

# Why it is difficult to establish enhanced recovery after surgery (eras) programs in surgical units? *Narrative review*

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## Abstract

Approximately 234.2 million major surgeries are performed worldwide every year, which is equivalent to one in 25 people [1]. In Australia, 662,000 patients underwent elective surgeries in public hospitals in 2011. Majority of these surgeries are essential and lifesaving procedures [2]. Growing population and increasing available management options increase demand for surgical procedures. Health care costs consume significant amount of the national income in both developed and developing countries [3]. At the same time population is aging and demonstrates upsurge in number of associated co-morbidities [4]. As a result, the incidence of perioperative complications is enhanced and length of stay and consumption of rehabilitation requirements are dramatically amplified [4]. There is a need for innovative pathways to improve perioperative outcomes in older and co-morbid patients undergoing surgical procedures. Several models were trialed in many centres and “enhanced recovery after surgery” (ERAS) is the most successful programme amongst them. Aim of this article is to assess the role of ERAS in major surgical procedures and challenges in implementing ERAS in a surgical setting.

**Keywords:** Preoperative, Enhanced recovery, Surgical, complications, Surgical outcomes

## Introduction

Approximately 234.2 million major surgeries are performed worldwide every year, which is equivalent to one in 25 people [1]. In Australia, 662,000 patients underwent elective surgeries in public hospitals in 2011. Majority of these surgeries are essential and lifesaving procedures [2]. Growing population and increasing available management options increase demand for surgical procedures. Health care costs consume significant amount of the national income in both developed and developing countries [3]. At the same time population is aging and demonstrates upsurge in number of associated co-morbidities [4]. As a result, the incidence of perioperative complications is enhanced and length of stay and consumption of rehabilitation requirements are dramatically amplified [4]. There is a need for innovative pathways to improve perioperative outcomes in older and co-morbid patients undergoing surgical procedures. Several models were trialed in many centres and “enhanced recovery after surgery”

(ERAS) is the most successful programme amongst them. Aim of this article is to assess the role of ERAS in major surgical procedures and challenges in implementing ERAS in a surgical setting.

## History of ERAS

The terminology of ERAS is initially described by Kehlet in 1997 [5]. However, the concept of “fast track surgery” was in practice earlier in view of achieving better postoperative outcomes. Bundling of perioperative care interventions such as preoperative education, early extubation, early discharge, accelerated rehabilitation and postoperative routine follow up demonstrated higher outcomes in coronary artery bypass surgeries and were recommended for all bypass surgeries in 1994 [6]. Another study in 1995 reported lowering recovery time in patients undergoing laparoscopic colonic surgery with epidural analgesia and early mobilization and nutrition. Length of stay dropped to two days in this cohort compared to conventional colonic resection pathway [7]. Multimodal approach confirms enhanced

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recovery in further studies afterwards [8].

Assembly of academic surgeons in Europe created ERAS study group in 2001. First ERAS Symposia was held in Stockholm in 2003 and published ERAS protocol for colonic surgeries in 2005 [9]. However, it was found just a protocol is not sufficient to change the practice [10] and ERAS society was established in 2010 to optimize use of the ERAS pathways in surgical patients. The attempt to use the concept of ERAS is being trialled in many centres globally.

### Definition of ERAS

The concept of ERAS is based on evidences on outcome after major surgical interventions. It is defined as evidence-based patient centred perioperative pathways with multidisciplinary team involvement for rapid recovery in patients undergoing surgical procedures [5]. The aim of the ERAS is to improve perioperative outcomes such as postoperative complications, length of stay and discharge destination following elective surgeries

[11]. Prompt re-establishment of normal physiology and function in immediate postoperative period is the key concept in this process. This pathway has several elements based on surgery specific evidences. Those elements are distributed across preoperative, intraoperative, and postoperative periods. Figure 1 describe some basic elements of the ERAS. However, the validity in all elements of ERAS is not demonstrated in later studies and major perioperative principles remain same with procedure specific changes [12].

Major components of ERAS are common across different specialities with procedural specific variations and some of these elements are in standard anaesthetic practice for long time [12]. Initial evidences were observed in open colorectal surgeries and then expanded to gynaecology, urology, vascular, hepato-pancreatic specialities [13,14].

