

# Enhanced recovery protocols after oesophagectomy

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**Abstract:** The feasibility and safety of enhanced recovery protocols (ERP) have been demonstrated in a large number of surgical specialties. Several studies have shown improved post-operative outcomes and economic benefit from the use of ERPs in oesophageal cancer surgery. However, these improvements are not always translated more widely into clinical practice due to variation in protocols, poor compliance and failure to implement a robust implementation strategy. ERP implementation strategies should reflect the fact that these are complex interventions that are influenced by a wide range of social, organizational and cultural factors.

**Keywords:** Perioperative care; esophagectomy; postoperative complications; health plan implementation

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## Background

Previous research has established a volume-outcome relationship for complex surgery including oesophagectomy and led to centralisation of surgical services for oesophageal cancer to high volume centres in many parts of the world (1). Centralisation, along with other factors such as surgeon specialisation, improvements in multi-modality therapy, and patient selection has contributed to significant improvements in post-operative mortality and survival (1,2). However, despite this, oesophagectomy is still associated with a high complication rate and a prolonged hospital stay (3).

Further improvements in treatment outcomes are likely to come through incremental changes to the surgical pathway as a whole. These include innovations in anaesthetic techniques, minimally invasive surgery, prehabilitation and post-operative care.

Traditionally post-operative care has been ad-hoc, heterogenous and characterized by traditional beliefs, absence of standardisation and reliance on decision making by the senior surgeon. Enhanced recovery protocols (ERP), pioneered by Kehlet in the 1990s, were the first attempt to develop protocol based care (4). ERPs are a bundle of evidence based clinical processes that both individually and

collectively have been associated with lower complications and a shorter hospital stay following major surgery (5-7).

Developed first in colorectal surgery, their feasibility and safety has been demonstrated in many surgical specialties. Of specific interest, there is increasing evidence that they result in improved outcomes in patients undergoing oesophagectomy. In many studies concerning oesophageal cancer surgery, ERPs have been associated with a reduction in length of hospital stay, pulmonary complications, costs and improved patient satisfaction from cancer treatment (8-13). However, a recent systematic review and meta-analysis of thirteen studies (one randomized controlled trial and twelve cohort studies) demonstrated that ERPs were associated with no change in in-hospital mortality, total complications, anastomotic leak or pulmonary complications (14), although length of hospital stay was reduced for patients managed with an ERP protocol.

## Challenges in the implementation of ERPs

While ERPs have been shown to impact on post-operative outcomes within a few units, the benefit has not always translated into wider clinical practice. This is due to a number of factors highlighted below.

### *Variation in ERPs*

There is a lack of standardisation of the elements within individual ERPs, even within colorectal surgery where the greatest volume of evidence lies (15). In oesophageal cancer surgery, we have found considerable variation in the type, timing and combination of elements within ERPs from eight oesophago-gastric (OG) cancer units in the UK (16). There were some common elements including epidural use for post-operative analgesia, the use of supplemental enteral nutrition, and active physiotherapist involvement to facilitate early post-operative mobilization. However there was considerable variation amongst several aspects of care including the use of drains, use of nasogastric tubes, time taken to commence oral intake and the use of post-operative oral contrast studies.

This variation maybe a reflection of the lack of robust, high-grade evidence for many of the elements within ERP (8,11) but some of the variation is also due to developments in anaesthetic and surgical technique. For example, with the increasing use of laparoscopic surgery, many units are abandoning the use of epidural catheters as these can be associated with postural hypotension and a resultant need for vasopressors, which with delayed post-operative mobilisation may lead to an increase in pulmonary complications and delayed discharge.

### *Compliance with ERPs*

There is a paucity of research regarding compliance to ERP elements (17,18). The lack of measurement of compliance with ERPs leads to a misjudged assumption amongst surgical teams that there is a high level of compliance when the reality maybe quite different. In colorectal surgery, the highest compliance rates are for pre- and intra-operative elements (19). In comparison, compliance with post-operative elements is inconsistent across studies but can be as low as 20% (19,20). Patients who develop post-operative complications will contribute to deviations from the ERP even if they were compliant prior to this event, and this should be considered when interpreting results (12,21).

