Enhanced Recovery After Surgery Toolkit

Perioperative Clinical Action Network

2024 · V.1

SSC
SPECIALIST SERVICES COMMITTEE

Perioperative Clinical Action Network

For general inquiries, please contact the Portfolio Liaison, Geoff Schierbeck at gschierbeck@doctorsofbc.ca

Website [PCAN]: www.sscbc.ca/pcan

Produced by: Perioperative Clinical Action Network

Version: 1
Date: November 2024

Funding for this project was provided by the Specialist Services Committee [SSC], one of four Joint Collaborative Committees [JCC] representing a partnership between Doctors of BC and the Government of BC

TABLE OF CONTENTS

INTRODUCTION

Enhanced Recovery Canada's™ (ERC) clinical pathways offer healthcare providers in Canada evidence-informed strategies to improve outcomes in patients undergoing common surgeries. Data shows the protocols behind ERC's surgical pathways have reduced surgical complications and hospital stays by up to 50 percent, all while readmissions and costs are reduced. This is vital given the pressures facing healthcare systems across the country.

Clinical pathways have been developed for surgeons, anesthesiologists, nurses, dietitians, physiotherapists, and other providers involved in the delivery of care for patients undergoing specified surgeries. The purpose of each clinical pathway is to provide evidence-informed strategies to improve surgical outcomes in the outlined patient populations. The pathways are divided into 5 phases with recommended actions for each perioperative phase.

PHASE 1 PATIENT OPTIMIZATION

PHASE 2 PREOPERATIVE

PHASE 3 INTRAOPERATIVE

PHASE 4 POSTOPERATIVE

PHASE 5 DISCHARGE

Guiding Principles

Enhanced Recovery Canada's clinical pathways and resources were developed based on six core principles:

- patient and family engagement
- nutrition management
- fluid and hydration management
- early mobility and physical activity
- surgical best practices
- pain management with fewer narcotics (multi-modal opioid-sparing analgesia)

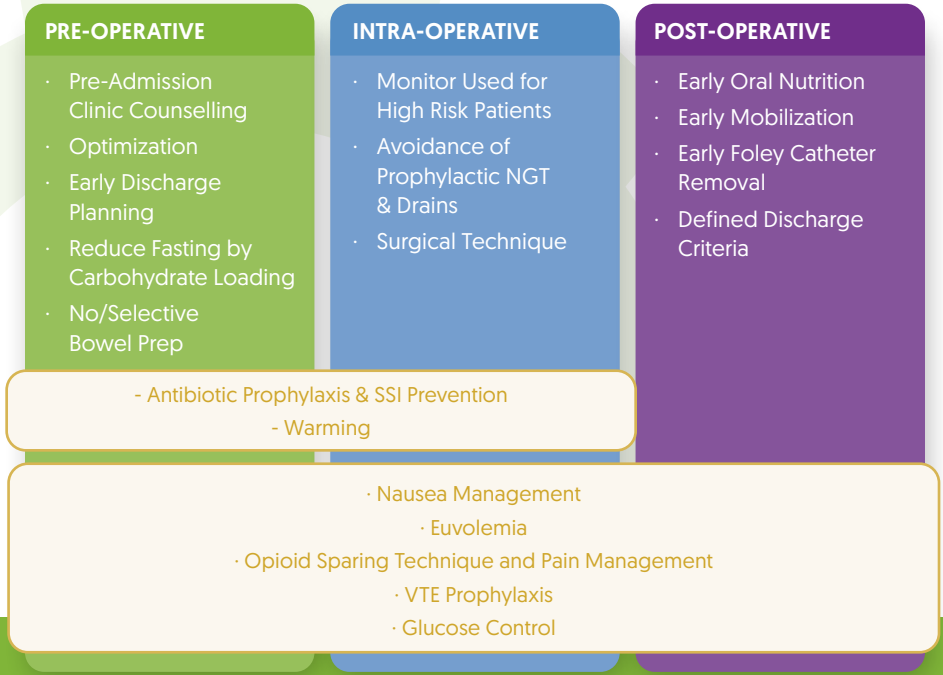
These represent a paradigm shift in how patient care is planned, delivered and monitored. The ERAS approach reexamines traditional practices, replacing them with evidence-informed best practices when necessary.

