9. Postoperative Management

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The Problem

- Postoperative care of the colorectal patient is focused on decreasing morbidity, mortality, and health-care costs.
- An estimated 161,000 Medicare patients undergo major intestinal surgery in the USA annually at a cost of 1.75 billion dollars.
- The average patient remains in the hospital 10.3 days after colorectal surgery, costing approximately $1,055/day.
- Advances and standardization of postoperative care have reduced perioperative morbidity and mortality.
- Estimates of overall morbidity are 24.3 % following colorectal surgery, with the incidence of serious morbidity including organ space surgical site infection, pulmonary embolism, and septic shock at up to 11.4 %.
- Recent NSQIP data estimates mortality at 1.4 % for elective procedures and 15.8 % for emergency colon and rectal surgery.
- Although some costs and complications are unavoidable in postoperative care, a substantial percentage results from prolonged hospitalization, complications including surgical site infections, postoperative ileus, and venous thromboembolic events.
- Numerous studies demonstrate that most patients can safely leave the hospital within 3–5 days following colon and rectal surgery without increasing rates of complications or readmission.

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- By decreasing the length of hospital stay, postoperative complications, and postoperative ileus, clinicians have the potential to save millions of healthcare dollars annually, as well as accelerate the recovery of patients after major surgery.

Standardized Fast-Track Protocols or Enhanced Recovery Pathways

- Standardized fast-track or enhanced recovery protocols have the ability to substantially reduce length of stay.
- Generally, patients with stable vital signs are deemed ready for discharge when ambulating, tolerating enteric nutrition, and pain is well controlled with oral analgesia and adequate discharge care (home or transitional facility) is available.
- In 2005, average length of stay following colectomy was 10.6 days. Using multimodal, enhanced recovery, or fast-track protocols, length of stay has dropped to a mean of 4–5 days in many series and as short as 2.5 days in the hands of some authors.
- Overall, 11 of 13 programs demonstrated a significant decrease in length of stay when compared to conventional care; 3 also found a decrease in complication rates. None of the studies documented an increased risk of negative outcomes in the clinical pathway group when compared to standardized protocol patients.
- Length of stay was significantly decreased in fast-track protocols (1.56–2.35 days shorter), and overall morbidity rates favored fast-track protocols.
- Meta-analysis has failed to show a significantly higher rate of readmission for fast-track protocols (RR = 1.17, 95 % CI 0.73–1.86). In addition, total hospital stay was analyzed including readmission in several studies and was still found to be approximately 2.5 days shorter than patients on conventional protocols.
- Data on increased use of posthospital services at time of discharge are scant.
- Implementing a fast-track protocol is not simple. Most fast-track protocols incorporate 8–12 elements, with ranges varying from 4 to 20 elements (Table 9.1).
- In a study center familiar with the fast-track protocol, the percentage of patients discharged upon meeting criteria was 66 % versus less familiar centers where only 26 % of patients were immediately discharged ($p < 0.001$).
- Many studies have now analyzed the cost-effectiveness of fast-track protocols.
- The mean cost per hospital stay was \$19,997.35 ± \$1,244.61 for patients in the historical control group, \$20,835.28 ± \$2,286.26 for those in the simultaneous control group, and \$13,908.53 ± \$1,113.01 for those in the enhanced recovery group ($p < 0.05$ vs. other groups).

Table 9.1 University Hospital Case Medical Center-enhanced recovery protocol guidelines