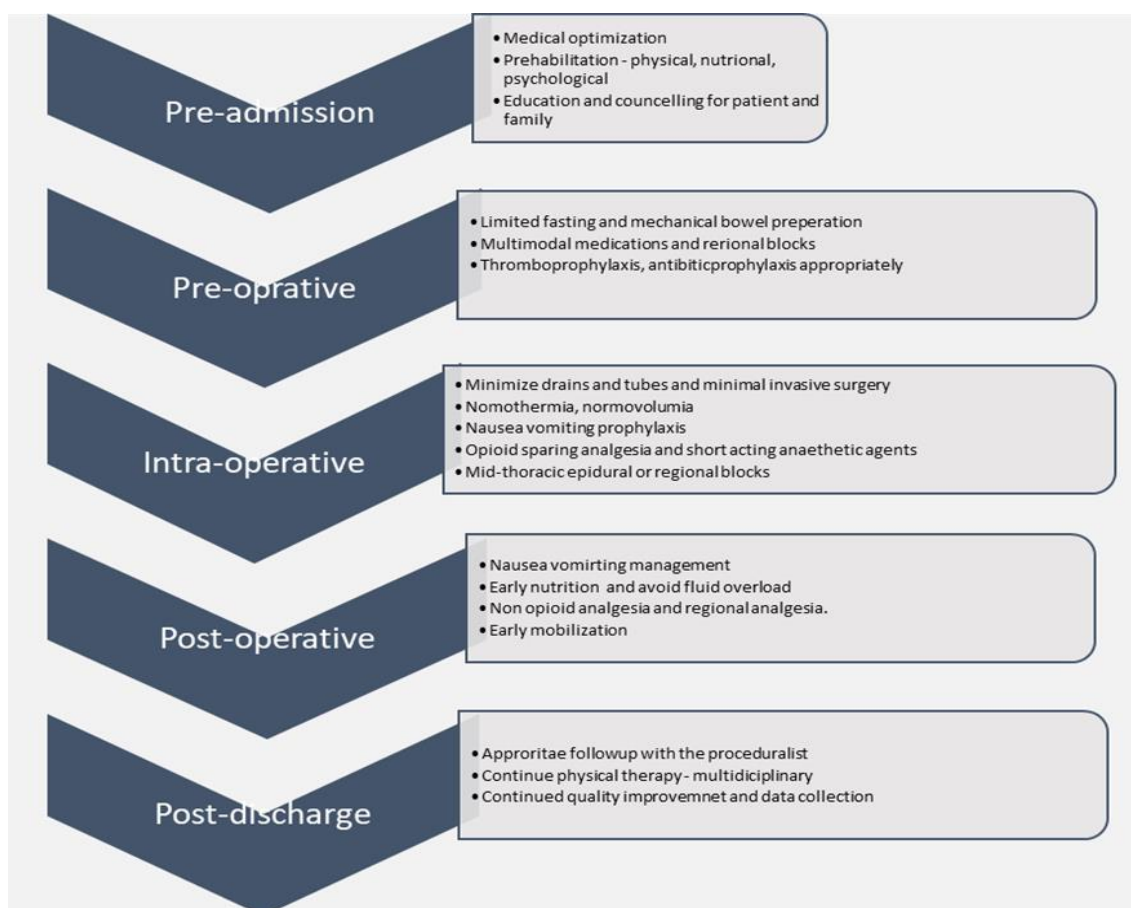


Figure 1: Basic elements of ERAS

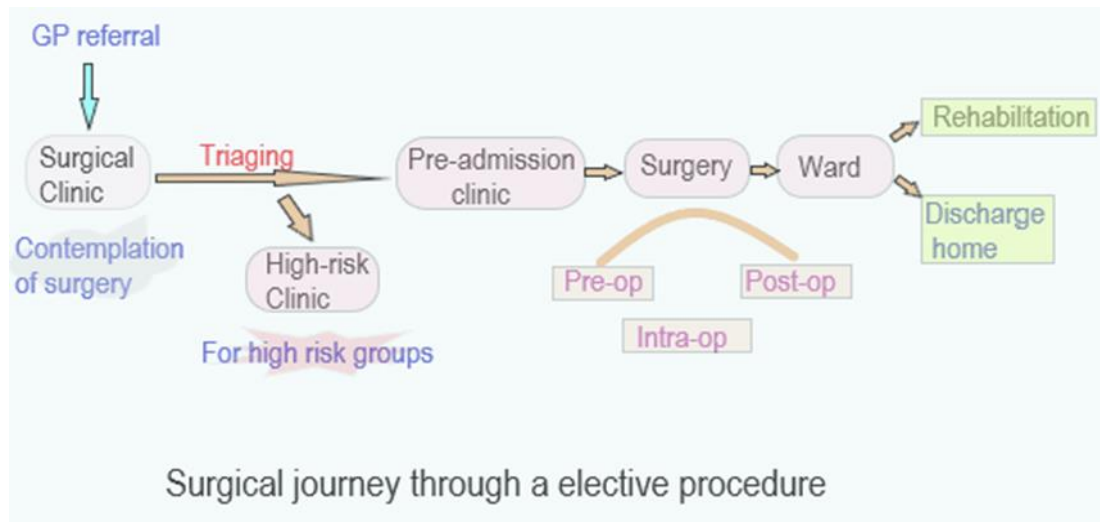
### Role of ERAS in achieving early postoperative recovery