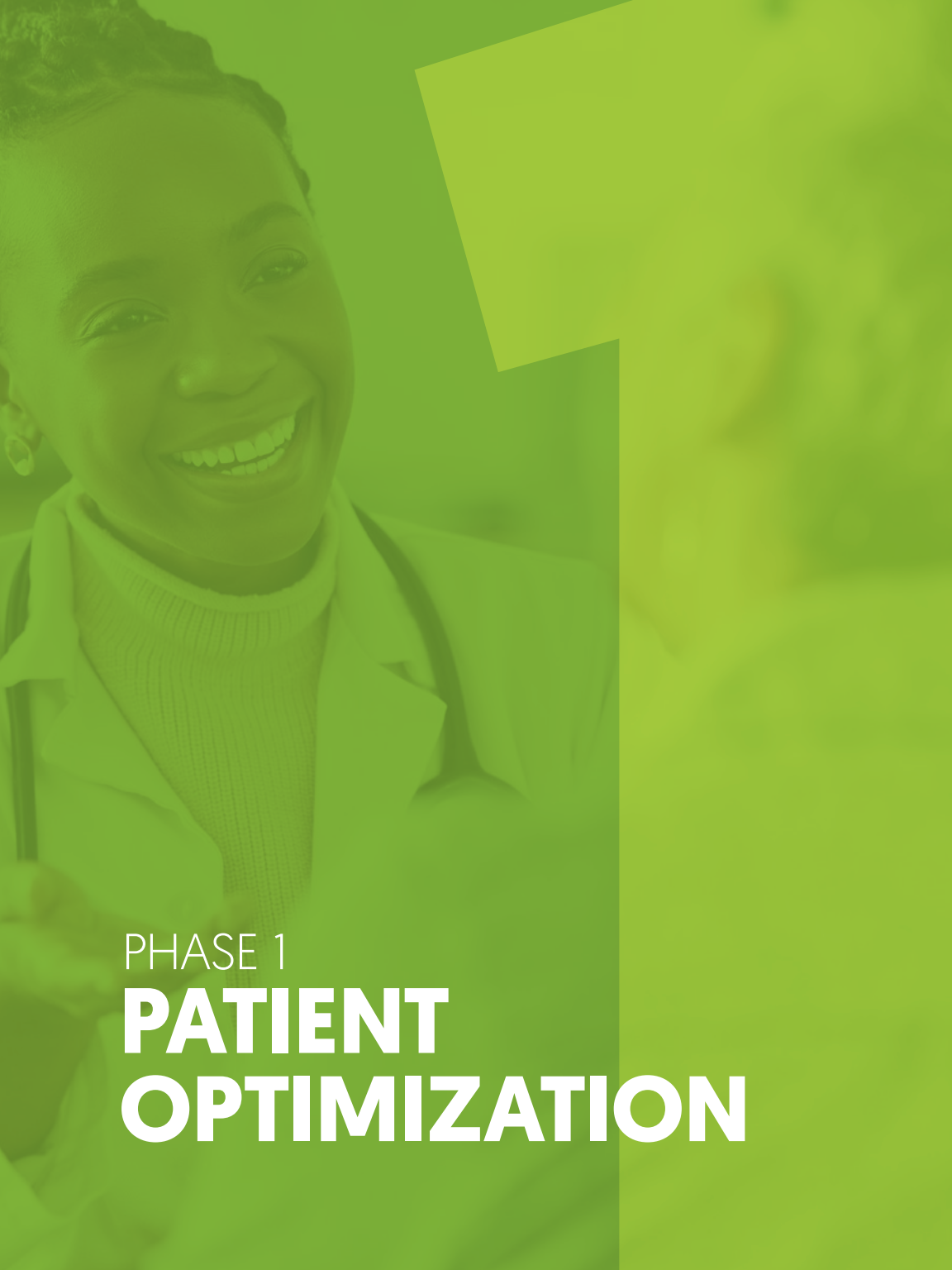
ERAS TOOLKIT

This toolkit is derived from ERC's clinical pathways for colorectal, orthopedic, gynecological, and caeserean delivery surgeries. All content, unless otherwise referenced, is from the ERC documents. The objective of this toolkit is to summarize the ERAS key components that should be considered for all surgeries. The toolkit outlines best practices and is intended to be used in consideration of provider expertise and individual patient factors. Surgery specific guidelines and links to the complete ERC clinical pathways are included following the general components.