Day before surgery
1. Protein/glucose drink
2. Bowel prep as directed
3. Ibuprofen 800 mg tid
Preoperative holding area
1. Gabapentin 600 mg po 1–2 h prior to induction
2. Alvimopan 12 mg po 1–2 h prior to induction
3. Thromboprophylaxis low-dose unfractionated heparin 5,000 U SC
4. Antibiotics prior to induction 30–60 min prior to induction
Postanesthesia recovery unit
1. Morphine PCA for all patients
2. DC antibiotics unless therapeutic indication
Nursing floor – general orders
1. CBC, BMP POD #1, 3 unless otherwise indicated
2. Ambulate in hallway 5 times/day
3. Sit out of bed 4–6 h/day
4. Foley removed POD#1 if laparoscopic, POD#2 if open
5. Heplock IVF POD#1 if laparoscopic, POD#2 if open
Nursing floor – dietary orders
1. Clear liquids as tolerated
2. Protein/glucose drink 1 can BID
3. Soft diet POD#1 if laparoscopic, POD#2 if open
4. Chewing gum 1 stick TID × 60 min
Nursing floor medication orders
1. Gabapentin 300 mg po TID while in hospital
2. Alvimopan 12 mg po BID Å~7 days while in hospital
3. Ketorolac 15 mg IV Q6 h Å~72 h while in hospital
4. Ibuprofen 800 mg TID while in hospital
5. Heparin 5,000 U SC TID while in hospital. This may be continued following discharge in high-risk patients
6. Lactulose 10 mL po BID
Nursing floor – oral analgesia
1. Transition to oral analgesia – POD#1 if laparoscopic, POD#2 if open
2. DC PCA
3. Acetaminophen #3 1–2 pills po q4–6 h, first dose 30 min prior to stopping PCA
4. Hold morphine except break through pain

The above guidelines should be modified as clinically appropriate and do not replace clinical evaluation and experience
POD postoperative day, *PCA* patient controlled analgesia

- After implementation of a fast-track protocol, length of stay was reduced from 6.6 to 3.7 days ($p < 0.001$), and costs were reduced from \$9,310 ± \$5,170 to \$7,070 ± \$3,670 ($p = 0.002$).
- Kariv et al. looked exclusively at patients undergoing ileal pouch anal anastomosis and found shorter hospital stays (4 days vs. 5 days) ($p = 0.012$) and lower direct 30-day costs reduced from \$6,672 to \$5,692 ($p = 0.001$).

Fluid Management

- Postoperative fluid management is complicated by perioperative changes in homeostasis, and appropriate fluid management is essential to optimizing postoperative care.
- Basic fluid requirements are approximately 2,500 cc/day in a 70 kg adult. This allows for both insensible losses from respiration, perspiration, and feces as well as the 1,500 cc of urine necessary to excrete waste products including urea, potassium, and sodium.
- A basic formula for calculating fluid needs is 1,500 cc for the first 20 kg and 20 cc/kg for the rest of the weight.
- After surgical stress, there is an increase in renin, aldosterone, and antidiuretic hormone release and activation of the sympathetic system resulting in sequestration of fluid (third spacing) and increased volume requirements.
- Additional losses may occur from evaporation from exposed abdominal cavity, blood loss, diarrhea, nasogastric tubes, and abdominal drains; each of these must be accounted for.
- In recovering patients, fluid retention begins to resolve with a return of the hormones and sympathetic nervous system toward normal in approximately 72 h.
- Data have shown that insufficient perioperative fluid resuscitation increases the risk of hypotension, inadequate tissue perfusion, and renal failure.
- Over-resuscitation is associated with hypoalbuminemia, delayed gastrointestinal recovery, pulmonary complications, and increased cardiac demand.
- Transesophageal Doppler monitoring has been used to guide resuscitation. Monitoring of ejection fraction and stroke volume aids in assessing oxygen tissue delivery.
- Optimization of stroke volume as determined by Doppler is compared with typical postoperative hemodynamic parameters such as urine output, heart rate, and blood pressure.
- Several studies have shown reduced postoperative gastrointestinal and overall complications and earlier return of bowel function.
- Resuscitation with colloid versus crystalloid did not further improve length of stay.
- The rate of anastomotic leaks was not increased in the study groups.
- Three studies demonstrated a statistically reduced postoperative length of stay by 1.5–2 days confirmed in two separate meta-analyses in favor of Doppler-guided resuscitation.

