Enhanced recovery programme in colorectal surgery: a challenging approach

The enhanced recovery programme in colorectal surgery is an exciting and innovative new approach for pre- and postoperative management of surgical patients. It challenges some of the non-evidence-based practices and myths which have been entrenched in the minds of clinicians for decades.

There are considerable variations in the rates of recovery following major colonic surgery. Traditionally patients remain in hospital following surgery to be observed for any complications before they are nursed back to a level of self care before discharge. The postoperative hospital stay following major colonic surgery is 6–12 days. However, owing to the lack of evidence for most of the postoperative rituals and routines, practices vary widely throughout the world. After discharge from hospital following major abdominal procedures, patients experience postoperative fatigue which can last up to 3 months. Fatigue can slow recovery and return to the pre-surgical functional state. This may lead to psychological, social and economic strains for patients and their families.

The enhanced recovery programme is a multimodal rehabilitation programme which significantly reduces the postoperative hospital stay (Basse et al, 2000). Also known as fast track surgery, the enhanced recovery programme has been a revolutionary breakthrough in all disciplines of surgery. Professor Henrik Kehlet and his group in Denmark pioneered the concepts of multimodal surgical care with the first reports coming out in the 1990s.

The concept was mainly built around colo-rectal patients and incorporates the use of newer techniques in anaesthesia and surgery such as minimally invasive surgery, good pain control and aggressive postoperative rehabilitation. It also propagates the discontinuation of non-evidence-based practices such as routine use of bowel preparation before colorectal surgery, and the use of drains or nasogastric tubes. The combination of these techniques reduces the postoperative stress response and organ dysfunction thereby shortening the time needed for full recovery (*Figure 1*).

This review looks at the evidence and the key techniques which facilitate the enhanced recovery programme in the preoperative, intraoperative and postoperative periods in colorectal surgery (*Figure 2*). This review focuses mainly on colorectal surgery, but most of the techniques discussed are applicable to almost all disciplines of surgery. Kehlet and Wilmour (1992) proposed 15 fast track elements as listed in *Figure 2* which can be divided into pre-, intra- and postoperative techniques to enhance recovery.

Figure 1. Major components of the enhanced recovery programme.

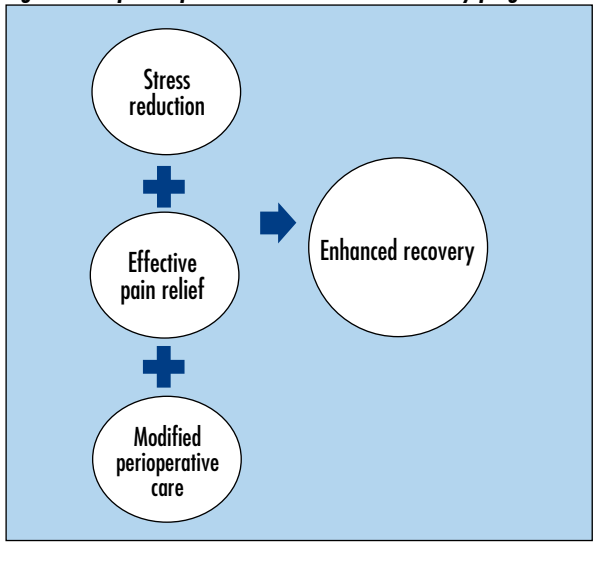
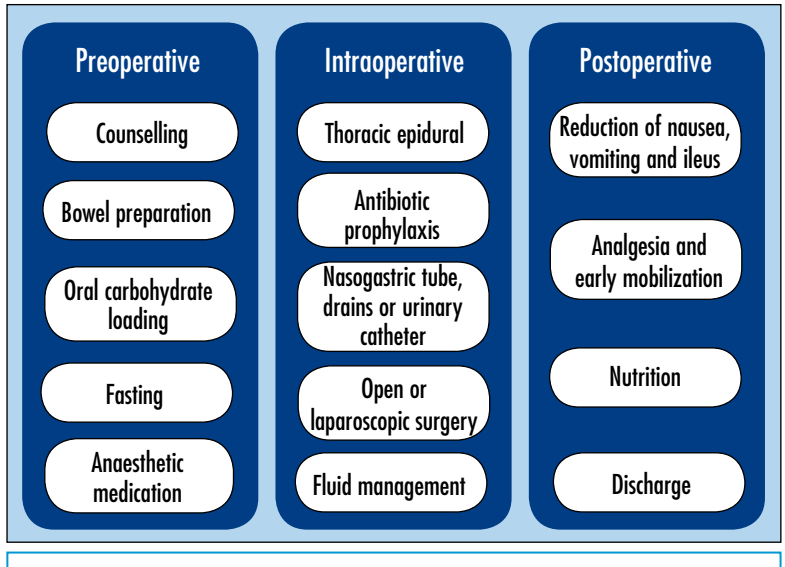


Figure 2. Key features of the enhanced recovery programme.



