

Anaesthesia in Fast Track Gastrointestinal Surgeries

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Abstract

Fast track surgery is a global healthcare package for the care of the patient in the peri-operative period. It consists of a multi-disciplinary team approach where several interventions of surgery, anaesthesia, nursing, nutrition and physical rehabilitation are simultaneously applied to expedite recovery. Other than surgical technique the cornerstone of a successful fast track program is anaesthesia delivery. By using the several interventions at the disposal of an anaesthesiologist there should be a reduction in the surgical stress induced on a patient. Each phase before, during and after surgery is targeted to employ techniques known to facilitate early recovery after surgery. The Anaesthesiologist-Surgeon partnership is crucial in effective peri-operative management of the patient. Understanding each one's role and places where their paths coincide is essential. The healthcare delivery system stands to gain a lot from the effective implementation of a fast track surgery program. Strict adherence to fast track principles has shown to be beneficial but there is scope of flexibility and individualisation. An appropriate fast track policy is one which is suited to meet local requirements and formulated with facilities that are locally available. Even though it has been demonstrated that fast track surgery is safe and effective there has not been across the board acceptance of all its aspects.

Keywords: Anaesthesia in Fast track surgery; Fast track surgery; Enhanced recovery after surgery; Fast track anaesthesia; Peri-operative management

Introduction

'Fast track surgery' also known as 'Enhanced Recovery after Surgery', 'Multimodal rehabilitation' or 'Ambulatory surgery' was first described in the 1990s by Professor Henrik Kehlet [1]. It is a package of comprehensive peri-operative care provided to the patient with the intention to expedite recovery. It involves the application of evidence based practices in the fields of surgery, anaesthesia, nutrition and physical therapy to the rehabilitation of the patient after surgery. The basic principle is to use a multimodal approach to reduce surgical stress. The belief is that there must be minimal disturbance to the patient's physiology while attempting to treat the pathology. Even though classically the principles of fast track surgery were described with regards to colorectal surgery it is being gradually adopted by various surgical specialties. There is enough evidence currently to suggest that fast tracking patients has better outcomes than were obtained by the practice of traditional peri-operative care regimens [2]. Early discharge and ambulation are achieved without a rise in complications or re-admissions after discharge [1,2].

Central to the idea of fast track surgery is a 'multi-disciplinary' team approach to patient care. The members of this team include surgeons, anaesthesiologists, nursing staff, nutritionists, physical therapists, medical social workers and patient educator/liaisons. It may include any other relevant person who has a stake in the well being of the patient. The surgeon is usually the head and convener of such a team. The team is responsible for the formulation and implementation of the fast track surgery policy at an institutional level. Policy is formed after a review of available literature regarding the best peri-operative

interventions in practice. Implementation of fast track surgery involves the formulation of a 'protocol' for patient care. The patient is made to go through a pre-designed protocol of various interventions before, during and after surgery. This helps to streamline patient care at institutional level. There must be a periodic review of this policy and protocol in light of changing evidence and /or according to the results of implementation of the protocol at the concerned institution.

The interventions carried out in this form of surgery may be divided into 3 groups: pre-operative, operative and post-operative. The interventions of a typical fast track gastrointestinal surgery are mentioned in, but may not be limited to [Table 1]. Each of the mentioned intervention has been proved to have beneficial effects, but when applied together the effect is compounded [1].

The anaesthesiologist is a key ally of the surgeon in the practice of fast track surgery and an important member of the multi-disciplinary team. Several of the interventions mentioned above are concerned with the specialty of anaesthesiology. The developments of newer drugs and anaesthetic agents that have favourable pharmacokinetic profiles have gone a long way in ensuring the success of fast track surgery. The judicious use of techniques of regional anaesthesia has helped facilitate early recovery. Post-operative analgesia and nausea-vomiting prophylaxis are key post-operative measures which affect recovery.

Literature Review

A thorough search of the Pub Med, Medline and Scopus databases was employed to adequately review anaesthetic considerations in fast track surgery.

Keywords that were input into the search engines included, "fast track surgery," "ambulatory surgery," "enhanced recovery after surgery," "anaesthesia" concerns in Fast track surgery and perioperative

“management” and anaesthesia. The results were then reviewed by title and abstract for relevance, with preference afforded to more recent manuscripts.