Key components that extend through the pre-, intra- and post-operative phases have been included in the preoperative section of the toolkit as they are typically initiated during that phase and continued through the intra- and post-operative phases.

ERAS Key Components





PHASE 1

PATIENT OPTIMIZATION

PHASE 1 – PATIENT OPTIMIZATION

Pre-Admission Clinic Counselling

- Provide ERAS patient handbook

Patient & family receives preoperative information about surgical procedure and enhanced recovery, including:

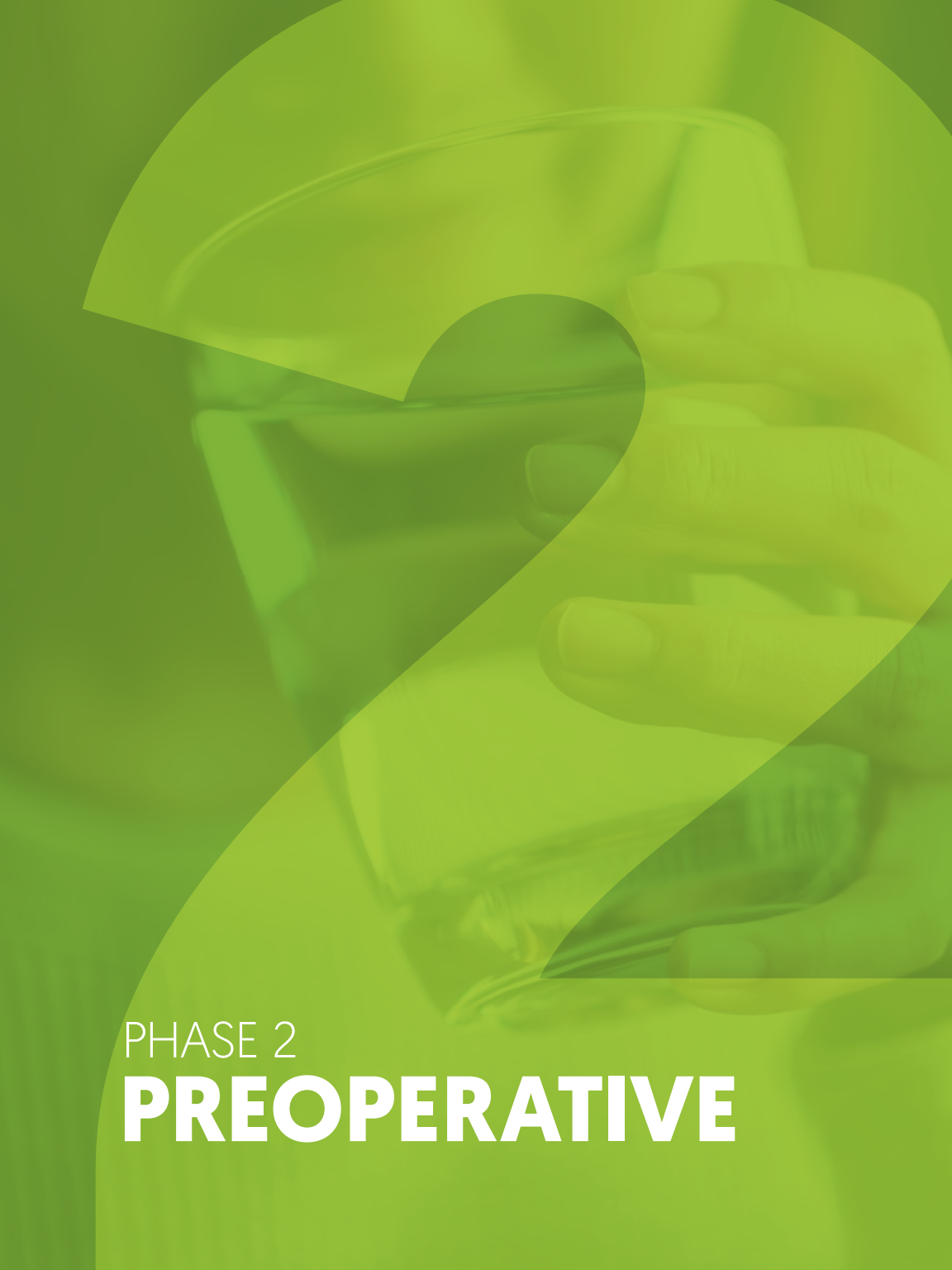
- reduced fasting
- carbohydrate loading
- early postoperative ambulation/mobilization
- early postoperative oral intake
- surgical site infection (SSI) and venous thromboembolism (VTE) prophylaxis
- possible use of regional anesthesia
- avoiding or minimizing opioid pain medication
- early discharge planning

