

# Provincial Clinical Knowledge Topic

## *ERAS Liver Surgery, Adult – Inpatient*

### *V 1.1*

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**Revision History**

<b>Version</b>	<b>Date of Revision</b>	<b>Description of Revision</b>	<b>Revised By</b>
1.0	March 2018	Topic Complete	Dr. Oliver Bathe
1.1	June 2019	Pre-operative Order Set, Intra-operative Guidance and Post-operative Order Set amended; updates to linked documents	Christine Fantuz

## Important Information Before You Begin

An Alberta Health Services (AHS) Provincial Clinical Knowledge Topic is the evidence-informed clinical best practice standard for a specific patient population. Enhanced recovery after surgery (ERAS) Topic content is based on recommendations from published international guidelines and other evidence, with consideration for current practices at ERAS sites and other clinical standards. Topic information strives to adhere to [Institute for Safe Medication Practices \(ISMP\)](#) safety standards, and align with provincial and national Quality and Safety initiatives and standards, e.g. [Health Quality Council Alberta \(HQCA\)](#), [Choosing Wisely](#), [Safer Healthcare Now](#), and [Accreditation Canada](#). The Topic will be reviewed periodically and updated according to best practice evidence and other clinical recommendations and guidelines.

Clinicians using this Topic should, in consultation with the patient, use independent medical judgement in the context of individual clinical circumstances to direct care.

## Guidelines

This Topic is based on the following guidance:

- 1) [Guidelines for Perioperative Care for Liver Surgery: Enhanced Recovery After Surgery \(ERAS\) Society Recommendations](#)<sup>1</sup>
- 2) [Enhanced Recovery After Surgery \(ERAS\) for gastrointestinal surgery. Part 1: pathophysiological considerations](#)<sup>2</sup>
- 3) [Enhanced Recovery After Surgery \(ERAS\) for gastrointestinal surgery. Part 2: consensus statement for anaesthesia practice](#)<sup>3</sup>

## Keywords

- ERAS
- Enhanced recovery
- Liver
- Surgery
- Adult

## ERAS Liver Surgery, Adult – Inpatient

### Rationale

International ERAS guidelines were developed to improve patient outcomes, accelerate recovery after surgery, and reduce healthcare costs. ERAS is a multimodal approach, with interventions across all stages of surgical care. Refer to [Enhanced Recovery After Surgery: A Review<sup>4</sup>](#).

The international ERAS guidelines were used in the refinement of provincial care pathways for enhancing recovery after surgery. There are AHS ERAS care pathways developed for Breast Reconstruction (not applicable outside of Foothills Medical Centre, Misericordia Community Hospital and Grey Nuns Community Hospital), Colorectal, Cystectomy, Gynecologic Oncology (not applicable outside of Foothills Medical Centre and Royal Alexandra Hospital), Liver, Major Gynecology, Major Head and Neck (not applicable outside of Foothills Medical Centre and University of Alberta Hospital), and Pancreas surgery. These care pathways are detailed in surgery-specific ERAS Topics.