Discussion

The role of an anaesthesiologist in fast track surgery may be divided into separate phases in the peri-operative period.

Pre-operative phase

The first and probably the most important consideration in this phase is patient selection. The patient is usually evaluated by the anaesthesiologist at the request of the surgeon. There should be an evaluation of the existing organ function and any associated co-

morbid conditions. There is a reluctance to recruit elderly patients and those with co-morbidities (ASA grade 3 and 4) under a fast track surgery program. There is now evidence to suggest that such protocols are safe in the elderly and even those with severe co-morbidity [3]. There is also an opportunity to recognize patients who may benefit from measures like smoking cessation [4], beta-blocker therapy [5], nutritional support and appropriate glycaemic control. All of the above measures have been associated with better outcomes after surgery. It is very important to evaluate the physical fitness and advise a daily exercise regimen if possible to increase exercise tolerance. It has been shown to improve outcome after surgery [6]. Assuring adequate nutritional status and even a short period of pre-operative nutritional support has shown to be beneficial [7].

Pre-operative interventions	Operative interventions	Post-operative interventions
1. Evaluating existing health status	1. Pre-medications with appropriate drugs (like anxiolytics, anti-emetics, antacids, pro-kinetics, etc.)	1. Multi-modal Analgesia to achieve a state of minimal or no pain
2. Adequate nutritional support	2. Use of thoracic epidural Analgesia	2. Post-operative nausea and vomiting pharmaco-prophylaxis
3. Smoking cessation	3. Avoiding or selective use of nasogastric tube, urinary catheter or abdominal drains	3. Patient to be rendered tube/catheter/drain free as soon as possible
4. Exercise regime	4. Goal-directed fluid administration (preventing both over and under hydration)	4. Early enteral nutrition
5. Education regarding procedure and protocol	5. Maintaining intra-operative Normothermia	5. Enforced Ambulation
6. Minimal starvation time (2h-liquids and 6h-solids)	6. Surgical techniques (like Minimal tissue handling, Minimize operative time, Minimal access surgery)	6. Discharge when decided criteria met.
7. Pre-operative oral carbohydrate loading	7. Other measures like infiltration of wound site with local anaesthetic at end of surgery	7. Ensure follow-up
8. Avoiding mechanical bowel preparation.		

Table 1: Components of a typical fast track surgery protocol

Patient education is an important aspect of any comprehensive fast track surgery program. Preoperative patient education and preparation have positive effects on outcomes like pain, psychological distress, and indices of recovery, including hospital stay [8]. In the immediate pre-operative period minimal fasting 2 hours for liquids and 6 hours for solids has found to be safe [9]. Necessary precautions need to be taken for patients with gastric outlet obstruction, suspected intestinal obstruction and gastroparesis. Pre-operative oral carbohydrate loading has been shown to reduce catabolic response to surgery and modulate insulin sensitivity in the post-operative period. [10] Additional benefits include reduction of thirst, hunger and discomfort in the pre-operative period [11]. This may be given as a 100 g glucose-water solution before surgery [2].

Operative phase

This phase is probably the most crucial part of the patient’s hospital stay. The approach to anaesthesia for a patient in fast track surgery is multi-modal and should be aimed at reducing the surgical stress.

The pre-medication is used not only to relieve anxiety or provide sedation but also to modulate intra-operative hemodynamic parameters and attenuate post-operative side effects [12].

Benzodiazepines may be used as a sedative and anxiolytic agent. Fentanyl is the only opioid that has a suitable pharmacokinetic profile and used as a pre-medication in fast track surgery. Acetaminophen and cyclo-oxygenase-2 inhibitors may be used rectally up to one hour prior to surgery. This may have significant post-operative opioid sparing effects [13]. Glycopyrrolate is the anti-cholinergic agent suitable for use wherever indicated. Acid suppressive medication and/or prokinetic may be used as a single dose or multiple dose regimens before surgery. Post-operative nausea and vomiting prophylaxis is given in the form of injectible ondansetron or dexamethasone. Beta-blockers and alpha-2 agonists are adjuvants used in fast track anaesthesia. Beta-blockers when used in elderly patients undergoing non-cardiac surgery and patients with pre-existing coronary disease were shown to blunt the intraoperative rise in circulating catecholamines, provide hemodynamic stability during emergence from anesthesia and in the early postoperative period, and prevent perioperative cardiovascular events [4,14]. Additionally they have been shown to possess anti-catabolic properties and anaesthesia sparing effects which facilitate early recovery [15]. Alpha-2 agonists like clonidine when used as pre-medication have been shown to reduce post-operative nausea and vomiting as well as shorten duration of ileus [16].

