



Enhanced Recovery After Surgery Toolkit

Perioperative Clinical Action Network

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SSC
SPECIALIST SERVICES
COMMITTEE



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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 that 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.

Enhanced recovery approaches also improve patient and healthcare provider experiences by helping clinicians and patients work as a coordinated team. Based on best practices that put the quadruple aim within reach, these pathways promote a multidisciplinary team approach focused on all areas of the patient's journey. If implemented consistently, these strategies improve patient experience and reduce length of stay, complication rates and hospital readmissions – all valuable outcomes at a time when healthcare systems are under serious pressure.

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 care during each 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 have been developed based on six core ERAS 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 re-examines traditional practices, replacing them with evidence-informed best practices when necessary.

ERAS TOOLKIT

The surgical pathways provided by Enhanced Recovery Canada's™ (ERC) are lengthy and detailed. This toolkit does not replace those documents, but instead summarizes the key components of ERAS that should be considered for all surgeries. These key components are provided in visual and checklist form for easy reference by clinicians. These guidelines outline suggestions for best practice and are meant to be used in consideration with provider expertise and understanding of individual patient factors.

Special considerations for each of the ERAS surgeries are provided following the general checklist. The links to the complete clinical pathway are included on these pages.

ERAS Key Components

PRE-OPERATIVE

- Pre-Admission Clinic Counselling
- Optimization
- Early Discharge Planning
- Reduce Fasting by Carbohydrate Loading
- No/Selective Bowel Prep

INTRA-OPERATIVE

- Monitor Used for High Risk Patients
- Avoidance of Prophylactic NGT & Drains
- Surgical Technique

POST-OPERATIVE

- Early Oral Nutrition
- Early Mobilization
- Early Foley Catheter Removal
- Defined Discharge Criteria

- Warming
- Antibiotic Prophylaxis & Re-dosing

- Nausea Management
- Euvolemia
- Opioid Sparing Technique and Pain Management
- VTE Prophylaxis
- Glucose Control



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 components of the enhanced recovery clinical pathway in which the patient is expected to participate, including:

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

Optimization

► Use presurgical optimization toolkit/resources

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

- ⊗ Anemia
- ⊗ Cardiac
- ⊗ Frailty
- ⊗ Glycemic control
- ⊗ Mental Wellbeing
- ⊗ Nutrition
- ⊗ Obesity
- ⊗ Pain management
- ⊗ Physical activity
- ⊗ Sleep apnea
- ⊗ Smoking cessation
- ⊗ Social supports
- ⊗ Substance use

A hand holding a clear glass, overlaid with a large green number 2. The background is a solid green color.

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 (may be full fluid, post surgical transition, regular or diabetic diet)
 - Passed flatus or had a bowel movement (BM)
 - Voids
 - Patient self-administers Low Molecular Weight Heparin (LMWH) (if applicable)
 - Self-manages ostomy (if applicable)
 - 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 abandoned.
- ⚙ 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)

▶ No/selective bowel prep

Avoid use of bowel prep unless clinically indicated. MPB 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 in the immediate preoperative period is recommended, though there is no consensus regarding the optimal regimen and formulation.

- ⚙️ 250 ml of apple/cranberry juice or 400 ml of PREcovery (drink over 20 minutes)
- ⚙️ Exceptions:
 - Insulin dependent patients (unless patient feels hypoglycemic)
 - Obstruction
 - Documented delayed gastric emptying

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 (34-36C) 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

Antibiotic prophylaxis

- ▶ IV antibiotics administered immediately preoperatively within the recommended time.
- ▶ Skin disinfection performed using chlorhexidine-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 (such as <2 hours) should be re-dosed every three to four hours during surgery if the operation is prolonged (>4 hours) or has major blood loss ($>1.5L$).

Antiemetic prophylaxis

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

Risk factors for PONV are common in the colorectal surgery population and include 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

Minimum Apfel score minus 1 = number of prophylactic agents

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

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).

Maintenance infusion ≤ 5 ml/kg/hr. can be used if goal-directed volume therapy is supported by advanced hemodynamic monitoring to minimize the risk of organ hypoperfusion.

Multimodal opioid-sparing pain management

- ▶ **Multimodal pain management plan used pre-, intra-, and post-operatively (minimum 2 non-opioid modalities)**

Optimization of pain management is a key component to an ERAS program.

- ⊗ Defined as the use of more than one pain modality
- ⊗ Effective analgesia and minimize opioid-related side effects
- ⊗ Definition of compliance: minimum of two non-opioid modalities
 - Preop Acetaminophen and regular scheduled dose QID
 - NSAID when possible
 - Ketamine
 - Dexamethasone 0.1-0.2 mg/kg (PONV dose 0.06/kg)
 - Alpha agonists
 - LA infiltration
 - Regional techniques

Venous thromboembolism (VTE) prophylaxis

► Preoperative VTE chemoprophylaxis 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).

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 NGT 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 criteria

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 (may be full fluid, post surgical transition, regular or diabetic diet)
- ⚙ Passed flatus or had a bowel movement (BM)
- ⚙ Voids
- ⚙ Patient self-administers Low Molecular Weight Heparin (LMWH) (if applicable)
- ⚙ Self-manages ostomy (if applicable)
- ⚙ 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 (SGA B or C) 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 safety possible; ideally on POD 0.

The first mobilization attempt should always be assisted and supervised by clinical staff (for example nurse, nursing assistant, physiotherapist, or kinesiologist).

- ⚙ 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 POD1 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, epidural analgesia, and pelvic surgery.

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 in all patients.

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 s/s 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.



COLORECTAL SPECIFIC GUIDELINES

There are specific guidelines for colorectal surgeries that warrant special considerations beyond the core ERAS components. The full colorectal pathway as 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. ONS 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 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.

GYNECOLOGIC SPECIFIC GUIDELINES

There are no specific guidelines for gynecologic surgeries that warrant special considerations beyond the core ERAS components. The full gynecologic pathway as prepared by ERAS Canada can be found on the ERC website.



CAESAREAN DELIVERY SPECIFIC GUIDELINES



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



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 (0.040-0.125 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.



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