Postoperative Gastrointestinal Recovery: Nausea, Vomiting, Feeding, Gum Chewing, and Ileus

Postoperative Nausea and Vomiting (PONV)

- Approximately 25 % of patients experience PONV within 24 h.
- Among high-risk patients, the incidence may be as high as 70–80 %.
- PONV delays recovery of patients after inpatient surgery and accounts for a significant proportion of unanticipated hospitalizations following ambulatory surgery.
- Consensus guidelines for managing PONV highlight patient, anesthetic, and surgical risk factors as listed in (Table 9.2).
- Instruments that predict PONV have been validated with a high level of correlation to patient outcome.
- Among the simplest is the Koivuranta score (Table 9.3), which uses only the five strongest risk factors – female gender, previous PONV, duration of surgery, history of motion sickness, and nonsmoking status – as predictors of PONV.
- Prevention of PONV is centered on reducing anesthetic and surgical risks while appropriately adding pharmacologic prophylaxis.
- Use of regional anesthesia, minimization of narcotics, and avoidance of nitrous oxide and volatile anesthetics have efficacy in reducing PONV.
- Propofol induction, increasing hydration, and use of supplemental oxygen are associated with reduction in risk in patients undergoing colorectal surgery.

Table 9.2 Risk factors for postoperative nausea and vomiting

Patient-specific risk factors
1. Female sex
2. Nonsmoking status
3. History of PONV/motion sickness
Anesthetic risk factors
1. Use of volatile anesthetics
2. Nitrous oxide
3. Use of intraoperative or postoperative narcotics
Surgical risk factors
1. Duration of surgery
2. Type of surgery

Adapted from Gan TJ. Risk factors for postoperative nausea and vomiting. Anesth Analg. 2006;102:1884–98

PONV postoperative nausea and vomiting

Table 9.3 Koivuranta score II for evaluation of postoperative nausea and vomiting

Scoring: Patient risk is calculated based on cumulative number of risk factors.
Risk factors:
Female gender
Previous PONV
Duration of surgery over 60 min
History of motion sickness
Nonsmoker

# of risk factors	Risk of nausea (%)	Risk of vomiting (%)
0–1 factor	17–18	7
2 factors	42	17
3 factors	54	25
4 factors	74	38
5 factors	87	61

Adapted from Koivuranta M, Laara E, Snare L, Alahuhta S. A survey of postoperative nausea and vomiting. Anaesthesia. 1997;52:443–9
PONV postoperative nausea and vomiting

- Many pharmacologic therapies for PONV are familiar to the colorectal surgeon. 5-HT_3A agents such as ondansetron, granisetron, and tropisetron are often chosen as first-line treatment. They are generally effective (NNT 5–7) with a favorable side effect profile which includes headaches, increased liver enzymes, and constipation.
- Typical dose of ondansetron is 4 mg IV every 8 h, but this may be doubled for increased efficacy.
- Steroids have also been shown to be effective, particularly if administered prior to induction. Dexamethasone is generally administered as a single dose intravenous of 8–10 mg, although doses as low as 2.5 have been found to be effective (NNT = 4).
- Side effect profile is more concerning to surgeons and includes wound infection and adrenal suppression, but these effects have not been reported after a single bolus dose.
- Droperidol was commonly administered at the end of surgery in doses of 1 mg IV with good effect (NNT = 5), but an FDA "black box" warning recently issued has diminished enthusiasm for this antiemetic.
- Acupuncture has been demonstrated to reduce the incidence of PONV when compared to placebo (23 % vs. 41 %, $p = 0.0058$).
- Economic and emotional costs of nausea and vomiting are often weighed against the cost of therapy. PONV prophylaxis was not found to be cost-effective in patients whose risk of nausea or vomiting are less than 20 %.
- Algorithms for management of PONV are well established.
- Patients should be assessed preoperatively for risk of PONV and if found to be low risk, no prophylactic dosage is generally given. A rescue dose of 5-HT_3A, such as ondansetron, may be given if the patient experiences PONV after emersion.

- Patients deemed to be at moderate to high risk of PONV are generally treated empirically. Monotherapy agents such as use of dexamethasone, droperidol, or ondansetron may be used, or combination therapy of multiple agents can be employed when deemed appropriate.