The choice between general, regional or local anaesthesia used is subject to the discretion of the anaesthesiologist-surgeon team. The extent of surgical procedure, patient co-morbidity and expertise available should be taken into account while decision-making. General guidelines and benefits of each within a fast-track surgery program are mentioned below.

General anaesthesia

General anaesthesia, when used should allow for the patient to be ambulatory in the early post-operative period. Therefore naturally agents with shorter duration of action and favourable pharmacokinetics need to be used. Propofol has emerged as the agent of choice for induction [17]. Desflurane or Sevoflurane are used for maintenance and preferred over Propofol or Isoflurane as they are known to facilitate early recovery [18]. Nitrous oxide is avoided in surgeries over one hour in duration as it pre-disposes to post-operative nausea and vomiting. Among opioids fentanyl remains a popular choice. Remifentanyl, the ultra-short acting analogue may also be used. A multimodal analgesia with timely and judicious use of acetaminophen, NSAIDs, alpha-2 agonists, ketamine and local anaesthesia at wound have an opioid sparing effect [13,19]. Short to intermediate acting muscle relaxants are used as there may be no need to reverse them. Sugammadex is a novel agent that leads to rapid reversal of non-depolarising agents which may be used to hasten early reversal and extubation [20].

Regional anaesthesia

Regional anaesthesia may be used in place of general anaesthesia or adjuvant to it. Spinal anaesthesia when used as a standalone has the advantages that it preserves pulmonary function, reduces incidence of ileus and provides good quality of analgesia. Epidural Anaesthesia has a special place in fast track gastrointestinal surgery. It may be used alone or as an adjuvant to spinal or general anaesthesia. It causes a neuraxial blockade which is known to reduce the impact of surgical stress as well as reduce morbidity and mortality after surgery [21]. Epidural anaesthesia with local anaesthetic agents is known to reduce the endocrine and metabolic response to surgery, preserves pulmonary function after major abdominal and thoracic operations [22] and facilitates the return of bowel function. It has been associated with better preservation of peri-operative nutritional profiles, higher health-related quality-of-life scores, and improved exercise capacity after colon surgery [23]. In fast track surgery programs where epidural anaesthesia was used, it has helped to reduce the incidence of ileus and facilitated early discharge [24]. It may also be used as an effective analgesia in the post-operative period. Most of the benefits mentioned above are noticed when it is used as an infusion for at least 48 hours after surgery, but it may be delivered by a patient controlled device also. As an analgesic measure it has shown to be better than intravenous patient controlled analgesia [25].

Local anaesthesia

Infiltrating the operative site with local anaesthetic agent or the use of peripheral nerve blocks form an important part of any multimodal analgesia program. Wound pump devices may be used to provide a continuous infusion of a local anaesthetic at wound site post-operatively. Not only has it shown to contribute in the ability to perform ambulatory surgery [26] but it also leads to improved analgesia, reduces incidence of post-operative nausea and vomiting,

has greater patient satisfaction and is associated with shorter hospital stay [27].

The basic aim in the intra-operative period is to minimally alter the physiology of the patient. Several other measures are used to meet this goal, they are:

Maintenance of normothermia

There should be attempts to minimise loss of body heat as well as maintain core body temperature at normal level. Fall in body temperature is known to elicit a stress response. Shivering and vasoconstriction increases cardiovascular demands and oxygen consumption. The use of active and passive warming devices, warm intravenous fluids is recommended to maintain normothermia. This has been associated not only with reduced incidence of wound infection but also contributes to shorter hospital stay [28].

Fluid management

There is an increasing understanding that both under and over-hydration have detrimental effects on the patient's outcomes [29]. While under hydration might lead to decreased perfusion of the gut, over hydration leads to compromised oxygenation due to tissue edema. There has been a trend towards goal-directed fluid therapy in fast track surgery recently. It translates into fluid therapy which results only in minimally supra-normal cardiac index. This approach however warrants the use of monitoring devices which may be excessively invasive like pulmonary artery catheterization. A relatively lesser invasive method like intra-esophageal Doppler probe monitoring may be used to judge adequacy of fluid. Fluid should be given to meet with pre-decided specific target values of cardiac index. Such goal directed fluid therapy has shown to reduce hospital stay after major surgery [30].