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Preoperative techniques to enhance recovery

Preadmission and counselling

Patients with significant comorbidities (cardiac disease, chronic obstructive pulmonary diseases, diabetes) are aggressively optimized before any proposed surgery. Cessation of smoking for at least 1–2 months reduces postoperative respiratory complications. Pre-existing conditions like anaemia and diabetes are corrected and tightly controlled up to and after surgery. This in turn reduces morbidity and enhances recovery in these patients. Explicit explanation regarding the procedure and the expectations encourages a speedy recovery and early discharge. Patients are given written information and a full explanation of the enhanced recovery programme. A diary of expected targets and goals post surgery is handed over to the patient who is encouraged to maintain a daily log of his/her targets. This is monitored by trained nursing staff postoperatively. Evidence suggests that preoperative information reduces anxiety and enhances postoperative recovery (Daltroy et al, 1998).

Bowel preparation

Mechanical bowel preparation has traditionally been regarded as an essential prerequisite for bowel surgery. However, it is known to cause prolonged postoperative ileus (Jung et al, 2007) thus increasing the risk of postoperative morbidity and prolonged hospital stay. There are also concerns about bowel preparation leading to dehydration and electrolyte imbalances especially in the elderly. There is growing evidence, contrary to popular belief, that mechanical bowel preparation increases the risk of anastomotic leaks (Bucher et al, 2005). Colorectal surgeons have always been wary of left-sided anastomotic leaks because of their disastrous consequences. However, a Cochrane review (Guenaga et al, 2005) did not find an increase in leak rates in 231 low anterior resection patients without bowel preparation. Patients in the enhanced recovery programme undergoing colorectal resection do not routinely receive oral bowel preparation. Patients with left-sided resections are given phosphate enemas on the day of surgery.

Fasting and oral carbohydrate loading

A lot of work has been carried out delineating the phenomenon of postoperative insulin resistance. This contributes to the postoperative catabolic state, reducing lean body mass and increasing the risk of postoperative complications such as wound infections and respiratory complications. Enhanced recovery programme patients are given a carbohydrate-rich drink the night before and 2–3 hours before surgery. This helps maintain an anabolic state, reducing nitrogen and protein losses and maintaining lean body mass (Nygren, 2006), which in turn leads to a shorter hospital stay and accelerated recovery.

Traditionally patients have been fasted from midnight the day before any major surgery to reduce the risk of pulmonary aspiration. Studies have shown that preoperative fasting of clear fluids up to 2 hours before surgery does not increase complications (Brady et al, 2003). Patients in the enhanced recovery programme are allowed clear fluids up to 2 hours before surgery and solids are permitted up to 6 hours preoperatively. A combination of carbohydrate loading and oral intake closer to the time of surgery reduces the insulin resistance, and preserves lean body mass and muscle strength. This also reduces preoperative anxiety, hunger and thirst helping with accelerated postoperative recovery.

Preanaesthetic medication

The enhanced recovery programme tries to eliminate any factors that will prolong recovery. Long-acting premedication, like opioids and sedatives, are replaced by short-acting anxiolytics to expedite postoperative mobilization and early feeding. Short-acting anxiolytics are also deemed to be helpful in placement of an epidural.

Intraoperative techniques to enhance recovery

Use of anaesthesia in enhanced recovery

In the enhanced recovery programme patient short-acting inhalational anaesthesia is preferred to total intravenous anaesthesia as it facilitates proactive recovery on the day of surgery. Shorter acting agents like propofol are used instead of long-acting intravenous opioids.

The use of epidural is still debated in the enhanced recovery programme for colorectal surgery. However, the use of a mid-thoracic (T7/T8) epidural intraoperatively is preferred because it has several perceived advantages: reduction in the dosage of intraoperative anaesthetic agents, blockage of stress hormone release and attenuation of postoperative insulin resistance. This level of epidural also helps with achieving sympathetic blockade which helps to reduce postoperative ileus. The epidural block is maintained with a local anaesthetic agent and low dose opiates, i.e. a combination of bupivicaine and fentanyl.