The ERAS protocol provides multiple beneficial outcomes during surgical procedures. A patient's journey through a surgical procedure is complex and

involves many specialities and disciplines. Between the time period of initial surgical referral by the patient's general practitioner and returning to normal lifestyle after surgery, a patient goes through several departments of the hospital [15]. This includes

outpatient clinics of surgical, anaesthetic and medical specialties, preadmission units, surgical ward, operation unit, recovery unit, ward and rehabilitation unit. (See Figure 2) Collaboration of all these units is

challenging in normal setting as these units have its own goals for optimal patient care. The elements of ERAS spread through these different units and provide a bridge to integrated care.



**Figure 2:** Patients journey through a surgical procedure

Surgery is a stressful situation and multiple pathophysiological changes occur in human body during this period. Surgical intervention and anaesthesia lead to multiple cascades of events including tissue inflammation, volume redistribution, vascular and tissue hypoxia, metabolic disturbances. As a result, many organs undergo high demand throughout this period [16]. It is impossible to achieve optimal and rapid recovery with single point intervention. Thus, ERAS has many elements expanded through multiple interventions, targeting various organ systems to restore normal function early. For an example, early nutrition and oral feeding with minimal preoperative bowel preparation enhance rapid restoring of gut functions after bowel surgeries. As a result, usual surgical stress response is suppressed. Another element is less invasive surgery to lower the tissue damage. Early mobilization improves cardio-pulmonary muscle function and tissue oxygenation. This multimodal approach is a main factor driving rapid recovery after the surgery. However, since the ERAS elements are executed by different medical and health professionals, multidisciplinary collaboration is required to achieve optimal outcomes.

Teamwork is crucial in ERAS programme and is a leading cause for its role in achieving successful postoperative outcomes. The programme is usually lead by an ERAS nurse manager. Active collaboration of all other participants, managing practical issues, continue training and quality improvement are key responsibilities of the ERAS manager [17]. The

clinical lead is commonly a surgical specialist or an anaesthetist. Multidisciplinary health team including nursing, physiotherapy, occupational therapy, social work, dietician, clinical psychology involvement is crucial in well establish ERAS system. Multidisciplinary approach is a primary principal of the system and ultimately care is delivered to surgical patients in holistic methodology. As a result, patients receive not only surgical procedures, but also interventions to optimize their social, psychological physical well-being. Holistic approach further appreciates individual cultural and social differences when the multimodal care is delivered to patients undergoing ERAS program.

This system is also based on patient centred approach for optimal care during surgical procedures. Patient and family are educated about the surgical process and they actively participate in decision making throughout the journey. Overall patient experience reported a positive attitude towards ERAS compared to traditional surgical pathways [18]. At the same time, consumer feedback is a component of the ERAS to improve the quality of the programme [14,15]. This allows patients to express their experience and minimize gaps in the service delivery. Periodical team meetings and reviewing the issues of the system is important to maintain high quality programme. High level of attendance and communication among team members remain positive predictors of a successful ERAS programme [19]. Overall, ERAS process allows continuous evolution of the system for optimal postoperative recovery.

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Main issues preventing post-surgical patients discharging from hospital are postoperative complications such as gut dysfunction, intravenous analgesics, low blood pressure and poor mobility. Key elements of ERAS address these complications and lower the risk of their occurrence [20]. Some elements of the ERAS are new to traditional surgical care such as bedside ultrasound to confirm gastric emptying in post colorectal surgery [21], use of Alvimopan fastens restorage bowel function [22] and single dose Dexamethazone lowers postoperative nausea vomiting [23]. Invariably postoperative recovery is expedited with these novel elements of the ERAS and length of stay is improved [19]. Continuous evolution of the system with new emerging evidences is another positive fundamental in the ERAS program. This explains its role in improving key performance outcomes of the system.