Optimization

- Use presurgical optimization toolkit/resources

Patients are optimized well in advance of surgical date on the following components:

- Anemia
- Cardiac
- Delirium
- Frailty
- Glycemic control
- Goals of Care
- Mental wellbeing
- Nutrition
- Obesity
- Obstructive Sleep apnea
- Pain management
- Physical activity
- Smoking cessation
- Substance use
  - Alcohol
  - Cannabis
  - Illicit Substance
- Support after surgery



PHASE 2

PREOPERATIVE

PHASE 2 – PREOPERATIVE

Early Discharge Planning

- Communicate discharge criteria to patient

- Discharge criteria:
  - Early mobilization
  - Performs Activities of Daily Living (ADLs) at pre-operative baseline level
  - Pain managed on oral analgesics
  - Tolerates prescribed diet
  - Passed flatus or had a bowel movement (BM)
  - Voids
  - Patient self-administers Low Molecular Weight Heparin (LMWH) (if applicable)
  - Self-manages ostomy (if appliable)
  - Self-irrigates internal Indiana pouch or neobladder (if applicable)
- Patient arranged for support person at home for 72 hours post discharge
- Discharge destination/accommodation confirmed
- Patient has a ride home on discharge day

Reduced fasting

- Allow clear liquids up to one hour before hospital check in (or 3 hours before surgery)

- Prolonged preoperative fasting (NPO after midnight) should be avoided.
- Patients should be encouraged to eat a normal meal the night before and a light snack up until six hours (unless bowel preparation required) and drink clear fluids up until 1 hour before hospital check in unless the patient has documented delayed gastric emptying or other factors that may increase risk of aspiration.

No/Selective Mechanical bowel preparation (MBP)

Avoid use of bowel prep unless clinically indicated. MBP using a combined iso-osmotic mechanical preparation and oral antibiotic considered

- MBP should not be used without concurrent oral antibiotics.

Carbohydrate loading

▶ Encourage consumption of carbohydrate drink pre-operatively

Routine carbohydrate loading 3 hours before surgery start time is recommended, though there is no consensus regarding the optimal regimen and formulation.

- Clear fluid (250mL apple/cranberry juice or commercially prepared clear carbohydrate drink as labelled)
- Carbohydrate loading with bowel preparation:
  - Night before surgery
    - clear fluid carbohydrate loading (500mL apple/cranberry juice or commercially prepared clear carbohydrate drink as labelled)
  - Morning of surgery (3 hours prior to surgery)
    - clear fluid carbohydrate loading (250mL apple/cranberry juice or commercially prepared clear carbohydrate drink as labelled)
- Exceptions:
  - Insulin dependent patients (unless patient feels hypoglycemic)
  - Obstruction
  - Documented delayed gastric emptying

PHASE 2 – PREOPERATIVE

Antibiotic prophylaxis and SSI prevention

- IV antibiotics administered immediately preoperatively within the recommended time.
- Skin disinfection performed using chlorohexidine-alcohol-based preparations.