Early Refeeding and Use of Nasogastric Tubes

- Nasogastric tubes are associated with increased atelectasis and pneumonia and gastroesophageal reflux
- A recent meta-analysis demonstrated earlier return of bowel function after colonic surgery without a routine use of nasogastric tube.
- Early refeeding is believed to stimulate propulsive activity, decrease intestinal gut mucosal permeability, and induce secretions of gastrointestinal hormones to promote bowel motility.
- Feeding patients promptly after surgery is associated with decreased rate of infections (RR = 0.72, $p = 0.036$), and shorter length of stay (RR = 0.84, $p = 0.001$), but an increased risk of vomiting after surgery (RR = 1.27, $p = 0.046$).
- Approximately 5–15 % of patients will develop substantial postoperative ileus requiring return to NPO status or nasogastric decompression, but most patients tolerate early feeding without complications.
- For the majority of patients who tolerate early refeeding, decreased complications, earlier discharge, and patient comfort are significant benefits.
- Postoperative hyperglycemia and insulin resistance have been proposed as independent factors increasing hospital stay.
- Preoperative fasting of 8–12 h can deplete available carbohydrate reserves and promote a fasting metabolism.
- Administration of a preoperative carbohydrate drink does not increase risk of aspiration or complications on induction.
- A carbohydrate-rich drink, given the evening before surgery and 2–3 h prior to surgery, has been shown to significantly reduce patient thirst and hunger and improve well-being while also decreasing the loss of muscle mass postoperatively and significantly reducing length of stay by 1.2 days ($p < 0.02$).

Treatment and Prevention of Ileus

- Postoperative ileus is defined as the "transient cessation of coordinated bowel motility after surgical intervention, which prevents effective transit of intestinal contents and/or tolerance of oral intake."
- The average time until recovery of bowel function after major abdominal surgery is less than 24 h for the small intestine, 24–48 h for the stomach, and 48–120 h for the colon.
- In general, ileus should resolve within the fifth postoperative day after open surgery and by the third postoperative day after laparoscopic surgery.

- Failure to resume gastrointestinal function has many adverse effects including increased postoperative pain, nausea and vomiting, poor wound healing, delay in postoperative mobilization, increase in deconditioning, pulmonary complications and nosocomial infections, prolonged hospitalization, decreased patient satisfaction, and increased health-care costs.
- Health Care Financing Administration data estimates that postoperative ileus occurs in approximately 14.9 % of patients following large bowel resection and up to 19.2 % after small bowel resection.
- It is estimated that the total health-care cost of postoperative ileus is approximately $1.14 billion dollars annually or 6.24 % of all health-care costs in the USA.
- The average length of stay of patients with postoperative ileus is almost doubled to 11.5 from 6.5 days for patients without postoperative ileus.
- To reduce the incidence and duration of postoperative ileus, multiple pharmacologic interventions have been attempted.
- Newer drugs have been designed to selectively block peripheral (mu) μ-opioid receptors that contribute to postoperative ileus (POI).
- The ideal POI treatment is a peripheral opioid receptor antagonist that reverses GI side effects without crossing the blood–brain barrier and therefore is unable to compromise postoperative analgesia.
- Two novel peripheral (mu) μ-opioid receptor antagonists have been studied in patients undergoing abdominal and pelvic surgery.
- Alvimopan is a peripherally active (mu) μ-opioid antagonist, with affinity for human (mu) μ-opioid receptors and an active metabolite that appears to be absorbed systemically.
- Alvimopan speeded overall GI-2 (tolerance of solid food and first bowel movement) recovery by 12 h and accelerated time to discharge order ($HR = 1.35$, $p < 0.01$).
- Alvimopan has not been shown to have an increase in adverse event rates or complications.
- The first dose of 12 mg should be given orally prior to surgery, and continued 12 mg BID for 7 days, or until discharge.
- Alvimopan is contraindicated for patients on chronic opioids, with bowel obstruction or severe hepatic or renal disease.

Use of Gum Chewing

- Gum chewing has also been proposed to decrease the incidence of postoperative ileus.
- Chewing stimulates the cephalic phase of digestion and serves as a form of sham feeding stimulating neural and hormonal pathways.
- Mastication and salivation increase vagal cholinergic stimulation and promote the release of gastrointestinal hormones such as gastrin, neurotensin, and pancreatic polypeptide.