Open and laparoscopic surgery

The use of minimally invasive surgery has revolutionized several aspects of surgical care. It reduces the inflammatory response and immune dysfunction in the postoperative period.

Laparoscopic colorectal surgery also reduces postoperative paralytic ileus (Holte and Kehlet, 2000), causes less postoperative pain, early return of bowel function, early feeding and rapid mobilization; overall it shortens postoperative recovery time. Interestingly evidence suggests that laparoscopic colorectal surgery does not have any additional benefit when carried out in the setting of the enhanced recovery programme (Basse et al, 2005). There is no significant difference in terms of length of stay,

readmission rate and morbidity. The enhanced recovery programme also encourages the use of transverse incisions for open surgery as this may lead to less pain and better pulmonary function postoperatively.

Nasogastric intubation, drains and urinary catheters

One of the biggest changes in postoperative management of colorectal patients, propagated by the enhanced recovery programme, is refinement of non-evidence-based practices like the use of nasogastric tubes, abdominal drains and urinary catheters. A meta-analysis of 33 trials with more than 5000 patients confirmed that there was an increased incidence of atelectasis and pneumonia in patients with nasogastric tubes. Patients with nasogastric tubes had a slower return of bowel function compared to patients without one (Cheatham et al, 1995). Evidence also suggests that use of abdominal drains does not reduce the incidence or severity of anastomotic leaks in colonic surgery (Karliczek et al, 2006). The use of urinary catheters over 48 hours after colonic surgery is not beneficial in terms of reducing the risk of urinary retention. Enhanced recovery programme discourages the routine use of nasogastric tubes and abdominal drains, and urinary catheters are removed within 24 hours of surgery.

Intra- and postoperative fluid management

There is evidence to suggest that excess administration of salt and/or water can delay the return of normal gastrointestinal function (Lobo et al, 2002), leading to increased postoperative complications and prolonged hospital stay (Tambyraja et al, 2004). In postoperative colorectal patients it is important to maintain a balance between adequate tissue perfusion and fluid overload to avoid impaired wound and anastomotic healing. The use of transoesophageal ultrasound during surgery helps titrate fluids in relation to cardiac output, leading to a better ejection fraction, reducing the overall fluid overload and resulting in reduced hospital stay (Sinclair et al, 1997). Patients in the enhanced recovery programme with an epidural can experience hypotension both intra- and postoperatively as a result of vasodilatation leading to relative intravascular volume depletion. The judicious use of vasopressors in this situation instead of fluid administration can prevent excessive fluid loading. Enhanced recovery programme encourages stopping intravenous fluids on the first postoperative day. Patients are commenced on oral fluids 2 hours postoperatively.

Postoperative techniques to enhance recovery

Nausea, vomiting and postoperative ileus

Postoperative nausea and vomiting will result in delayed discharge and increased risk of postoperative morbidity. The use of epidural for pain relief plays an important role in avoiding postoperative nausea and vomiting. Antiemetics should be used selectively in these patients to avoid nausea and vomiting thus promoting early feeding and speedy postoperative recovery. A combination of dexamethasone, a serotonin receptor antagonist and metoclopromide are used at the induction of anaesthesia or at the end of surgery. Avoiding fluid overload during surgery and in the postoperative period is another major contributory factor towards preventing ileus which in turn reduces nausea and vomiting. Laparoscopic surgery, reduction in the routine use of opioids and early mobilization also helps reduce postoperative nausea and vomiting. Routine use of oral magnesium oxide enhances bowel mobility early in the postoperative phase.

Postoperative pain relief and early mobilization

Sufficient pain relief is a prerequisite for optimal recovery (Kehlet, 1999). Analgesic regimens based on opioids are not as efficient as epidural anaesthesia in providing pain relief and have fewer beneficial effects on the surgical stress response (Marret et al, 2007). Opioid sparing also reduces nausea, vomiting and sedation. Early mobilization after major surgery can be accomplished by using epidural or other local anaesthetic techniques rather than opioids, as this reduces opioid-related side effects enabling early recovery and mobilization (Kehlet et al, 1996). Spinal and local anaesthetic blocks such as transverse abdominis plane blocks, and the use of non-steroidal anti-inflammatory drugs are opioid sparing in addition to providing good pain relief. The use of intravenous paracetamol after removal of the epidural reduces opioid requirement and related side effects.

One of the concerns highlighted with the use of epidural anaesthesia in colorectal surgery is the reduction of the splanchnic perfusion as a result of changes in mean arterial pressure, as this can impair the blood supply to the anastomosis. As mentioned before, judicious use of vasopressors in this scenario can help alleviate the situation.