Refer to your local institutional antimicrobial stewardship guidelines

- Antibiotic selection should be based on SSI pathogens commonly associated with the specific procedure type, local antimicrobial resistance patterns and a balance of benefits versus potential risks associated with the antibiotic
- Weight-based dosing should follow guideline recommendations
- Antibiotics with short half-lives [< 2 hours] should be re-dosed every 3 to 4 hours during surgery if the operation is prolonged [> 4 hours] or has major blood loss [> 1.5 L]
- Administer cefazolin, ceftriaxone, gentamicin, or tobramycin within 60 minutes prior to inclusion or procedure

Hypothermia prevention/Warming

- Patients prewarmed for 20-30 minutes before induction of anesthesia
- Patient normothermic on arrival to PACU

Defined as a temperature < 36.0 °C at any point in the perioperative period. Mild hypothermia [34-36 °C] is associated with an increased risk of complications:

- Increased SSI [2-4x]
- Increased risk of bleeding [16% higher]
- Increased risk of transfusions [22% higher]
- Increased risk of myocardial morbidity

Core temperature should be monitored during cases of general and neuraxial regional anesthesia lasting 30 minutes or longer

Antiemetic prophylaxis

- Postoperative nausea and vomiting (PONV) prophylaxis given pre-, intra-, and post-op

Risk factors for PONV are female sex, non-smoker, history of PONV, and postoperative use of opioids.

- The number of medications used should be determined by the number of modifiable and non-modifiable risk factors.
- Patients with 1-2 risk factors should receive a two-drug combination using first line antiemetics (such as dopamine antagonists, serotonin antagonists, corticosteroids).
- Patients with ≥2 risk factors should receive two to three antiemetics

Apfel score minus 1 = number of prophylactic agents to be administered

- Dexamethasone
- Dimenhydrinate
- Aprepitant—40-80 mg preop
- Ondansetron **Consider Q8H for first 24 hours on postoperative order sets
- TIVA with propofol
- Ephedrine IM 0.5mg/kg
- Haloperidol 0.5-< 2 mg
- Perphenazine
- Transdermal scopolamine 2 hours preoperatively

PHASE 2 – PREOPERATIVE

Euvolemia

- Pre-, Intra-, and Post-operative fluid management individualized to minimize fluid and maintain euvolemia

Acute kidney injury (AKI) can have a significant negative impact on patient prognosis. Adequate fluid management is a valuable strategy to avoid prerenal failure.

- Very restrictive or liberal fluid regimens should be avoided in favour of euvolemia.
- IV fluid maintenance with balanced crystalloid solution should be used to ensure water and electrolyte homeostasis with the goal of achieving 1.0 to 2.0 L positive fluid balance at the end of surgery (6-8 ml/kg/hr).
- Goal-directed volume therapy is when fluids are administered in response to hemodynamic changes when using advanced hemodynamic monitoring such as arterial lines and pulse pressure variation. If using goal-directed fluid therapy a maintenance fluid rate can be dropped as low as around 5 mL/kg/hr. Advanced hemodynamic monitoring is recommended in the following populations: ASA 3 or above, expected blood loss > 500 mL, procedures booked for > 4 hours, BMI < 19 or > 40

Multimodal opioid-sparing pain management

- Multimodal pain management plan used pre-, intra-, and post-operatively

Multimodal opiod-sparing pain management is defined as use of minimum two non-opiod modalities such as: [1]

- Acetaminophen 15mg/kg every 6 hours po
- NSAID (e.g., Ibuprofen, Ketorolac, Cox -2 inhibitors)
- IV Lidocaine 1.5 mg/kg bolus and 1-2 mg/kg/hr based on Ideal Body Weight
- Ketamine 0.25-0.5 mg/kg bolus and infusion 0.1-0.5 mg/kg/hr, with higher dose range for opioid tolerant patients
- Dexamethasone 0.1-0.2 mg/kg IV bolus
- IV Magnesium Sulphate 30-50 mg/kg bolus over 20 minutes and infusions of 8-10 ug/kg/hr
- Dexemedetomidine 0.2-0.7 ug/kg/hr
- LA infiltration into wound
- Transversus Abdominus Plane block

PHASE 2 – PREOPERATIVE

Venous thromboembolism (VTE) prophylaxis

- Preoperative VTE prophylaxis given

Most patients will have one or more risk factors, and as many as 40% will have three or more risk factors.

- Patients should receive mechanical thromboprophylaxis using compression stockings or intermittent pneumatic compression during hospitalization or until they begin to mobilize.
- Patients should receive pharmacological prophylaxis with low molecular weight heparin (LMWH)
- Timing of heparin administration should be discussed at the surgical briefing. Administration in the preoperative area must involve discussion with anesthesiologists as this would preclude any neuraxial techniques

Glycemic control

- Glucose control in all patients regardless of diabetic status to prevent hyperglycemia

Hyperglycemia is prevalent in both diabetic and non-diabetic hospitalized patients and has been associated with SSIs and complications.