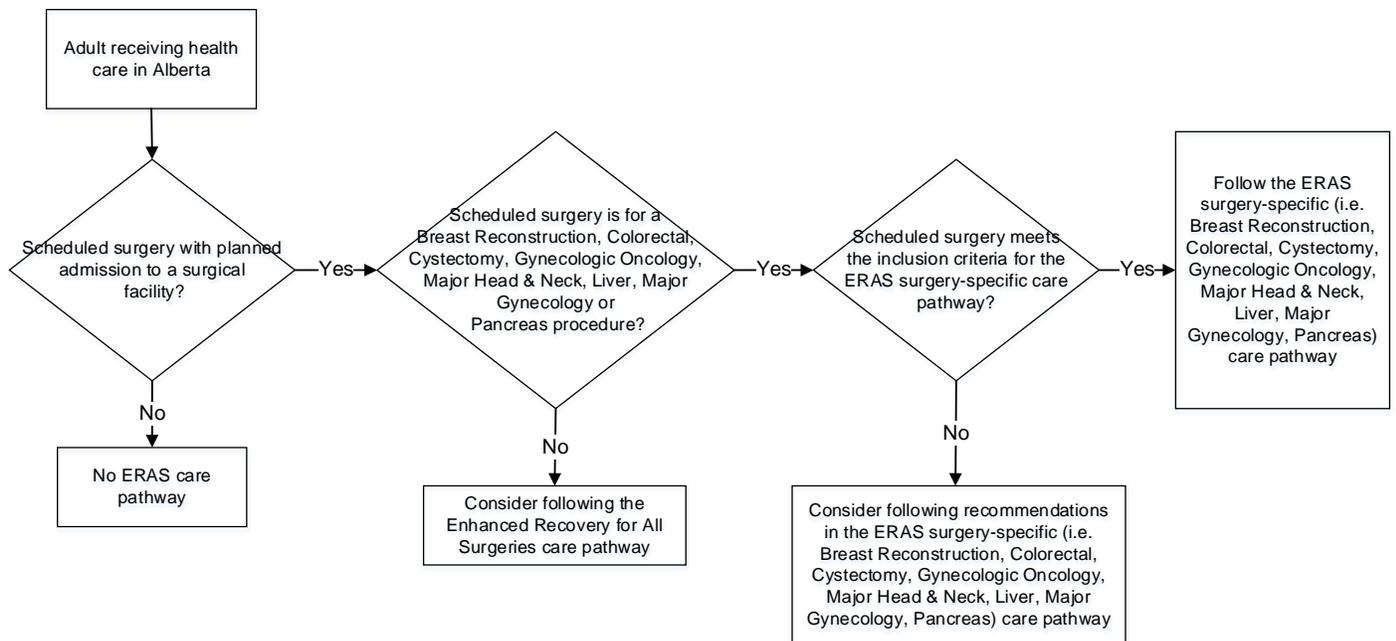
Certain criteria must be met for a patient to be considered for inclusion in an ERAS care pathway. See the Rationale section in each ERAS Topic for specific surgical procedures appropriate for inclusion.

The inclusion criteria (applicable as of July 1, 2017) for the ERAS Liver Surgery, Adult - Inpatient care pathway are

- Adult surgical inpatient undergoing scheduled surgery within Alberta for any of the following liver procedures
  - Left Hemihepatectomy
  - Extended Left Hemihepatectomy
  - Right Hemihepatectomy
  - Extended Right Hemihepatectomy
  - Other Segmentectomies
  - Wedge or Minor Resections

While all eligible patients should be started on the ERAS Liver Surgery, Adult – Inpatient care pathway, individual patient care plans may need to be modified based on surgical findings or additional procedures. Liver surgery patients who do not meet the inclusion criteria may still be considered for applicable recommendations in the ERAS Liver Surgery, Adult – Inpatient care pathway, or in the case of liver surgery in conjunction with colorectal surgery, they may be considered for inclusion in the ERAS Colorectal Surgery, Adult - Inpatient care pathway.

**Figure #1 ERASAlberta Care Pathway Inclusion Flowchart**



## Goals of Management

The goals of clinical management for enhancing the recovery of adult patients after scheduled surgery are to

1. Decrease
  - surgical care length of stay (acute and total) with no increase in readmissions or use of emergency, specialty or primary care related to the post-surgical care
  - surgical complications delaying discharge
  - serious surgical complications including reoperations
2. Increase
  - positive surgical care experiences for patients and families, and providers
  - compliance with ERAS recommendations

This can be achieved by engaging patients and families, clinicians and staff in a multidisciplinary evidence-informed ERAS care pathway focused on

- patient preparation that includes pre-operative optimization, an explanation of the surgical procedure, as well as post-operative expectations and goals to maximize patient participation in their surgical care journey
- pre-operative fasting and carbohydrate loading following national anesthesia guidelines
- appropriate prophylaxis to prevent or reduce surgical complications including venous thromboembolism (VTE), surgical site infections, nausea and vomiting
- multimodal, opioid-sparing analgesic approaches to improve the management of perioperative pain, nausea and vomiting