An optimal regimen could comprise continuous mid-thoracic epidural with local anaesthetic in combination with an opioid used for the first 48 hours. Paracetamol is given throughout the postoperative period. Following removal of the epidural, patients are commenced on non-steroidal anti-inflammatory drugs.

Adequate pain relief plays a vital role in early mobilization of the patient. Enhanced recovery programme patients are given a daily list of activities and tasks to do to help with early mobilization. Bed rest increases insulin resistance and muscle loss, in addition to decreasing muscle strength, pulmonary function and tissue oxygenation (Kehlet and Wilmore, 2002). It also increases the risk of thromboembolism. Therefore it is important to encourage patients to mobilize from the day of surgery. It is recommended that patients are mobilized for 2 hours on the day of surgery and thereafter for 6 hours a day.

Early postoperative feeding

Evidence from randomized controlled trials (Anderson et al, 2006) has clearly demonstrated that there is no advantage to keeping patients nil by mouth after conventional gastrointestinal surgery. Patients who start enteral nutrition in the immediate postoperative period have minimal nitrogen losses, helped by the reduction in insulin resistance. The combination of preoperative carbohydrate loading, epidural anaesthesia and early enteral nutrition maintains nitrogen equilibrium without hyperglycaemia (Soop et al, 2004). There is also earlier discharge, a reduction in postoperative infection and no increase in anastomotic leaks. The enhanced recovery programme recommends that patients should be started on oral food intake within 4 hours of surgery and should take oral nutritional support from the day of surgery until they commence a normal diet.

Discussion

Although there is robust evidence about the superiority of all the individual components of the enhanced recovery programme compared to their traditional counterparts, there is now enough data to suggest that when combined, these elements enhance and expedite recovery. Data from all around the world has shown a 3–4-day reduction in the length of stay following the enhanced recovery programme after major colorectal surgery. In a cohort study (Teeuwen et al, 2010) enhanced recovery programme patients were compared with historical controls and had reduced morbidity and length of hospital stay compared to non-enhanced recovery programme patients. In a meta-analysis of four randomized controlled trials, Eskicioglu et al (2009) concluded that patients in the enhanced recovery programme group had a shorter length of stay and a reduced chance of developing postoperative complications. The latest meta-analysis by Varadhan et al (2010) includes six randomized controlled trials with a total of 541 patients. The results still favoured reduced length of stay and less morbidity in the enhanced recovery programme group. No difference in readmission rates and mortality has been reported.

KEY POINTS

- The enhanced recovery programme challenges traditional practises such as 'nil by mouth' and bowel preparation for major colorectal surgery.
- Evidence suggests that the enhanced recovery programme enhances patient comfort and reduces pre- and postoperative anxiety.
- Length of hospital stay after major bowel surgery is reduced from 7–10 days to 3–5 days.
- The enhanced recovery programme empowers patients and encourages them to take charge of postoperative nutrition and early mobilization.
- The Department of Health fully endorse the enhanced recovery programme and pilot sites are up and running with a view to national implementation.

The advantages of the enhanced recovery programme are obvious in terms of reduction in the number of inpatient hospital days. The Department of Health is keen for the enhanced recovery programme to be implemented across the country. Various innovation sites (NHS trusts) have been chosen across the country to roll out the enhanced recovery programme. The plan is for wider implementation over a few years as it will take some time for health professionals and patients to get used to this new way of managing postoperative care.

Conclusions

The enhanced recovery programme has developed in leaps and bounds over the years and is now widely accepted in colorectal surgery. Patients undergoing the enhanced recovery programme are spared the undue stress of being starved before and after surgery. Practices like bowel preparation and postoperative nasogastric tubes are discouraged, increasing patient comfort and enhancing recovery. Correct and timely use of preoperative intravenous antibiotics, prevention of thromboembolism with low molecular heparin products and avoidance of intraoperative hypothermia is also part of the enhanced recovery programme.

Adequate pain relief is a contentious issue in the enhanced recovery programme. Although mid-thoracic epidural provides good analgesia it has its own pitfalls such as hypotension, technical failure in about half the patients and difficulty in mobilizing. Therefore currently there is debate about other forms of analgesics. The enhanced recovery programme will not only benefit patients in terms of early recovery, it will also help reduce waiting times for many other patients with malignant and debilitating benign diseases. **BJHM**

Conflict of interest: none.

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