- For most non-critically ill hospitalized patients with diabetes, preprandial blood glucose targets should be 5.0 to 8.0 mmol/L, in conjunction with random blood glucose values <10.0 mmol/L if these targets can be safely achieved.
- For critically ill hospitalized patients with diabetes, blood glucose levels should be maintained between 6.0 and 10.0 mmol/L.

PHASE 3

INTRAOPERATIVE

PHASE 3 – INTRAOPERATIVE

Avoidance of prophylactic NG tubes and drains

- Avoid use of drains and tubes

The routine use of drains and nasogastric (NG) tubes should be avoided.

- If a NG tube is required intraoperatively, it should be removed before reversal of anesthesia

Pelvic and peritoneal drains should not be routinely used.

Surgical approach

- A minimally invasive surgical approach (laparoscopic, robotic, trans-anal) should be employed whenever appropriate

Factors that may increase the possibility of selecting or converting to an open surgery include:

- obesity
- prior abdominal surgery
- locally invasive cancers

PHASE 4

POSTOPERATIVE

PHASE 4 – POSTOPERATIVE

Defined Discharge Criteria

- Patient must meet defined discharge critera

Patients must meet the following discharge criteria:

- Performs Activities of Daily Living (ADLs) at pre-operative baseline level
- Pain managed on oral analgesics
- Tolerates prescribed diet
- Passed flatus or had a bowel movement
- Voids
- Patient self-administers Low Molecular Weight Heparin (LMWH) (if applicable)
- Self-manages ostomy (if appliable)
- Self-irrigates internal Indiana pouch or neobladder (if applicable)

Early Oral Nutrition

- Patients offered food and fluid as early as day of surgery and by POD 1

- Food intake should be self-monitored by patients to identify those who do not consume >50% of their food. Patients consistently eating ≤50% of their food for 72 hours, or as soon as clinically indicated, should receive a comprehensive nutrition assessment.
- Patients assessed as malnourished before surgery should receive a high protein, high energy diet postoperatively and be followed by a dietician.

Early Mobilization

- Patient mobilized as soon as it is safely possible; ideally on POD 0.

The first mobilization attempt should always be assisted and supervised by clinical staff

- Throughout the hospital stay, patients should be encouraged to mobilize independently or with assistance from family or friends
- On POD 0 patients should be encouraged to mobilize out of bed (for example sit on a chair) and, if possible, walk short distances
- From POD 1 until hospital discharge, patients should be encouraged to mobilize out of bed as much as possible according to their tolerance

Throughout the hospital stay patients should be encouraged to:

- Perform foot and ankle pumping and quad setting (ideally every hour while awake)
- Perform deep breathing and coughing exercises
- Exercise in bed if walking is not feasible

Early Foley Catheter Removal

- Catheter removed on POD 1 unless contraindicated

Patients at low risk for urinary retention should have routine removal of catheter on the first day after surgery. Patients at moderate to high risk require catheterization for up to three days.

- For patients who fail trial of void, clean intermittent catheterization for 24 hours should be considered

Risk factors for retention include male gender, lumbar epidural analgesic, intrathecal opioids, and pelvic surgery.

PHASE 4 – POSTOPERATIVE

Venous thromboembolism prophylaxis

- VTE prophylaxis given

Combined mechanical and chemoprophylaxis for VTE is recommended for the duration of hospitalization.

- Thromboprophylaxis with LMWH can be considered for up to 28 days.

Glycemic control

- Blood glucose monitored

Blood glucose should be maintained within the recommended range for patients with diabetes or elevated preoperative HbA1c.

- CBG check on arrival to PACU, then TID & HS x 24hours with sliding scale insulin, including non-diabetic patients
- CBG can be discontinued if CBG <8.1 mmol/L x24 hours for patients without diabetes

PHASE 5

DISCHARGE

PHASE 5 – DISCHARGE

Patient and family or caregiver engagement

- Patients given discharge plan to follow including surgery specific rehabilitation booklet

Providers should address or answer any questions that patients and their family or caregiver may have related to the patient's condition or concerns with their discharge and follow-up.