Newer interventions that have recently been described in fast track literature are:

Intravenous lidocaine

The use of intravenous lidocaine (as a bolus at induction followed by an infusion for the first 24 hours) in patients undergoing colorectal surgery has shown to be associated with improved postoperative analgesia, fatigue, and facilitated earlier return of bowel function [31]. The role of lidocaine in the setting of fast track surgery however needs further research.

Alvimopan

Alvimopan is a peripherally acting mu-opioid receptor antagonist. When used in a fast track surgery setting it has shown to facilitate earlier recovery of bowel function and shorten hospital stay after abdominal surgery [32].

Post-operative phase

The main priority of the anaesthesiologist in this phase is to ensure analgesia and prevent post-operative nausea and vomiting. This is important as it has direct effect on other components of the program. It can be easily imagined that only a pain free patient will carry out early ambulation and early feeding will be possible only when there is no nausea or vomiting. All of the above components have a direct bearing on length of hospital stay.

Pain management

The approach to analgesia in fast track surgery is multi-modal. A relatively pain free state or presence of minimal pain is desirable and takes precedence over mode of analgesia. Pain is the single most important reason leading to delay in discharge in fast track surgery [33]. When an epidural catheter has been inserted it is used to deliver post-operative analgesia. In the absence of epidural catheters patient controlled analgesia with opioids may be used as effective analgesia. This has not been associated with increased hospital stay [34]. Even though opioids are very effective as analgesics in the post-operative period their side effects (acute opioid tolerance, hypoventilation, sedation, ileus, nausea and vomiting, and urinary retention) have resulted in limited enthusiasm in using them in fast track surgery. The use of NSAIDs, acetaminophen, ketamine, clonidine, dexmedetomidine, adenosine, gabapentine, dexamethasone, lidocaine, beta blockers and alpha-2 agonists has been advocated as they have opioid sparing effects. The dosages of all the drugs usually are according to standards practiced otherwise. Titration to achieve maximum analgesia is permitted as long as the drugs are given in amounts that are within safe limits and appropriate combinations.

Post-operative nausea and vomiting

Post-operative nausea and vomiting may produce unnecessary discomfort and anxiety in a patient who has undergone a major surgery. It hampers the institution of early post-operative feeding. Even though its actual incidence in fast track settings is not known rough estimates place incidence at 10-20%. It also has been noted as a reason to return to healthcare facility post-discharge in ambulatory surgery. [35] It has also shown to have a risk of aspiration and increases risk of suture dehiscence. A systematic review of the Cochrane Database revealed that the use of dexamethasone, ondansetron, droperidol, propofol (instead of volatile agents), ultra-short-acting narcotics, supplemental oxygen, and avoiding nitrous oxide all help reduce the incidence of post-operative nausea and vomiting [36]. A multi-drug and multi-modal approach yields better results.

Understanding where the paths of an anaesthesiologist and surgeon cross in a fast track surgery program is essential. For a comprehensive implementation of such a program it is essential that there is inter-disciplinary co-ordination. The steps involved in the planning and implementation of a fast track surgery protocol at an institutional level are shown in Figure 1. There is a need to understand the goals of a surgeon in the fast track surgery program and how anaesthetic interventions are likely to contribute in achieving them. The surgeon's responsibility in the pre-operative phase is to ensure proper patient selection, implement a pre-operative exercise and physical therapy regimen, advise cessation of smoking, avoid mechanical bowel preparation, give pre-operative oral carbohydrate loading and minimise 'nil by mouth' time. In terms of operative techniques there has been a focus on minimally invasive surgery. It is well known that laparoscopy is associated with a reduced surgical stress response [37]. The benefits include avoiding large painful incisions, preservation of pulmonary function and a reduced incidence of ileus [38]. There is an emphasis on selective rather than routine use of nasogastric tubes, urinary catheters and abdominal drains in the peri-operative period [2]. The presence of these tubes impedes early ambulation. [39] The surgeon should ensure that there is early enteral nutrition. It has been shown to reduce the incidence of anastomotic leak, wound and other infections, pneumonia, and mortality with an associated reduction in

length of hospital stay [40]. Enforced early ambulation in the post-operative period promotes a sense of well-being and is associated not only with an early discharge from hospital but also it was observed that patients who obeyed an enforced ambulation plan had reduced fatigue, normal sleep, earlier return to leisure activity and activities of daily living after discharge [41].

