Optimizing Perioperative Care

Enhanced Recovery After Surgery

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As anesthetic techniques, antibiotics, and minimally invasive surgery have improved surgical care over the centuries, further strategies to continue to improve patient outcomes have emerged.

The ERAS Study Group was founded in 2001.

The primary goal of ERAS is to treat the surgical patient in a multidisciplinary team approach throughout the perioperative course with the unified goal of accelerating functional recovery and optimizing patient outcomes based on evidence-based

Medicine.

ERAS and its associated principles truly represented a paradigm shift in perioperative care, breaking from the classical teaching of prolonged fasting postoperatively until signs of bowel function, excessive fluid administration, and delayed postoperative mobilization.

Instead, mitigating the metabolic and stress responses to surgery through multimodal care and utilizing evidenced based medicine allows for “fast-track” recovery and improved outcomes.

- **ERAS: Team-centered approach**
- **Patient**

Surgical team

Preoperative nursing team

Anesthesiology team

PACU nursing team

Inpatient nursing team

Office/clinic team

ERAS educator

Pharmacy

ERAS project manager

Information technological team

ERAS

Preoperative phase

- Patient education & set expectations
- Smoking & alcohol cessation
- Prehabilitation with diet & exercise
- Shortened fasting
- Antimicrobial prophylaxis
- VTE prophylaxis
- Minimize bowel preparation

ERAS

Intraoperative phase

- Pain blocks
- Minimally invasive surgery
- Goal-directed fluid therapy
- Multimodal pain relief
- Prevention of PONV
- Avoidance of tubes, drains, lines
- Normothermia

ERAS

Postoperative phase

- Goal-directed fluid therapy
- Prevention of PONV
- Early ambulation
- Early feeding
- Multimodal pain relief
- Early urinary catheter removal
- Defined discharge criteria

Preoperative Optimization

preanesthetic and presurgical evaluation by an anesthesiologist is associated with improved outcomes for the efficiency of the operating room, the hospital, and most importantly, the patient.

The use of a **preoperative evaluation** results in identifying patients at elevated respiratory risk, a 55% decrease in preoperative testing, an 88% reduction in case cancellations,reduction in day of surgery delays, reduced total length of stay, a positive impact on hospital finances with cost reduction, and lower in-hospital mortality.

Setting Expectations and Patient Education

- Setting expectations in the preoperative clinic helps to orient patients regarding the entire surgical experience, from what they are expected to do at home before the surgery to the entire length of the recovery both in the hospital and at home.
- the patient as the leader in his or her owncare.
- However, in reality, it is up to the patient to make his or her own care a priority.
- The optimization for success at surgery begins preoperatively with smoking cessation, exercise, and nutrition, but it also continues in the hospital and after discharge with pain control, physical activity, discharge planning, and returning to daily activities.

Nutrition

Surgery results in a significant catabolic stress response on the body, triggering inflammation and nutrient depletion.

Ensuring preoperative adequate nutrition is imperative before a large surgical procedure in order to mitigate adverse outcomes.

Exercise and Prehabilitation

- Prehabilitation is defined as “the process of enhancing the functional capacity of the individual to enable him or her to withstand a stressful event.”

- ERAS programs around the world have been analyzed, and it is noted that a reduction in fitness prior to surgery is associated with increased mortality and morbidity in the postoperative arena.

- The addition of physical fitness and activity to a preoperative regimen for elderly patients undergoing major abdominal surgery significantly improved mortality, discharge to home versus a care facility, and length of stay.

Smoking Cessation

Clearly tobacco use, especially smoking, has been well documented across all surgical specialties to increase postoperative mortality, as well as increase postoperative complications including prolonged ventilation, pneumonia,deep venous thrombosis, wound infection, delayed wound healing, and reduced bone fusion.

There is debate about the duration of the nicotine free days needed preoperatively to offer best outcomes,though the literature suggests that the longer duration of smoking cessation prior to surgery portends better outcomes.

This is likely to allow for bronchiolar and collagen remodeling and the several weeks following last exposure that are needed to achieve blood free of nicotine and its derivatives.

Metabolic Stress Response to Surgery

- Multiple organ systems interact in numerous metabolic and inflammatory cascades following the stress response to surgery leading to insulin resistance and protein catabolism.

- As insulin is the main anabolic hormone involved in glucose control, fat metabolism, and protein balance, insulin resistance disrupts many metabolic pathways.

- The preoperative and postoperative fasting state triggers insulin resistance resulting in a catabolic state with gluconeogenesis and protein breakdown

Preoperative Fasting and Preoperative Carbohydrate Loading

- Traditionally, patients have been instructed to fast for 6 to 12 hours before surgery to reduce the risk of aspiration of gastric contents during the induction of anesthesia.
- This fasting state results in a prolonged period without nutrients or hydration prior to and during surgery, and it can lead to insulin resistance, hyperglycemia, failure to achieve a postsurgical anabolic state, and sometimes, the need for insulin.

- Both European and American Societies of Anesthesiology guidelines have supported the use of clear liquid oral intake up to 2 hours prior to surgery with the exception of patients with gastroparesis, intestinal obstruction,or dysphagia.

