Oncologic Surgical Care Using an Enhanced Recovery Approach

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ABSTRACT

Enhanced recovery programs are multimodal, evidence-based perioperative programs designed to improve a patient’s functional recovery after surgery. Enhanced recovery programs promote standardized, multidisciplinary care throughout the perioperative course to improve patient outcomes, rather than focusing on surgical technique. It is important for nurses working in acute and critical care to be aware of the paradigm shift created by the trend toward the enhanced recovery approach. By learning more about facets of the approach, the nurse will be better prepared to adopt whatever aspects of enhanced recovery their institution implements for the surgical oncology population. An overview is provided of the potential components of enhanced recovery.

Key words: cancer, enhanced recovery, ERAS, surgical outcomes

Enhanced recovery programs (ERPs) are multimodal, evidence-based perioperative programs designed to improve a patient’s functional recovery after surgery. Despite their more recent growth in international popularity, these programs actually originated 20 years ago, with the work of several European surgeons. Although early publications used the term fast-track surgery, enhanced recovery is preferred by clinicians, to emphasize the importance of patient recovery over the reduction in hospital stay.¹

Enhanced recovery programs promote standardized, multidisciplinary care throughout the perioperative course to improve patient outcomes, rather than focusing on surgical technique. The interventions minimize the metabolic and other stresses of surgery, resulting in care programs that differ vastly from historical surgical care.² Outdated paradigms may include requiring patients to fast before and after surgery, rehydrating with liberal use of intravenous fluids, relying on opioid-centric pain control, and allowing for prolonged bedrest. Enhanced recovery advocates for shorter preoperative fasting times with the inclusion of carbohydrate-loading drinks, patient-directed use of intravenous fluids, the use of regional anesthesia and other nonopioid pain medications, early feeding after surgery, and

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promotion of early ambulation after surgery. Additional emphasis is also placed on the outpatient time period before surgery, encouraging improved patient education, and maximizing the patient’s health status by encouraging cessation of alcohol and tobacco use while optimizing nutrition, functional status, and management of chronic medical conditions.  

For the programs that have successfully implemented ERPs, the results are impressive. Enhanced recovery programs are associated with reduced time in the intensive care unit, shorter hospital length of stay, fewer complications, cost savings, and reduced opioid use after discharge.  

Patients undergoing surgery for cancer have improved postoperative patient-reported outcomes and can return to their intended oncologic treatment earlier with ERPs than with previous surgical care. Analysis of data from colorectal cancer surgeries shows an association between higher adherence to ERPs and better 5-year cancer-specific survival rates. Care is both more efficient and provides a better overall experience for the patient.

Leaders worldwide are working to support the implementation of ERPs and dissemination of information on evidence-based perioperative practice. The Enhanced Recovery After Surgery (ERAS) Society was founded in 2010. This group grew out of the ERAS Study Group that was brought together in 2001 by Ken Fearon and Olle Ljungqvist to further develop the research of Henrik Kehlet, in collaboration with other academic surgeons. The ERAS Society publishes consensus guidelines on surgical procedures from various specialties and has developed an interactive audit tool to help health systems monitor protocol compliance, as well as promote data sharing among participants. Founded in 2014, the American Society for Enhanced Recovery also promotes the practice of enhanced recovery and has hosted consensus conferences as part of the Perioperative Quality Initiative that have resulted in publications on a variety of important topics.

Nurses working in acute and critical care need to be aware of the paradigm shift created by the trend toward the enhanced recovery approach. By learning more about facets of the approach, nurses will be better prepared to implement whatever aspects of enhanced recovery their institution adopts. In this article, we provide an overview of the potential components of enhanced recovery pathways for patients undergoing oncologic surgery.

### Outpatient Prehabilitation to Immediately After Surgery

The enhanced recovery approach to cancer surgery begins with prehabilitation. Silver and Baima define cancer prehabilitation as a process on the continuum of care that occurs between the time of cancer diagnosis and the beginning of acute treatment, includes physical and psychological assessments that establish a baseline functional level, identifies impairments, and provides targeted interventions that improve a person’s health to prevent or reduce the incidence and the severity of current and future impairments.