- Healthcare team can refer patients and family to discharge section of the ERAS patient handbook

COLORECTAL SPECIFIC GUIDELINES

There are specific guidelines for colorectal surgeries that warrant special considerations beyond the core ERAS components. The full colorectal pathway prepared by ERAS Canada can be found on the ERC website.

Postoperative ileus prevention

- Combined elements of this pathway such as limited opioid use, minimally invasive surgery, omission of nasogastric tubes, fluid therapy and early feeding will help to minimize the development of postoperative ileus.
- Selective opioid antagonists, bisacodyl, magnesium oxide, and coffee or caffeine may be offered to reduce the duration of postoperative ileus.
- There is no evidence to support the use of gum chewing to prevent postoperative ileus

Nutrition therapy

- Patients should be offered food and fluid as early as day of surgery and by POD 1. Oral nutrition supplements should be included.
- “Clear liquid” or “full liquid” diets should not be used routinely.

ORTHOPEDIC SPECIFIC GUIDELINES

There are specific guidelines for orthopedic surgery that warrant special considerations beyond the core ERAS components. The full orthopedic pathway as prepared by ERAS Canada can be found on the ERC website.

Anesthesia

- Based on expert opinion and retrospective studies, ERAS THA and TKA pathways support neuraxial techniques over general anesthesia, which is supported by expert consensus regarding anesthetic practice in THA/TKA surgery and a recent large retrospective study comparing general and spinal anesthesia.

Prevention of Blood Loss

- Administration of IV, topical, or oral tranexamic acid, as well as combinations of individual formulations of tranexamic acid are all effective strategies for reducing blood loss.
- All methods of administration effectively demonstrate equivalent efficacy at reducing blood loss

Use of Tourniquet

- For TKA, the routine use of a tourniquet is not recommended. If used (e.g. cement application), reduce the application time to a minimum, minimize cuff pressure, and release before wound closure to perform optimal cauterization/hemostasis.

Hip and Knee Precautions

- Range of motion restrictions should be avoided to facilitate early mobilization and reduce patient anxiety. However, this decision should be left to the operating surgeon.
- There is no good evidence to support whether hip precautions with or without the addition of equipment and functional restrictions are effective in preventing dislocation and improving outcomes after THA.

Mobility & Physical Activity

- According to the standard of care in the area, physiotherapists will assess patients and teach them teach how to progress prescribed hip and knee exercises.
- Patients should initially avoid strenuous physical effort. Low impact exercises such as swimming, cycling, and walking are encouraged (at low intensity levels) in the early weeks post-surgery once the wound is healed, swelling is controlled, and as the patient feels comfortable.
- Higher impact activities may start at 3 months post-surgery according to the surgeon's recommendations.

Multimodal Analgesic

Suggestions for Knee arthroplasty [2]

1. Preoperative or intraoperative and postoperative acetaminophen
2. Preoperative or intraoperative and postoperative NSAID
3. Dexamethasone > 10 mg IV
4. Adductor Canal Block or Peri-articular Local infiltration analgesia
5. Intrathecal morphine (100 ug) may be considered only for hospitalized patient and whenever regional anesthesia is not possible.

Suggestions for Hip arthoplasty [3]

1. 1-3 as above
2. Regional anesthesia techniques (e.g., fascia iliaca block or local infiltration)
3. Intrathecal morphine (100 ug) can be considered for hospitalized patients but does increase the risk of pruititis, PONV, and urinary retention (grade D evidence).

CAESAREAN DELIVERY SPECIFIC GUIDELINES

There are specific guidelines for cesarean delivery surgeries that warrant special considerations beyond the core ERAS components. The full caesarean delivery pathway as prepared by ERAS Canada can be found on the ERC website.