- Carbohydrate oral intake up to 2 hours prior to surgery does not increase aspiration in healthy adults undergoing elective surgery and in fact reduces preoperative hunger,thirst, anxiety, and nausea.

- Current guidelines support fasting from clear liquids for 2 hours and solid food for 6 hours

Intraoperative Considerations

- **Surgical Considerations.** Prevention of surgical site infection consists of the use of mechanical, chemical, and/or antimicrobial modalities.

- **Hypothermia Prevention**

Those at highest risk include patients over the age of 60 years, and/or patients that have malnourishment, preexisting hypothermia, preexisting medical comorbidities that impair body temperature regulation (including advanced diabetes with neuropathy and hypothyroidism), who are undergoing general anesthesia, and who are undergoing a major long surgery.

Further, in patients who experience hypothermia, surgical complications are increased, including impaired wound healing, wound infection, pressure ulcers, cardiac disorders including arrhythmia andinfarction, as well as increased bleeding requiring blood transfusion.

- Temperature reduction can also be accelerated by cold intravenous fluids, low operating room temperatures, and a decreased thermoregulatory threshold, which occurs during the administration of general anesthesia.

- There are steps to take to prevent this hypothermia including active, convective heating using clean, filtered, forced-air warming blankets in patients in the preoperative area (prewarming) and also during anesthesia; thermal insulation; warmer ambient operating room temperatures, warmed irrigation solutions during surgery; and warmed infusions and blood products

Venous Thromboembolism Prophylaxis

- Venous thromboembolism(VTE), which includes deep venous thrombosis(DVT) and pulmonary embolism (PE), is the number one cause of potentially preventable death in common but preventable causes of morbidity and mortality in the perioperative patient.

- Surgical patients have increased risk for VTE due to advanced age, multiple medical comorbidities, prolonged proceduretimes, the inflammatory and hypercoagulable state of surgery, and immobility.

Specific risk factors include major general, vascular, or orthopedic surgery; lower extremity paralysis due to spinal cord injury; fracture of the pelvis, hip, or long bones; multiple trauma; cancer; prior VTE; age 40 years and higher; obesity; immobility; oral contraceptive use; hyperviscosity syndromes; and severe cardiopulmonary disease (prior myocardial infarction, congestive heart failure, chronic obstructive pulmonary disease.

- **the best approach is to systematically apply prevention strategies to all patients undergoing surgery**

- Appropriate VTE prophylaxis should be given preoperatively, intraoperatively, and postoperatively based upon current guidelines for the surgery type.

- Examples of nonpharmacologic methods include early ambulation, graduated compression stockings, and intermittent pneumatic compression devices.

- Pharmacologic methods include the use of low dose unfractionated heparin, low molecular weight heparin, and in some case, factor Xa inhibitors.

Perioperative Fluid Management

- Excess fluid in certain general surgical cases can cause ileus and bowel edema, and in cardiac cases, it can cause hemodilution.
- It must be understood that goal-directed therapy does, in no way, mean reduction in fluid administration.
- Normovolemia is important to maintain perfusion without volume overload.

- **Hypovolemia consequences**
- Reduced intravascular volume
- Hypotension
- Endothelial dysfunction
- Altered coagulation
- Decreased renal blood flow
- Hypoxia

- **Hypervolemia consequences**
- Hyperchloremic acidosis
- Pulmonary edema
- Impaired wound healing
- Anastamotic dehiscence
- Decreased tissue perfusion
- Altered coagulation
- Multiple organ failure

In cardiac surgery, the utilization of 0.9% normal saline solution was associated with hyperchloremia and poor postoperative outcomes, including higher length of stay and increased mortality.

A more balanced crystalloid, such as Plasma-Lyte, was associated with improved outcomes.

Other complications such as acute kidney injury, gastrointestinal complications, major hemorrhage, and major infection were also increased in the group of patients that were hyperchloremic after normal saline administration.

Based on such evidence, it would seem prudent to proceed with a more balanced solution, such as PlasmaLyte,to reduce complications.

Perioperative Pain Management

- There are two important implications of this: pain is completely subjective in that it is whatever the patient says it is, and patients cannot experience pain while unconscious.
- The mainstay of alleviating pain has historically relied almost exclusively on opioids, especially with the usage of patient controlled analgesia devices (PCAs)

- Limiting opioids in the perioperative setting is of substantial benefit;

Some adverse effects of opioids:increase postoperative opioid requirements, increase nausea andvomiting, cause respiratory depression, reduce gastrointestinal motility, worsen urinary retention, induce endocrine dysfunction,and suppress the immune system.

- The ERAS protocols focus on opioids as a single component of pain relief strategy, not as the mainstay for treatment.

- Multimodal analgesia mitigates the side effects of opioids by opioid reduction and enhances pain management.

- Preoperative and postoperative administration of acetaminophen and celecoxib or other nonsteroidal anti-inflammatory drugs, as well as gabapentin have been shown to be efficacious.