One intent of prehabilitation is to optimize surgery outcomes by improving strength, endurance, nutrition, and organ function before surgery. Prehabilitation has been studied in multiple types of cancer, including breast, lung, and colorectal. The process of prehabilitation may start immediately after a diagnosis of cancer, several weeks before surgery to resect the tumor. The length of prehabilitation programs reported in the literature varies from 1 to 5 weeks. Tumor biology and selected national guidelines for cancer treatment mandate that cancer removal surgery be done within a specific number of weeks after cancer diagnosis; therefore, the guidelines influence the length of prehabilitation. For example, findings suggest there is slight survival benefit if a patient with early-stage breast cancer has initial cancer removal surgery within 60 days of diagnosis. This limits the amount of time that can be spent in prehabilitation in this population. In addition to variations in length, components of prehabilitation may vary.

Prehabilitation can include 1 intervention (unimodal) or encompass multiple interventions (multimodal). van Rooijen et al suggested a 4-pillar approach to prehabilitation that included endurance and strength training, nutritional optimization, coaching toward lifestyle changes (ie, tobacco or alcohol cessation, or both), and psychological support.

Endurance and strength training during prehabilitation is done to improve the patient’s overall physical condition before surgery. Minnella and Carlil recommended the 3 key components of exercise (ie, aerobic, resistance, and flexibility training) be included in prehabilitation to achieve improved functional outcomes of cancer surgery. Preoperative exercise reduces postoperative pulmonary complications and length of hospital stay.
Nutritional optimization and hydration in ERPs can start in the prehabilitation phase of care and continue through the trajectory to the postoperative phase. Nutrition is one way to decrease stress and create homeostasis. It is imperative for the patient to maintain muscle strength, have adequate protein intake, and avoid cellular dysfunction and catabolism. Enhanced recovery programs may include dietitian consultation before surgery and nutritional supplementation using amino acid or carbohydrate-loading oral supplements. The supplement may be prescribed for weeks or days before surgery. Data support the hypothesis that patients who receive oral supplements before and after surgery have lower rates of complications and shorter hospital stays.

Enhanced recovery programs have resulted in less mood disturbance and better adaptation to life after postoperative hospital discharge. It is important to note that higher quality of life in persons with cancer is associated with longer survival after a cancer diagnosis. Prehabilitation may indirectly improve cancer survival.

Preoperative Phase: 30 Days Before Surgery

In addition to prehabilitation, an enhanced recovery approach to cancer surgery includes a preoperative evaluation within 30 days of the procedure. The goals are to medically optimize the patient for better surgical outcomes and provide preoperative education. The evaluation includes a medical history, physical examination, preoperative risk assessment, preoperative testing, and medication management. Frailty assessment may be added as a component of determining surgical risk.

Preoperative anxiety has been noted in newly diagnosed patients with cancer. Iqbal et al recommend preoperative counseling to reduce anxiety as a component of an ERP. Women have reported higher levels of anxiety than men in previous trials. Emerging evidence suggests preoperative counseling may positively affect postoperative pain levels, psychosocial adjustment, and length of stay. More research is needed in this area.

It is difficult to generalize the outcomes seen in patients participating in research trials of prehabilitation to recommend a best approach to surgical prehabilitation. Because of lack of standardization in the modes used in the prehabilitation programs, previous studies cannot be compared. Individual studies of prehabilitation programs that included physical interventions revealed improvement in exercise tolerance, muscle strength, and quality of life. Psychological interventions in prehabilitation programs have resulted in less mood disturbance and better adaptation to life after postoperative hospital discharge. It is important to note that higher quality of life in persons with cancer is associated with longer survival after a cancer diagnosis. Prehabilitation may indirectly improve cancer survival.
result offers the opportunity for the surgical provider to refer the patient for optimization of blood glucose before surgery and for anesthesia providers to closely monitor blood glucose during surgery.

A critical part of the preoperative evaluation is medication management. Allergies, current medications including prescription, over the counter, herbal and dietary supplements, and substance use are components of medication review. Preoperative medication management consists of establishing the risks and benefits of continuing or stopping medications. Consideration of the patient’s individual status (including comorbidities), specific surgery, and anesthesia plan should be factored into medication decisions. Table 1 lists medications that may need to be held before surgery.

