplicated recovery will allow a patient to progress more quickly to the next phase of their oncological treatment and hence potentially improve their cancer survival (25).

Whilst the prospect of improving long-term outcomes is tantalising, it does not necessarily define a good quality recovery from the patients' perspective, which may be, for example, a rapid return to their baseline functional level (i.e., activities of daily living). Future studies may be designed to assess the influence of ERAS programs on patients' journey to complete functional recovery especially once discharged home.

Despite evidence demonstrating that outcomes are improved with increasing compliance, there is a desire in some sectors to try and simplify pathways, only including the most "important" elements. So far definitively identifying these elements has proved difficult but if simplification of the pathways is possible it may encourage a greater uptake meaning more patients could benefit from ERAS programmes.

There remain a number of areas that still have question marks over their optimal management including perioperative anaemia and prevention and management of postoperative fatigue, delirium, and cognitive dysfunction.

Another goal would be to generate risk stratification tools to predict certain procedure specific complications, such as ileus post radical cystectomy. This would allow implementation of specific interventions and improve outcomes.

Another future direction research is establishing optimal pain management strategies—both procedure- and patient-specific—that allow early functional recovery with minimal side-effects.

Ultimately, in order to move forward and for ERAS to continue to offer patients the best possible perioperative care, pathways must be kept under review and updated as new evidence emerges.

Finally, whilst there has been widespread adoption of ERAS for many surgical specialties, there are still others that remain to be convinced it can be applied to their patients. One example of a new frontier in ERAS is liver transplantation where a pilot study published recently by a team of French researchers demonstrated a reduction in length of stay from 18 to 9.5 days (26).

Undoubtedly, ERAS will continue to grow as more and more centres across the globe look at introducing it for their patients. However it is important to remember that whilst it may be relatively easy to produce a protocol, successful implementation and maintenance is challenging and requires a collaborative effort from the entire multidisciplinary team, and most importantly, regular auditing to ensure that the care delivered matches that prescribed by the protocol.

## Acknowledgments

*Funding:* None.

## Footnote

*Provenance and Peer Review:* This article was commissioned by the editorial office, *Digestive Medicine Research* for the series "Enhanced Recovery After Surgery (ERAS) Program in General Surgery". The article did not undergo external peer review.

*Conflicts of Interest:* Both authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/dmr.2019.08.03). The series "Enhanced Recovery After Surgery (ERAS) Program in General Surgery" was commissioned by the editorial office without any funding or sponsorship. CJ served as the unpaid Guest Editor of the series. The authors have no other conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



 

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doi: 10.21037/dmr.2019.08.03
**Cite this article as:** Jones C, Kelliher L. Enhanced recovery after surgery: past, present and future. Dig Med Res 2019;2:19.