- Intraoperatively, the utilization of ketamine, lidocaine, and magnesium, act as adjunctive measures to limit pain and have been utilized to reduce the utilization of opioids in the postoperative period.

Postoperative Nausea and Vomiting Prevention

- Postoperative nausea and vomiting (PONV) is very common and can cause significant distress to patients, All result in poor patient satisfaction, increased recovery room length of stay, and highercosts to the health-care system. This could further increase the time to first feeding, which in turn may prolong ileus and/or hospital stay.

PONV

- Risk factors include female sex, history of PONV or motion sickness, nonsmoking, younger age, general versus regional anesthesia,use of volatile anesthetics and nitrous oxide,postoperative opioids, duration of anesthesia, and the type of surgery including cholecystectomy, laparoscopy, gynecological, and strabismus.

- The strategies for avoiding PONV include the avoidance of general anesthesia, the use of totally intravenous anesthesia, avoidance of nitrous oxide and volatile agents, minimizing intraoperative and postoperative opioids, and adequate hydration.

- The medications to prevent, abort, and reduce PONV include perphenazine, aprepitant,dexamethasone, scopolamine, dolasetron, granisetron, and ondansetron.

Early Nutrition and Postoperative Ileus Prevention

Postoperative ileus is the most common cause of prolonged hospital stay and readmissions following surgery on the digestive tract, occurring in up to 19% of cases.

Numerous risk factors contribute to postoperative ileus and include open surgery, increased surgery length of time, blood transfusion, fasting, fluid overload, opioids, postoperative nausea and vomiting, and other pharmacological agents.

Nasogastric tubes (NGTs) were previously used prophylactically to prevent ileus, limit distension on the gastrointestinal anastomosis, as well as to prevent pulmonary complications.

However, NGT use actually delays return of gastrointestinal activity and increases pulmonary complications without preventing anastomotic leaks in numerous types of surgery, including gastroduodenal, biliary, trauma, and esophageal.

- Therefore, the routine use of NGTs for prophylaxis should beavoided.

- Mitigating surgical trauma through minimally invasive surgery and meticulous surgery with minimal blood loss reduces postoperative ileus, either directly by limiting the inflammatory response with smaller incisions or indirectly through reduced opioid use.

- Multimodal pain strategies and neuraxial blocks reduce opioid use and therefore minimize nausea, improve early enteral nutrition, limit intravenous fluid administration, and improve ambulation.

- Chewing gum is hypothesized toreduce postoperative ileus by stimulating the cephalovagal reflex and is considered a form of sham feeding.
- Alvimopan is a mu opioid receptor antagonist that is administered prior to surgery and twice daily postoperatively.
- Reduction in postoperative NGT use, faster return of bowel function, and earlier discharge.
- Erythromycin
- Metoclopramide

Mobilization

- Early mobilization following surgery is an important componentof ERAS that accelerates the return to baseline functional status.
- Prolonged postoperative bedrest leads to deconditioning, increased deep venous thrombosis risk, and loss of muscle mass.
- ERAS will assist in this early mobilization: postoperative nausea prevention, limiting drain use, and improved pain control.

ERAS in CRS

- The strongest predictors for shorter duration of stay include preoperative carbohydrate loading, no nasogastric tube, early mobilization, early oral nutrition, totally intravenous anesthesia, early removal of urinary catheter, and the use of nonopioid analgesia.

ERAS in Hepatopancreaticobiliary Surgery

delayed gastric emptying

ERAS in Gastrectomy and Esophagectomy

- In 2014, consensus guidelines for ERAS after gastrectomy were published, and these include no routine use of nasogastric decompression, early feeding within the first postoperative day, and early consideration for nutritional support if the patient is malnourished or unable to maintain at least 60% of caloric requirements.

ERAS in Bariatric Surgery

Abdominal Compatment Syndrome

- Multisystem trauma, thermal burns, retroperitoneal injuries, and surgery related to the retroperitoneum are the major initial causative factors that may lead to abdominal compartment syndrome (ACS).
- Ruptured AAA, major pancreatic injury and resection, or multiple intestinal injuries are also examples of clinical situations in which a large volume of IV fluid resuscitation puts these patients at risk for intra-abdominal hypertension.

- Manifestations of ACS typically include progressive abdominal distention followed by increased peak airway ventilator pressures, oliguria followed by anuria, and an insidious development of intracranial hypertension.

- These findings are related to elevation of the diaphragm and inadequate venous return from the vena cava or renal veins secondary to the transmitted pressure on the venous system.

- A pressure greater than 20 mmHg constitutes intraabdominal hypertension, but the diagnosis of ACS requires intra-abdominal pressure greater than 25 to 30 mmHg, with at least one of the following: compromised respiratory mechanics and ventilation, oliguria or anuria, or increasing intracranial pressures

The treatment of ACS is to open any recent abdominal incision to release the abdominal fascia or to open the fascia directly if no abdominal incision is present.

Immediate improvement in mechanical ventilation pressures, intracranial pressures, and urine output is usually noted.

- Left untreated, ACS may lead to multiple system end-organ dysfunction or failure and has a high mortality.

Thank you