Frailty

A more holistic approach to assessing patients’ readiness for surgery and their resilience is becoming a trend in practice. In recent years, more emphasis has been placed on frailty assessment before cancer treatment, including surgery. Ethun et al described frailty as “a complex, multidimensional and cyclical state of diminished physiologic reserve that results in decreased resiliency.” Ten percent to 20% of patients 65 to 85 years old meet the qualifications to be considered frail. After age 85 years, the chance of meeting the qualifications for fragility doubles.

Frailty in patients with cancer is significant, and the concept of assessing frailty is becoming more of a standard preoperative process. Frailty is associated with falls, disability, comorbid conditions, cognitive decline, increased hospitalization or institutionalization, health care–associated complications, social withdrawal and increased risk of death. Cancer-specific risks related to frailty include chemotherapy intolerance, treatment-associated complications, disease recurrence, and cancer progression. Frailty is a reliable predictor of postoperative outcomes, compared with several previously used surgical risk assessment

Table 1: Selection of Medications to Review and Potentially Hold or Dose Differently Before a Surgical Procedure

<table>
<thead>
<tr>
<th>Medications</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulants</td>
<td>Risk of bleeding</td>
</tr>
<tr>
<td>Antithrombotics</td>
<td>Risk of bleeding</td>
</tr>
<tr>
<td>Herbal supplements</td>
<td>Risk of bleeding</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Risk of increased vasopressor effect of a and b agonists, hypotension, cardiac arrhythmias, interaction with other medications given in operating room</td>
</tr>
<tr>
<td>Immunotherapies</td>
<td>Risks of impaired wound healing or bleeding secondary to thrombocytopenia if concurrent anticoagulant is given with agent</td>
</tr>
<tr>
<td>Glucocorticoids</td>
<td>Risks of impaired wound healing and elevated blood glucose, which may contribute to surgical site infection risk</td>
</tr>
<tr>
<td>Diabetic medications</td>
<td>Risk of hypoglycemia</td>
</tr>
<tr>
<td>Gastrointestinal agents</td>
<td>Risk of aspiration because of additional source of matter in stomach; can be substituted with intravenous agents</td>
</tr>
<tr>
<td>Genitourinary drugs</td>
<td>Risks of hypotension and bleeding</td>
</tr>
<tr>
<td>Cardiovascular agents</td>
<td>Risks of hypotension, arrhythmia, QT prolongation, bradycardia, hypokalemia, hyponatremia, irritation of esophagus or stomach, ketoacidosis, rhabdomyolysis, vasodilation, itching, bleeding</td>
</tr>
<tr>
<td>Pulmonary medications</td>
<td>Risks of anticholinergic effects, tachycardia, hypotension, thrush, anemia, arrhythmia, neurotoxicity</td>
</tr>
<tr>
<td>Hormones</td>
<td>Risk of venous thromboembolism</td>
</tr>
<tr>
<td>Substance abuse treatment medications</td>
<td>Risks of vasospasms, decreased seizure threshold, arrhythmias, decreased effectiveness of opioid pain control, respiratory depression</td>
</tr>
</tbody>
</table>

Data were derived from Ljungqvist et al.
tools for patients with and without cancer that do not examine frailty. Older people who underwent comprehensive preoperative assessment had a lower risk of dying and a shorter length of stay, and were more likely to be discharged to the same setting they lived in before the surgical procedure.

Several scales exist to assess frailty. The Frail Scale and the Vulnerable Elders Survey are two such scales. To rate frailty, these scales inquire about fatigue, exercise tolerance, comorbidities, recent weight loss, age, self-rated perception of health, and specific physical disabilities. If a patient is identified as frail before the surgical procedure, the surgeon has the option of increasing or lengthening prehabilitation efforts to reduce frailty or of working with the patient and multidisciplinary team to design a better cancer treatment plan. A less invasive approach to tumor removal may be used or surgery may not be used as a treatment option. Research findings to date have not supported a preferred method to assess frailty or the most important intervention to implement before the surgical procedure if the patient is deemed to be frail.