- management of physiological surgical stress response
- maintenance of normothermia
- minimally invasive surgical approaches
- balanced fluid management
- avoidance of, or early removal of drains and tubes
- mobilization soon after surgery
- stimulation of gut motility
- offer of food and drinks soon after surgery with appropriate nutritional supplements

## ERAS Liver Surgery, Adult – Inpatient: Recommendations

ERAS Alberta recommendations are based on published international ERAS guidelines and other evidence, with consideration for current practices at ERAS sites and other clinical standards. ERAS<sup>®</sup> Society recommendations are from the Table of Recommendations within [ERAS<sup>®</sup> Society Guidelines](#). The GRADE<sup>5</sup> methodology was used to determine quality of evidence and strength of recommendation for each ERAS<sup>®</sup> Society recommendation.

Note: Careful consideration should be taken with elderly and/or frail patients, particularly in the area of medication management.

### Pre-operative information, education and counselling

**ERAS Alberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below.

- **ERAS<sup>®</sup> Society Recommendation:** Patients should receive routine dedicated preoperative counselling and education before liver surgery.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

### Pre-operative optimization

**ERAS Alberta Recommendation:** Smoking and alcohol consumption (patients with alcohol dependency) should be stopped four weeks before surgery. Increasing exercise pre-operatively may be of benefit. Anemia should be actively identified, investigated, and corrected pre-operatively. Patients should be screened for nutritional status including weight loss within the previous 6 months. All patients at nutrition risk need an assessment to confirm malnutrition. If a patient is malnourished, an in-depth nutrition assessment, along with treatment, is required by a registered dietitian.

Note: Patients with alcohol dependency should wean consumption under the recommendation of a qualified healthcare professional.

- **ERAS<sup>®</sup> Society Recommendation:** Patients at risk (weight loss [WL] >10–15 % within 6 months, body mass index (BMI) <18.5 kg/m<sup>2</sup> and serum albumin <30 g/L in the absence of liver or renal dysfunction) should receive oral nutrition supplements for 7 days prior to surgery. For severely malnourished patients (>10% WL), surgery should be postponed for at least 2 weeks to improve nutritional status and allow patients to gain weight.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** High
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

### **Pre-operative bowel preparation**

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below.

- **ERAS<sup>®</sup> Society Recommendation:** Oral mechanical bowel preparation is not indicated before liver surgery.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Low
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Weak

### **Pre-operative fasting and carbohydrate load treatment**

**ERASAlberta Recommendation:** Before scheduled procedures, the minimum duration of pre-operative fasting should be 8 hours after a meal that includes meat, fried or fatty foods, 6 hours after a light meal (such as toast and a clear fluid), and 2 hours after clear fluids as per the [Canadian Anesthesiologists' Society Guidelines to the Practice of Anesthesia - Revised Edition 2019](#)<sup>6</sup>. Carbohydrate load treatment should occur between 2 and 3 hours prior to the administration of anesthesia.

Note: The AHS Provincial Clinical Knowledge Topic: [Perioperative Management of Patients with Diabetes Mellitus, Adult - Inpatient](#) provides recommendations for patients with diabetes mellitus.

- **ERAS<sup>®</sup> Society Recommendation:** Preoperative fasting does not need to exceed 6 hours for solids and 2 hours for liquids. Carbohydrate loading is recommended the evening before liver surgery and 2 hours before induction of anesthesia.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** No preoperative fasting more than 6 hours (Moderate), Carbohydrate loading (Low)
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** No preoperative fasting more than 6 hours (Strong), Carbohydrate loading (Weak)

### **Perioperative oral immunonutrition (IN)**

**ERASAlberta Recommendation:** IN product is not available within Alberta Health Services.

- **ERAS<sup>®</sup> Society Recommendation:** There is limited evidence for the use of IN in liver surgery.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Low
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Weak

### **Pre-anesthetic medication**

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below.