- Cephalic stimulation is accomplished without oral intake, thereby theoretically avoiding complications of food intolerance, which may occur in up to 20 % of patients after early oral intake.
- At least five meta-analyses on gum chewing exist in the literature, all of which demonstrate a statistically significant reduction in time to flatus and defecation. Cumulative time to flatus and defecation was reduced by as much as 20 and 29 h, respectively.

Early Ambulation

- Direct benefits of ambulation on postoperative gastrointestinal recovery are inconclusive.
- Early ambulation appears to be correlated with reduced postoperative respiratory and hematologic complications but may not have a direct effect on recovery of bowel function. Additional benefits include preservation of strength and conditioning.
- Ideally, patients ambulate on the evening of surgery. To accommodate early ambulation, lines and tubes are minimized after surgery. Foley catheters are removed by postoperative day 1 for laparoscopic surgery or day 2 after open surgery. Drainage catheters are not routinely left in place after surgery.
- By postoperative day 1, patients are encouraged to walk a minimum of 60 m and spend 5 or more hours out of bed.

Prevention of Pulmonary Complications

- Pulmonary complications are well established after surgery.
- Delayed ambulation has been directly correlated with worsening pulmonary function. Pain appears to be a factor in both ability to ambulate and pulmonary toilet.
- Appropriate pain control can be essential in moderating diminished lung capacity.
- Earlier return of forced expiratory volumes was one of the first benefits demonstrated from laparoscopic surgery. Several studies have demonstrated early recovery of pulmonary function as evidenced by incentive spirometry.
- Although all patients are at risk for pulmonary complications, there appear to be groups who are particularly susceptible.
- High-risk patients include those with chronic obstructive pulmonary disease, age greater than 60, American Society of Anesthesiologist (ASA) class II or greater, and cardiac failure. Emergency surgery, general anesthesia, abdominal surgery, and procedures longer than 3 h in length all further increase risk.
- Patients deemed high risk of complications benefit from deep breathing exercises or incentive spirometry, and the selective use of nasogastric tubes, though no single intervention was statistically superior.

- Preoperative smoking cessation may not be advantageous. Data regarding postoperative benefits of preoperative smoking cessation is generally inconclusive but appears to be most beneficial for patients who quit 4–6 weeks before surgery.
- Patients who quit smoking within 2 months of surgery may have a paradoxical increased risk of postoperative pulmonary complications, possibly from increased mucous production.

Prevention of Venous Thromboembolism

- Colon and rectal surgery patients are at risk for deep venous thrombosis (DVT) and pulmonary embolism (PE). Estimates are that between 20 and 40 % of patients undergoing abdominal surgery will experience DVT and 2–4 % will develop a pulmonary embolism.
- Fatal pulmonary embolism occurs in up to 1.0 % of hospitalized patients and accounts for 10 % of hospital deaths, making it the most common preventable cause of hospital death in the USA.
- Colon and rectal surgery patients often have multiple risk factors for venous thromboembolism (VTE), listed in Table 9.4, including diagnoses such as cancer or inflammatory bowel disease, advanced age, and prolonged surgical procedures.
- Patient risk should be stratified preoperatively, and use of prophylactic regimens including elastic stockings, mechanical sequential compression devices (SCDs), and pharmacologic agents should be employed.

Table 9.4 Risk factors for venous thromboembolism

Surgery
Trauma (major or lower extremity)
Malignancy
Cancer therapy (hormonal, chemotherapy, radiotherapy)
Previous venous thromboembolism
Increasing age
Pregnancy/postpartum
Estrogen-containing oral contraceptive/hormone therapy/modulation
Acute medical illness
Heart/respiratory failure
Inflammatory bowel disease
Nephrotic syndrome
Obesity
Smoking
Varicose veins
Central venous catheterization

Modified from Geerts WH, Bergqvist D, Pineo GF, et al. Prevention of venous thromboembolism. Chest 2008;133:381S–453S

Elastic Stockings and Sequential Compression Devices

- Elastic stockings and SCDs are mechanical methods of increasing venous outflow and reducing stasis in leg veins to decrease the risk of DVT.
- Graduated compression stockings function purely on a mechanical level to encourage venous return. SCDs are also believed to systemically increase the fibrinolytic activity by reducing plasminogen activator.
- For maximal benefit in patients undergoing surgery, elastic stockings or SCDs should be placed before the induction of anesthesia and function throughout the operation.
- Data on the effectiveness of elastic stockings and SCDs is limited. Both methods have demonstrated efficacy in reducing the risk of DVT, but neither have been shown to decrease the incidence of PE.
- Several factors limit the effectiveness of SCDs and elastic stockings including poor compliance, poor fit, and arterial insufficiency.