Surgical Approach and Considerations

- Use a transverse abdominal incision to reduce postoperative pain and to improve cosmesis compared with a midline incision
  - making a straight skin incision, 3 cm above the symphysis pubis
  - opening subsequent tissue layers bluntly, and
  - extending with scissors (not a knife) if necessary
- After the hysterotomy is made, expansion of the incision with a cranial-caudal direction is associated with less blood loss and fewer extensions
- Do not routinely reapproximate the subcutaneous tissue space unless the patient has ≥2 cm subcutaneous tissue, as it does not reduce the incidence of wound infection
- In most cases, skin closure should be performed with subcuticular suture rather than staples to reduce wound complications, specifically lower incidence of wound separation

Prevention of Uterine Atony and Postpartum Hemorrhage Recommendations

- Use lowest effective dose of uterotonic necessary to achieve adequate uterine tone and minimize side effects.
  - Elective cesarean delivery: bolus 1 IU oxytocin; start oxytocin infusion at 2.5-7.5 IU·h-1 (0.040.125 IU·min-1).5 Alternatively, consider carbetocin 100 mcg given as an IV bolus over 1 min
  - Intrapartum cesarean delivery: 3 IU oxytocin over ≥30 sec.; start oxytocin infusion at 7.5-15 IU·h-1 (0.125-0.25 IU·min-1)
- Tranexamic acid 1 g IV bolus over 10 mins can be considered as an adjuvant for treatment of postpartum hemorrhage within 3 hrs of delivery and may be a useful preventative measure with minimal side effects

Immediate Newborn Care

- Delayed cord clamping for at least 1 min. at a term delivery and at least 30 sec at a preterm delivery is recommended if there is no concern about fetal well-being.

Support Breast or Chest Feeding

- Provide educational material on breast and chest feeding, and access to lactation consultant as needed
- Support and respect a patients' decision about breast or chest feeding, free from commercial influence, coercion and bias. Patients have the right to make their own informed choice about whether to breast or chest feed
- Patients who choose not to or cannot breast or chest feed (for example a breast reduction) and wish to suppress lactation can be given cabergoline (2 x 0.5 mg PO) as a single dose on the first day postpartum

OTHER SURGERY SPECIFIC ERAS GUIDELINES

ERAS Canada Gynecologic Specific Guidelines

International ERAS Society Website

ERAS Society Emergency Laparotomy Guidelines

ERAS Society Gynecologic Oncology Guidelines

ERAS Society Liver Surgery Guidelines

ERAS Society Liver Transplantation Guidelines

ERAS Society Open Aortic Vascular Surgery Guidelines

ERAS Society Bariatric Surgery Guidelines

ERAS Society Lumbar Spinal Fusion

ERAS Society Pancreatoduodenectomy Guidelines

ERAS Society Vulvar and Vaginal Surgery Guidelines

ERAS Society Esophagectomy Guidelines

ERAS Society Lung Surgery Guidelines

ERAS Society Major Head and Neck Cancer Surgery with Free Flap Reconstructions Guidelines

ERAS Society Gastrectomy Guidelines

ERAS Society Cardiac Surgery Guidelines

ERAS Society Radical Cystectomy for Bladder Cancer Guidelines

ERAS Society Breast Reconstruction Guidelines

REFERENCES

1. Echeverria-Villalobos, M., Stoicea, N., Todeschini, A., Fiorda-Diaz, J., Uribe, A., Weaver, T., Bergese, S. (2020) Enhanced Recovery After Surgery (ERAS): A Perspective Review of Postoperative Pain Management Under ERAS Pathways and Its Role on Opioid Crisis in the United States. *The Clinical Journal of Pain, 36*(3), 219-226, https://doi.org/10.1097/AJP.0000000000000792

2. Anger, M., Valvovska, T., Beloeil, H., Lirk, P., Joshi, G. P., Van de Velde, M., Raeder, J. (2021) PROSPECT guideline for total hip arthoplasty: a systematic review and procedure-specific postoperative pain management recommendation. *Anaesthesia, 76*(8), 1082-1097. https://doi.org/10.1111/anae.15498

3. Lavand'homme, P. M., Kehlet, H., Rawal, N., Joshi, G. P., (2022) Pain Management after total knee arthroplasty: PROcedure SPEcific Postoperative Pain Management recommendations. *Eur J Anaesthesiol. 39*(9), 743-757. https://doi.org/10.1097/EJA.0000000000001691

SSC
SPECIALIST SERVICES COMMITTEE

Specialist Services Committee
115 - 1665 West Broadway
Vancouver BC V6J 5A4

604.638.4852
sscbc@doctorsofbc.ca

www.sscbc.ca

Access a digital copy of the
Enhanced Recovery After Surgery Toolkit here