Social Determinants of Care

Another new facet of the enhanced recovery approach to cancer surgery is assessment of the social determinants of care or the patient’s social vulnerability. Social determinants of care are interwoven with some of the contributing factors of frailty and may have led to interest in adding this to a preoperative assessment. Social determinants of care include living situation/housing quality, food security, social support, employment status, immigration status, communication, social engagement, leisure, life control, sexual orientation, age, gender identity, insurance status, education level, distance from medical care or hospital, sense of empowerment, and socioeconomic status. Assessment of these factors offers the clinician the opportunity to inform practice and tailor care to ensure a better surgical outcome. In a study of bladder cancer treatment, selected social determinants of care (eg, poverty) and African American race were often associated with not receiving appropriate treatment. By identifying these determinants, the surgical team can work to offer resources to help break down barriers to receiving appropriate, evidence-based care.

Perioperative Care

Perioperative care will be discussed in 3 sections: preoperative, intraoperative, and immediate postoperative phases. Respectively, these phases of care may also be referred to by their unit-based name in which the care occurs (ie, Ambulatory Surgical Unit, Operating Room, and Postanesthesia Recovery Unit [PACU]). In everyday nomenclature, perioperative providers may use these terms (ie, phases vs unit/location) interchangeably.

Preoperative Phase: 24 Hours Before Surgery

The preoperative phase is a significant but short time in a patient’s surgical trajectory. It is the last touchpoint to verify the patient’s surgical procedure, consent, and health information and to answer both the patient’s and providers’ questions before anesthesia is administered. Although not unique to enhanced recovery, infection prevention measures are often validated or initiated in this phase, such as hair clipping and chlorhexidine gluconate wipe application. An antibiotic infusion may also be started at a designated interval before the first incision.

Enhanced recovery programs often take a different approach to historical nothing-by-mouth practices. There is evidence to support allowing patients to drink clear liquids up to hours before surgery. A practice encouraged by ERPs is the administration of a carbohydrate-loading drink the night before surgery and 2 hours prior to surgery. Surgery inflicts stress on the body, leading to increased catabolism, which increases the risk of postoperative complications. Surgery increases blood glucose levels, which may contribute to delayed wound healing, pneumonia, sepsis, cardiovascular complications, and acute kidney injury. Use of a high-carbohydrate drink attenuates the body’s stress response. This intervention helps minimize insulin resistance, thus decreasing infections and promoting wound healing. More evidence is needed to support routine use of a carbohydrate-loading drink in patients with diabetes. Although there is no consensus of an ideal blood glucose level for surgical oncology procedures, most organizations advocate for keeping it less than 180 mg/dL.

Enhanced recovery multimodality oral pain medications are initiated during this phase of care and may include acetaminophen, gabapentin, and nonsteroidal anti-inflammatory
drugs. Administering these medications before surgery helps decrease postoperative opioid needs. Opioids should be used judiciously or avoided because of the side effect profiles of the μ opioid receptors, which may include sedation, respiratory depression, decreased bowel motility, nausea, and vomiting. Use of neuraxial anesthesia, such as epidurals or spinal blocks, is supported for certain types of surgeries, especially those with high risk for postoperative ileus. The benefits of epidurals extend beyond the perioperative phase and into the postoperative phase when patients start mobilizing.42

It is estimated that 30% of the general population undergoing anesthesia experience postoperative nausea and vomiting (PONV).43 Postoperative nausea and vomiting is detrimental to patient recovery because of risk of strain to incision sites, risk for aspiration, and effect on overall patient comfort. Two antiemetic drug classes are recommended for PONV prophylaxis, including an anticholinergic (eg, transdermal scopolamine) that is administered to the patient before surgery. This medication may take 2 to 4 hours to take effect and lasts up to 72 hours, which is ideal for patients going home on the day of surgery. Additionally, minimal use of opioids inherently decreases the risk of PONV.43

Patients undergoing surgery have an increased risk of developing deep vein thrombosis because of anesthesia, venous stasis, and contributing comorbid conditions, such as cancer. The use of mechanical prophylaxis, such as sequential compression devices or compression stockings, should be standard in the care of surgical patients. Consideration of prophylactic anticoagulation before surgery, such as with fractionated or unfractionated heparin, is indicated in many surgeries. In some instances, this may be deferred until after surgery, based on epidural placement.44