Low-Dose Unfractionated Heparin

- Unfractionated heparin has been used as a form of DVT prophylaxis since the 1970s and has been shown to be safe in the majority of surgical patients. It binds to antithrombin (ATIII) and accelerates the inhibition of thrombin and other coagulation factors, particularly factor X. Typically, pTT will be unchanged despite use of unfractionated mini-dose heparin. Heparin can be reversed with use of protamine. Recommendations are that the initial dose of low-dose unfractionated heparin (LDUH) be given 1–2 h preoperatively. Although the standard dosing regimen is 5,000 U subcutaneously every 8–12 h postoperatively, no study has compared dosing regimens directly.

Low-Molecular-Weight Heparin

- Compared to LDUH, LMWH has a longer half-life and may not be reversed with protamine infusion. The incidence of HIT is also lower than LDUH (2.7 % vs. 0 %). Dosing regimens for LMWH are varied. In Europe, LMWH (enoxaparin) is typically dosed 20–40 mg daily. Americans tend to prefer a 30 mg BID dosing.
- LMWH is at least as effective as LDUH in preventing DVT in postoperative general surgery and colorectal surgery patients.

VTE Prophylaxis and the Use of Epidural Analgesia

- A rare but potential complication of spinal or epidural analgesia is the risk of bleeding into the spinal canal or epidural space. This may result in spinal cord ischemia and paraplegia in patients. Risk factors for the development of hematoma include high level of anticoagulation and continuous use of epidural.

Duration

- Although thromboprophylaxis is traditionally terminated at the time of discharge from the hospital, the risk of DVT and PE continues.

Prophylactic Perioperative Antibiotics

- Significant literature has focused on the use of perioperative antibiotics for colorectal surgery. Surgical site infections account for 14–16 % of all hospital-acquired infection.
- Although patients who received antibiotics were less likely to develop surgical wound infections when compared to placebo (RR = 0.30, 95 % CI 0.22–0.41), there was no difference for short-term versus long-term prophylaxis (RR = 1.06, 95 % CI 0.89–1.27).
- Guidelines for perioperative antibiotics have been formalized by the Surgical Care Improvement Project, a partnership of organizations including the Centers of Medicare and Medicaid services (CMS) and US Centers for Disease Control.
- Currently, there are five recommendations relevant to prevention of surgical site infections in colorectal patients (see Table 9.5). Antibiotics should be given within a 60 min window of incision and within 2 h when using vancomycin or fluoroquinolones.

Table 9.5 Consensus recommendations of the surgical infection prevention guidelines for colorectal surgery

1. Antibiotic should be received within 1 h of surgical incision
2. Prophylaxis antibiotic should be discontinued within 24 h of surgical completion
3. Proper hair control (no clippers or hair removal)
4. Maintenance of normothermia in colorectal surgery patients
Oral antimicrobial prophylaxis
Neomycin + erythromycin
Neomycin + metronidazole
Parental antimicrobial prophylaxis
Cefotetan, cefoxitin
Ampicillin-sulbactam
Ertapenem
Cefazolin/cefuroxime + metronidazole
Parental antimicrobial prophylaxis with β-lactam allergy
Clindamycin + aminoglycoside
Clindamycin + quinolone
Clindamycin + aztreonam
Metronidazole + aminoglycoside
Metronidazole + fluoroquinolone

Adapted from material prepared by Stratis Health and the Oklahoma Foundation for Medical Quality, the Quality Improvement Organization Support Center for Patient Safety, under contract with the Centers for Medicare & Medicaid Services an agency of the US Department of Health and Human Services. 9SOW-QIOSC-6.2-09-36

- Prophylactic antibiotics should be discontinued within 24 h of surgery.
- Additional measures to prevent postoperative surgical site infections include appropriate preoperative hair removal, prompt removal of urinary catheters, and immediate postoperative maintenance of normothermia (greater than 96.8 °F/36 °C) for colorectal patients.