'Prehabilitation' is a new addition to the ERAS protocol. This includes an exercise program to improve functional reserve capacity of patients prior to the surgical procedure. Other elements of prehabilitation are nutritional support, mental wellbeing, social support, and medical optimization. There is substantial evidence that prehabilitation minimizes intraoperative cardio-pulmonary complications and expedite recovery post operatively [24]. Patients are well prepared to surgery through prehabilitation process with healthier understanding of their surgical journey and early recovery is achieved as defined in the ERAS protocol.

Other main reason for ERAS to be a successful process in optimizing post-operative outcomes is its evidence-based approach to multiple aspects of the surgical pathway [11]. This provides opportunity to access best available care to all patients undergoing major surgical procedures. Consistency of the program is also a positive feature towards superior postoperative outcomes. ERAS society collects literature and expertise opinions across the world and publishes protocol for multiple surgical procedures. These protocols are available for all surgical centres around the world. The society is a not-for-profit organization and does not charge for any of these guidelines. Compliance with the ERAS guideline is an outcome measure and it guarantees standard care to all patients. At the same time, ERAS protocol consists of an audit system to allow individual centres to assess their own performance. Main problems of the protocol are identified easily, and opportunity is available to communicate with other colleagues to understand the cause for these problems. The continuous quality review and improvement with

emerging evidences is another reason for achieving successful early recovery after surgery in ERAS program.

### Barriers to implement ERAS

Numerous studies, which looked at outcomes of ERAS, demonstrated positive results in functional recovery after surgical procedures. Cardio-pulmonary complications are reduced and overall length of stay, health care cost and mortality are declined with higher patient satisfaction in patients undergone surgical procedures through ERAS pathways [11-14]. However, there are multiple challenges in introducing a new protocol into routine surgical practice.

Successful ERAS system consumes significant staffing and resources. It also requires multidisciplinary team collaboration [17,19]. ERAS manager, allocation of clinical lead sessions, allied health staffing, data management services are some of the resource requirements. Most of the centres are concerned with the cost associated with introducing new surgical pathways, such as ERAS. Systematic review evaluated cost effectiveness of ERAS compared to standard perioperative pathways in colorectal surgery and demonstrated a cost reduction in ERAS with length of stay and morbidity [25]. However, data is lacking with regards to out of hospital expenditure for these patients discharged early from ERAS pathways. Patients requiring general practitioner reviews, readmissions, social support, out-patient allied health care are some of these hidden costs, which requires further research and auditing [26]. The cost effectiveness of the ERAS in smaller surgical centres are not well defined which is a challenge in rural and secondment units to implement the program.

As mentioned in previous sections, aim of the ERAS is to provide a bridge to fill gaps between different departments that surgical patients go through during their surgical journey [15]. (Figure 2) Nevertheless, it is not easy to maintain communication among these various departments, which have its own policies and guidelines. Familiarization of all departments involved in ERAS regarding the principles of the programme is time consuming. This was identified as another barrier to implement this protocol in surgical centres.

Implementation of ERAS requires surgeons' confidence on evidence behind its guidelines. However, there is no universal agreement among surgical specialities on ERAS elements. Specially some of the elements in colorectal surgery such as avoiding bowel preparation was argued by many clinicians [27]. There are individual surgeons'



preferences for particular procedures such as type of incision, laparoscopic vs open approach, post procedure thromboprophylaxis, postoperative feeding regimens, etc. It is challenging in most centres to overcome proceduralists' preferences despite evidence of beneficial outcomes with ERAS elements. Anaesthetist also plays a key role in ERAS protocol. Most of ERAS elements such as patients' preoperative preparation, intraoperative care, fluid management, pain management are governed by them [28]. Majority of anaesthetists are proactive with new evidence behind ERAs protocol. However, the departmental policies and centre related guidelines are required to optimize their involvement in the program. Physiotherapists, occupational-therapists, social workers, dieticians and psychologists are also important allied health team members of the program. Even these team members raised concerns about the complexity of the protocol which makes it harder to establish the protocol easily [29]. ERAS nurse manager or coordinator is the central link for the programme. Definition and responsibilities of ERAS coordinator is broad, and the capabilities of the role largely affect effective establishment of the program [17].