Intraoperative Phase

The intraoperative phase begins in the operating room with multiple safety checks and induction of anesthesia. Depending on the type of surgery, the anesthetic course may vary. Enhanced recovery supports the use of up to 2 pharmacological modalities for PONV prophylaxis, minimizing volatile anesthetic agents and, dependent on type of surgery, use of total intravenous anesthesia.45 Fluid administration is often conservative to optimize intraoperative cardiac workload. Many surgeons are moving toward more robotic procedures or minimally invasive surgeries. These methods promote decreased opioid requirements and early mobilization. Minimally invasive surgeries require patients to be in a steep Trendelenburg position, possibly for many hours, and may cause increased intracranial pressure and cardiac workload if the patient is fluid overloaded. The practice of goal-directed fluid therapy is used to guide appropriate hydration during surgery.46,47

Decreasing use of surgical drains and early discontinuation of indwelling urinary catheters and nasogastric tubes are encouraged in enhanced recovery protocols to decrease barriers to postoperative ambulation. If the patient requires either indwelling urinary catheters or nasogastric tubes past the intraoperative phase, the catheter or tube is typically removed within 24 hours, if surgical indications permit.48 Discontinuing these tubes early also mitigates the risk of a hospital-acquired infection or injury.

Avoiding hypothermia (<36 °C) in the intraoperative setting is important to decrease the body’s stress response. The use of warming blankets and administration of warm fluids to enable therapeutic normothermia decreases cardiac workload, risk of surgical site infection, and coagulopathy. Glycemic control should be addressed during the intraoperative phase as well to aid in infection prevention.49

Immediate Postoperative Phase

The immediate postoperative phase starts when the patient is handed off from the anesthesia provider to the PACU nurse. Most PACUs are considered high-acuity units, similar to the care offered in intensive care units. The first postoperative hour is a vulnerable time as vital signs stabilize and the patient emerges from anesthesia.50 Expert pain management is one of the primary roles of a PACU nurse while balancing waning sedation from anesthesia. Most medications are delivered intravenously in the immediate postoperative period, because the patient may not be able to support airway patency, let alone manage fluids and secretions. If the patient is awake with appropriate reflexes, enhanced recovery protocols encourage oral intake.

If the patient has an epidural catheter in place, use of patient-controlled anesthesia is encouraged. Other intravenous pain modalities
aside from opioids should be considered, such as ketorolac, if the patient’s age and renal function criteria are acceptable. Ondansetron or another 5-HT₃ receptor antagonist is frequently used to prevent PONV. If the patient actively experiences nausea and vomiting, a rescue drug from a different class of medication should be administered.⁴⁵ This perioperative period, although short, is a high-risk period and requires a significant amount of collaboration and communication among many providers to make ERPs successful. Each phase of care is instrumental in creating a positive experience and outcome for patients.

**Postoperative Care: Exit From PACU to Discharge Phase**

The enhanced recovery approach to surgical care has led to changes in postoperative pulmonary toileting, ambulation, falls prevention, glucose control, and nutritional management, assessment for orthostatic hypotension, symptom management, timing of catheter removal, and increased efforts to prevent ileus and thrombi.⁵¹,⁵⁴ These changes result in shorter lengths of stay as well as better patient outcomes.⁵³

After anesthesia recovery, in addition to standard postoperative care, the foci of care for a patient on ERP protocols should include pulmonary toileting and progressive mobilization. Pulmonary toileting is often in the form of incentive spirometry 10 times hourly while awake and at least every 2 to 4 hours during sleep hours. In some cases, patients will be asked to begin using the incentive spirometer at home after the surgical procedure. This approach can aid in preservation of postoperative lung function.⁵⁵

Another component of pulmonary toileting is progressive mobility started as early as possible. The timing is determined by the patient diagnosis, activity restrictions related to surgery type, and the patient’s ability to tolerate movement from a cardiopulmonary standpoint.⁵⁷ In many ERPs, the patient may be expected to walk to the chair, sit up on the side of the bed for a short period, or walk to the bathroom within 4 hours or less of exit from the PACU.⁵⁶ Starting on the day after surgery, the patient should be out of bed ambulating several times a day, if not contraindicated by the surgical procedure, as a form of pulmonary toileting and improved endurance. Ambulation is one of the key components to prevent physical deconditioning, blood clots, and an extended hospital stay due to complications.⁵⁶