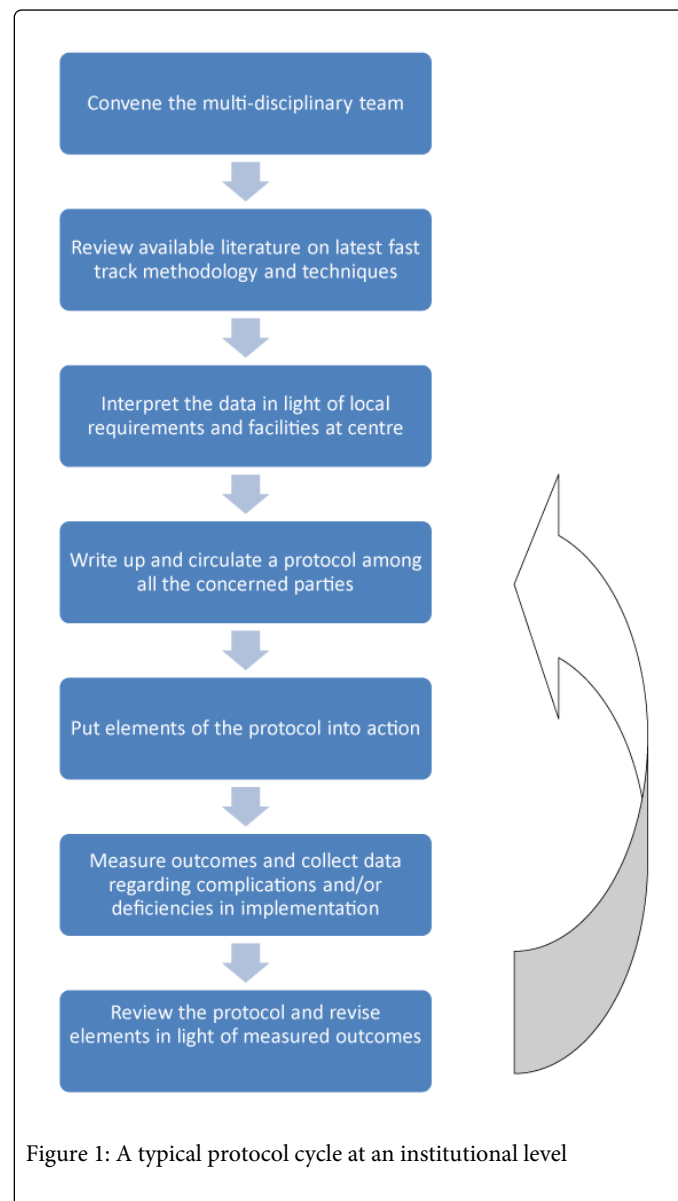


Figure 1: A typical protocol cycle at an institutional level

The outcome of implementing fast track surgery in clinical practice has been very encouraging. There has been a uniform reduction in the duration of hospital stay without concomitant rise in complications [24]. There are still considerable differences in the peri-operative care across hospitals across the world. There has not been a universal acceptance of all components of fast track surgery. Strict adherence to a fast track surgery program has shown to improve outcome and there may exist a dose response relationship between outcome and adherence to a protocol [42]. In spite of this there is a scope of individualisation and a protocol must be designed to suit local requirements at the concerned institute [43].

Conclusion

Fast track surgery is an idea that promotes early recovery after surgery by integrating modalities of therapy from the fields of surgery, anaesthesiology, nutrition, nursing and physical rehabilitation. The basic tenet is to reduce the impact of surgery on the patient's normal physiology. An anaesthesiologist is a key member of the multi-disciplinary team charged with the formulation and implementation of fast track surgery protocols at an institutional level. Understanding the components of fast track surgery and keeping abreast with ever-changing concepts and literature regarding fast track surgery is desirable for anyone who intends to be a fast track practitioner.

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