Compliance with many of the elements of ERP is difficult to measure due to the lack of standardisation of the description of each element within an ERP. For example, there is no standardized definition of early mobilization leading to variable reporting of compliance rates. For example in one unit, early mobilization maybe defined as sitting out in a chair, whilst for another it maybe mobilizing

greater than 30 metres twice a day. Thus both units report the same compliance rate based on widely different definitions of the same measure.

Higher compliance rates are associated with better outcomes. Data from the international ERAS (Enhanced Recovery after Surgery) registry found that high levels of compliance were associated with fewer complications and a shorter length of stay (7). These findings were echoed in a study of registry data from the UK, where patients who completed over 80% of the ERP had a shorter length of stay in comparison to patients with lower adherence (22). It is unclear whether this relationship reflects poor compliance causing complications or whether the complications cause deviation from the protocols. If the latter is true, monitoring compliance may help to identify patients who are not progressing in their post-operative recovery and enable early intervention when complications occur.

### *Implementation*

The lack of effectiveness of ERPs in reducing complications and improving outcomes may be a reflection of poor implementation. Implementation research indicates that the absence of a demonstrable impact of an intervention could be due to the absence of a robust implementation strategy rather than the intervention itself (23). Implementation is seldom mentioned in published literature on ERPs (15,18).

### **Recommendations for successful implementation of ERPs**

ERP implementation strategies should reflect the fact that ERPs are complex socio-technical interventions that are influenced by a wide range of social, organisational and cultural factors. Successful ERP implementation requires clinical champions, clinical facilitators, multidisciplinary engagement, patient engagement, management support and resources to deliver ERP based care 7 days a week.

### *Adaptation to local context*

ERPs are often implemented through a direct transfer of a protocol with or without minor adaptations from a pioneering unit to adopting sites. In this process, early successes may not be sustainable unless they are adapted to local context depending on existing clinical practices, resources, team and health-care service structure etc. The process of local adaptation not only fosters multi-disciplinary engagement

but also focuses resources and efforts on elements that are not routinely used in local clinical practice.

### *Staff engagement*

The current model, wherein implementation is driven and facilitated by an individual or a single professional group is unlikely to be sustainable and transferable. Routine ERP based care is only sustainable when its core principles are woven into the work patterns of the whole multi-disciplinary team.

Staff education and engagement is crucial to successful implementation. Successful implementation is only possible if the roles of the other healthcare professionals, such as dietitians, physiotherapists, pain specialists, ward nurses, are acknowledged and they are actively engaged in development and implementation of ERPs.

The benefits of ERP extend beyond just patient care. They help teams develop a shared mental model of care and empower junior members of the surgical team and nurses to take decisions based on pre-determined criteria without having to rely on a senior surgeon to make all the decisions. The communication and coordination that underpins successful implementation fosters a sense of teamwork that leads multi-disciplinary engagement in ensuring compliance with ERPs.

### *Patient engagement*

Very few studies make any mention of engaging patients in the development and implementation of ERPs. Patient engagement is a fundamental aspect of many improvement programmes (24) but with the exception of patient information and counseling in the pre-operative period, little effort has been made in engaging patients in order to improve compliance with ERPs. Patients can improve compliance by acting as their own champions and engaging with elements of ERPs, such as early mobilisation. They can also assist higher compliance when they are empowered to prompt clinical teams when certain aspects of their care are not undertaken (25).

### *Measurement and feedback*

Measurement is a fundamental aspect of quality improvement and there is recently some evidence that regular audit and feedback can improve compliance with ERPs (26,27). Just as seen with other improvement programmes, data feedback

stimulates teams to develop local solutions to improve compliance with elements that are difficult to implement.

At a research level, there is still very little evidence of the importance of each element within an ERP. Studying compliance rates alongside outcome measurements will help us understand how and why enhanced recovery programmes work; whether it is the individual elements or the overall process of goal-directed care that contributes most to improved outcomes.

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### **Footnote**

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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