All aspects of pulmonary toileting are made easier through adequate pain control. Enhanced recovery approach protocols often require scheduled adjuvant analgesics such as gabapentin, acetaminophen, ketorolac, and ibuprofen to prevent pain. These have demonstrated equal efficacy to opioid analgesia.⁶ When scheduled adjunct analgesics are administered, opioids may only be needed for breakthrough pain. These nonopioid medications should be given according to schedule, even if the patient is not experiencing pain, to prevent inevitable surgical pain. Convincing the patient to take an analgesic despite a lack of pain can be challenging. By keeping postoperative pain manageable, the patient is often more willing to ambulate, and pain-induced nausea can be prevented. The focus for the postoperative nurse is to prepare the patient for managing pain and other medications at home. This begins with transitioning the patient as early as possible from intravenous to oral pain medications using scheduled adjuvant analgesics as a base and opioids only for severe breakthrough pain.

Prevention of PONV continues in the acute care or intensive care unit setting. Scheduled antiemetics may be included in the plan of care for the first few days after surgery or until the patient is eating without nausea and can be transitioned to antiemetics only as needed. If nausea is well controlled and depending on the type of surgery performed, advancement of diet may begin the night of surgery.⁵³

In ERPs, measures to prevent ileus may be added to nausea control in the plan of care. Decreasing the risk of ileus is achieved through ambulation, gum chewing, and early removal of the nasogastric tube, ideally in the PACU for select surgeries. Sorbitol-gum chewing for 20 minutes 3 times daily may begin when the patient is alert and awake to stimulate vagal tone and decrease inflammation, reducing risk of ileus.⁵²

The focus on nutrition in ERPs continues after the surgical procedure. Patients are often fed before bowel sounds and function return, depending on the type of surgery performed.⁵⁷ The ERP trend has led to patients advancing to a liquid or solid food diet 1 to 2 days after surgery and adding oral supplements. While
Patients are on a full-liquid diet, a clear protein supplement may be added. When the diet is advanced, a shake-type supplement is added. Patients on ERP protocols may also be encouraged to continue to drink a prescribed number of supplements daily for a time after discharge. Patients who receive oral supplements before and after surgery have fewer complications and shorter hospital stays.21

Patient and Family Education

A topic of utmost importance in the postoperative period is patient and family education. Despite education at the outpatient preoperative visit regarding home care after surgery, patients and families may only retain a small portion of what is taught. Because of shortened length of stay, it is imperative to begin patient and family teaching regarding care after discharge as soon as possible during the hospitalization.

Delays in medication teaching may prolong the hospital stay or spark the need for home health care. Both of these are expensive and may be unnecessary if teaching is started at the appropriate time. There is also the option of having a nurse from the surgical outpatient clinic team caring for the patient call the patient or family member to reinforce teaching and check on progress. Recent advances in telehealth have supported postoperative virtual education.

It is also important that patients know the proper medication regimen and schedule. They should know how and when to take important medications such as pain medications, hypoglycemic agents, anticoagulants, and antiemetics. For example, patients on an ERP who undergo a pancreatectomy or Whipple procedure will require proton pump inhibitor therapy for life. Planning is needed early in the patient’s hospital stay to ensure insurance coverage of medications and to remove patient barriers to obtaining prescribed medications. Attention to social determinants of care require the nurse or case manager to inquire about any potential difficulty obtaining and paying for medications. See Table 2 for an example of the application of the ERP model.

Outcomes

Developing an ERP as described in this article is not enough to achieve optimal patient outcomes. Compliance with the protocol is often variable, and greater compliance has been tied to maximal improvements in patient outcomes.10,58 Ongoing monitoring of adherence and outcome measures by the multidisciplinary team is essential to ensuring that the execution of the protocol meets the standards. The plan for monitoring should be assured before protocol implementation. The method of collecting and disseminating this information will depend on local resources available and may include manual data collection or automated data extraction from an electronic medical record. However this is achieved, the implementation team should continue to evaluate protocol adherence in the interest of achieving optimal patient outcomes.

Conclusion

The enhanced recovery approach to surgical care has improved patient outcomes. This approach offers nurses the opportunity to be strong advocates and care managers for the patient undergoing surgical oncology procedures and their family. We have provided an overview of facets of enhanced recovery and invite the reader to learn more about what facets of enhanced recovery have been implemented for specific surgeries in their setting.