Surgical patients are encouraged to be discharged early in the ERAS program. This raises some concerns and affects patients' perception on the quality of surgical care. A Few patients reported persistent postoperative symptoms at the time of discharge home. Ongoing pain, Poor tolerance to food, lack of bowel function, fatiguability are some of those unresolved issues. On the other hand, most patients feedback was satisfactory on lower length of stay in hospital and overall long-term outcomes [30]. These factors adversely affect health administrations who attempt trialling the ERAS elements in their surgical services. Establishment of community support and services to follow up ERAS patients is a cost-effective option to overcome some of those patient concerns. However, establishment of these ambulatory services also add cost to the patients' care and further analysis is required to assess their suitability and cost effectiveness. At the same time, there is an ongoing criticism of higher readmission rates with ERAS pathways. A meta-analysis compared ERAS versus non-ERAS pathways for patients undergoing gastric surgery demonstrated greater readmission rates in ERAS cohort [31]. Another systematic study showed lower length of stay in similar surgical cohort but raised readmission rates [32]. These evidences negatively affect implementation of ERAS in surgical centres.

Nevertheless, there were data to support comparable readmission rates in ERAS compared to conventional perioperative pathways [33].

Significant proportion of older patients are undergoing major surgical procedures. Capacity of older patients to comply with ERAS elements to achieve same outcomes as younger patients is a concern. Adaptation to surgical stress response is altered in elderly accompanied by associated comorbidities. Surgical stress response can induce significant deconditioning in older patients which limits their ability to restore normal physiology post operatively [34]. At the same time, older patients underrepresent in most of the research studies. As a result, there is a hesitancy to adopt ERAS elements in these older frail patients during their surgical procedures [35]. However, recent randomized studies demonstrated similar outcomes and complications of older patients compared to young experience ERAS pathways [36,37].

Emergency procedures are essential sections in all surgical specialities which are often lifesaving. Most of the tertiary surgical centres have priority for trauma and emergency surgeries. At the same time Mortality and morbidity are higher with emergency procedures than electives. Emergency procedures have noticeably short preoperative periods and ERAS elements are difficult to apply in life threatening injuries. At the same time emergency surgical procedures are often individualized according to the injury [38]. There are only few studies which trialled ERAS in emergency surgeries. A prospective study demonstrated safe practice of ERAS elements in emergency colorectal surgeries [39]. Another randomized study applied ERAS in perforated peptic ulcer disease patients undergoing graham patch repair successfully [40]. Thus, little evidence is available in ERAS program for emergency surgeries. This is a barrier in acute surgical units in being interested in the ERAS program.

Establishment of a new ERAS program in a surgical centre requires a bunch of people who are interested in the concept with a clear vision. Leadership and constant effort are key factors for implementation of the ERAS knowledge into action. Situation analysis, strategic plan, implementation, and evaluation are other key components of the process. Barriers to establish a new programme includes lack of initiative to trial a new program in the current competitive and busy health care system. There are other political and financial threats, which are invariable hurdles implementing ERAS elements into surgical pathways.

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### Prospects of ERAS

The ERAS elements spread across multiple surgical specialities and speciality specific guidelines are evolving. Establishment of collaborative work is required among different surgical sub-specialities and colleges to develop such guidelines. The ERAS society plays a major role in communicating among interests' groups across the world. The ERAS program also supports a platform for prospective research and audits for continuous system improvement. Multiple elements of the program were evaluated in the literature for its safety and positive outcomes. Opportunity is available to investigate new elements which could be attached to ERAS guidelines. Emergency surgeries are less evaluated in ERAS due to its higher acuity and time constrains. Mortality and morbidity are higher in emergency surgical procedures [38]. There is a gap in evidences improving outcomes for patients undergoing emergency procedures. Further research is required to formulate evidence to establish ERAS program for emergency surgeries. Although most studies have focused on shorter-term postoperative outcomes and early recovery of ERAS protocol, there are long term benefits beyond 30 days post discharge [41,42]. There are limited studies that looked at longer-term outcomes of ERAS and further studies are required to confirm the beneficial effects to extended patient quality after ERAS protocol.

### Conclusion

It has been well studied in the literature that ERAS program is effective in optimizing postoperative care in patients undergoing major operative procedures. Rapid recovery after surgery is achieved in ERAS through multiple elements of novel concepts by lowering surgical stress response. It is an evidence based multimodal approach with expectation of lower length of hospital stay and complications postoperatively. However, implementing this program across surgical specialities is challenging. There are multiple, personal, institutional and ERAS program itself related barriers, to overcome establishing ERAS program in health care services.

### Declarations

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