Postoperative Treatment of Adrenal Insufficiency

- Glucocorticoids and mineralocorticoids are important in the control of hemostasis including maintenance of blood volume and normal cardiovascular function. In addition to hemodynamic changes, use of chronic steroids may have other perioperative side such as water retention, delayed wound healing, and diabetes. After stress of trauma or surgery, endogenous steroids are increased up to six times from baseline to over 150 mg daily. Patients with adrenal suppression or insufficiency are unable to secrete sufficient corticosteroids.
- There are many causes of adrenal insufficiency including primary causes such as Addison's disease, tuberculosis, and HIV or secondary causes such as chronic exogenous administration. In addition to underlying medical illness, patients undergoing colorectal surgery may use steroids chronically as a component of treatment for their primary colorectal disorder; patients with inflammatory bowel disease are often treated acutely with steroids, and steroids may be a component of oncologic treatment as well.
- Patients treated with steroids chronically or with primary steroid deficiencies may suffer from adrenal insufficiency during times of stress, such as surgical intervention.
- Any patient on doses of 5 mg prednisone for any prolonged period up to 1 year prior to surgery has traditionally been believed to be at risk of postoperative adrenal insufficiency.
- It is important to recognize the signs of adrenal insufficiency because they may occur both in the immediate postoperative period and beyond in the event of a complication.
- Symptoms may include hypoglycemia, cardiovascular collapse, fatigue, abdominal pain, nausea, and vomiting.
- In the postoperative patient presenting with a change in intestinal function, steroid withdrawal should be considered in the at-risk population.

Postoperative Analgesia

- Analgesia following colon and rectal surgery is of paramount importance in improving patient satisfaction, early ambulation, and minimizing sympathetic inhibition postoperatively.

- Narcotics are used to decrease pain after surgery by crossing the blood–brain barrier and binding to (mu) m-opioid receptors within the central nervous system.
- However, a secondary effect of narcotics is stimulation of (mu) m receptors in the gastrointestinal tract that contribute to inhibition of bowel function postoperatively.
- Narcotics have been shown to decrease peristaltic activity, delay gastric emptying, and play an important role in prolonging postoperative ileus.
- The use of epidural analgesia was proposed to minimize systemic narcotics, decrease inflammation, and create sympathetic blockade leading to earlier return of bowel function and decreasing need for narcotics.
- Notwithstanding the lack of evidence supporting use of epidurals, many centers still use them, particularly in European-enhanced recovery pathways.
- Although costs may be lower in patients with thoracic epidurals, difficulty inserting epidurals has been reported in up to 40 % of patients.
- Postoperative reduction of ileus and earlier return of bowel function are effective only with thoracic epidurals using local anesthetic alone without fentanyl, and several studies have demonstrated that epidurals should remain in place for 48 h to maximize benefits.
- Reducing the use of postoperative narcotics has a role in recovery of bowel function, avoiding postoperative ileus, and reduced length of stay. The use of thoracic epidural appears to reduce postoperative pain but not length of stay. Use of narcotic-sparing analgesia such as ketorolac and gabapentin may help improve pain control and reduce the incidence of postoperative ileus.

Conclusion

- The care of the postoperative colon and rectal surgery patient has undergone significant changes over the past 20 years.
- Optimization of perioperative fluids, early ambulation, timing of oral nutrition and gastric stimulation, prophylaxis for VTE, minimization of narcotics, and avoidance of postoperative ileus have led to substantial reductions in length of postoperative stay and improvements in postoperative care. A significant body of literature evaluating and testing various care options is now available. By combining care elements into standardized fast-track or enhanced recovery protocols, average length of stay can be reduced without compromising complication or readmission rates. Implementing a fast-track protocol requires multidisciplinary teams, with patient and provider education to be truly successful. However, patient care benefits as well as health cost savings may be substantial.

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