REFERENCES

Ms Washington is a 65-year-old widow living alone in an apartment in the city 2 hours away from her only child. She does not smoke or drink. Her body mass index, calculated as weight in kilograms divided by height in meters squared, is 32. She does not exercise. She is retired and on a very limited income. She is active in her church and has many close friends in the congregation. After she presented to the emergency department with trace rectal bleeding and a 10-pound weight loss, a colonoscopy revealed a polyp containing invasive adenocarcinoma of the colon. A right-side laparoscopic colectomy was the initial therapy recommended to Ms Washington pending results of preoperative testing. Ms Washington wished to have her surgical procedure in 3 weeks so that her daughter could help with postoperative care.

In addition to a standard preoperative assessment, Ms Washington was assessed for any risk factors associated with problems related to the cost of the treatment, frailty, nutritional status, and ability to care for herself after surgery. A hemoglobin A1c measurement was added to her preoperative laboratory work. After being assessed in the multidisciplinary Geriatric Oncology Clinic, Ms Washington was found to be slightly physically deconditioned with normal cognitive function but deemed to be able to have surgery with some prehabilitation. She was found to have type 2 diabetes, food insecurity, and no local medical provider. She supplemented her food shopping with visits to the food pantry for groceries at the end of the month. She was not receiving Medicaid or food stamps. Her serum protein and iron were low. The only medication she was taking was an herbal supplement for aches and pains.

Patient was urged to have her daughter come to a preoperative planning and education visit with nurse. This was not possible, so the patient’s daughter called into the visit to listen to instructions and help plan care.

Patient was established with a local medical provider close to her home for diabetes care.

A dietitian provided nutritional counseling and education about diabetes, and daily nutrition supplements were to be taken for the 3 weeks before surgery. A social worker assisted with Medicaid and food stamp applications. Free transportation to postoperative visits with a local volunteer organization was arranged, and the patient was urged to allow church members to assist.

Patient was referred to physical therapy for evaluation and an exercise prescription to include abdominal wall strengthening and 150 minutes of aerobic exercise a week (walking).

Patient was introduced to a navigator, who will follow her throughout her disease trajectory and explore options to remove barriers to care.

Patient was instructed to stop the herbal supplement 2 weeks before surgery to avoid drug interactions and bleeding risk.

Patient bathed with chlorhexidine soap daily for 5 days before and on the morning of the procedure.

Patient drank a carbohydrate-loading dietary supplement the night before and 2 hours before the surgical procedure start time.

An antibiotic was administered 1 hour before incision time.

Blood glucose was peripherally managed to maintain a level less than 150 mg/dL.

Patient was given intravenous acetaminophen, fentanyl, ketorolac, and a transverse abdominis plane nerve block for pain management.

Before the procedure, a scopolamine patch was administered and total intravenous anesthesia was done to decrease nausea.

A nasogastric tube was placed to provide perioperative suction.

Goal-directed fluid management was provided with use of esophageal Doppler.
Table 2: Continued

### Postoperative Care

The nasogastric tube was removed in the PACU.

Venous thromboembolism prophylaxis was done with heparin and sequential compression devices.

Patient was given scheduled gabapentin with acetaminophen doses alternating with scheduled oral doses of ibuprofen. Short-acting oral opioids were used only for severe breakthrough pain. Intravenous medications were given only if the patient was not able to take them orally.

Patient was directed to dangle or sit in chair with short ambulation within 4 hours of discharge from the PACU.

Patient was directed to be out of bed to ambulate 4 times minimum each day and out of bed to chair for all meals.

Urinary catheter was removed at 5 AM postoperative day 1 after intake and output were found to be adequate with no signs of dehydration or orthostatic hypotension.

Patient's diet was advanced to clear liquids by night of surgery if tolerated and intravenous fluids were stopped when patient was tolerating a regular diet.

A referral to home health was provided to follow up and ensure daughter was able to meet the patient's needs.

Initial postoperative clinic visits happened within 10 days of surgery.

A postdischarge follow-up call by clinic nurse happened within 2 business days of discharge.

Abbreviation: PACU, postanesthesia care unit.