- **ERAS<sup>®</sup> Society Recommendation:** Long acting anxiolytic drugs should be avoided. Short acting anxiolytics may be used to perform regional analgesia prior to the induction of anesthesia.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

### **Perioperative steroids administration**

**ERASAlberta Recommendation:** There is insufficient evidence to support the routine use of perioperative steroids in patients undergoing liver resection.

- **ERAS<sup>®</sup> Society Recommendation:** Steroids (methylprednisolone) may be used before hepatectomy in normal liver parenchyma, since it decreases liver injury and intraoperative stress, without increasing the risk of complications. Steroids should not be given in diabetic patients.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Weak

### **Venous thromboembolism prophylaxis**

**ERASAlberta Recommendation:** Patients should have a sequential compression device (SCD) applied, and receive pre-operative or intra-operative pharmacological prophylaxis with heparin. Extended prophylaxis with low molecular weight heparin (LMWH) should be given for an additional 28 days post-discharge to patients with cancer or other patients with increased risk of venous thromboembolism (VTE). Risk assessment is required in accordance with the AHS-Wide Policy Suite – Venous Thromboembolism Prophylaxis ([Policy](#) and [Guideline](#)).

Note: Refer to the AHS Provincial Clinical Knowledge Topic: *VTE Prophylaxis, Adult – Inpatient* ([link to be added once available](#)).

- **ERAS<sup>®</sup> Society Recommendation:** LMWH or unfragmented heparin reduces the risk of thromboembolic complications and should be started 2–12 hours before surgery, particularly in major hepatectomy. Intermittent pneumatic compression stockings should be added to further decrease this risk.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Use of heparin (Moderate), Use of intermittent pneumatic compression devices (Low)
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Use of heparin (Strong), Use of intermittent pneumatic compression devices (Weak)

### **Antimicrobial prophylaxis and skin preparation**

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below with antibiotic provision as per [AHS Recommended Drug Regimens for Surgical Prophylaxis in Adult Patients](#).

- **ERAS<sup>®</sup> Society Recommendation:** Single dose intravenous antibiotics should be administered before skin incision and less than 1 hour before hepatectomy. Postoperative “prophylactic” antibiotics are not recommended. Skin preparation with chlorhexidine 2% is superior to povidone-iodine solution.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Antimicrobial prophylaxis (Moderate), Skin preparation (Moderate)
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Antimicrobial prophylaxis (Strong), Skin preparation (Strong)

### **Prevention of post-operative nausea and vomiting (PONV)**

**ERASAlberta Recommendation:** All patients need to be pre-operatively assessed for risk<sup>7</sup> and provided with perioperative PONV prophylaxis accordingly. A multimodal approach to PONV prophylaxis should be adopted in all high risk patients.<sup>8</sup>

- **ERAS<sup>®</sup> Society Recommendation:** Multimodal approach to PONV should be used. Patients should receive PONV prophylaxis with 2 antiemetic drugs.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate

- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### **Standard anesthetic protocol**

**ERASAlberta Recommendation:** Emphasis is placed on using short acting anesthetic agents with consideration for the use of total intravenous anesthesia (TIVA) instead of inhalation anesthetic. Opioids should be used sparingly and if needed, short acting opioids are recommended.

- **ERAS<sup>®</sup> Society Recommendation:** None
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** N/A
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** N/A

#### **Prevention of intra-operative hypothermia**

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below.

- **ERAS<sup>®</sup> Society Recommendation:** Perioperative normothermia should be maintained during liver resection.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### **Perioperative fluid management**

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below with the following additions: an alternative to monitoring central venous pressure (CVP) is to monitor stroke volume variation, which should be maintained at 10 to 12% intra-operatively<sup>9</sup>. The enteral route for fluid post-operatively should be used as early as possible, and intravenous fluids should be discontinued as soon as clinically appropriate.

Note: Saline is sodium chloride 0.9%.

- **ERAS<sup>®</sup> Society Recommendation:** The maintenance of low CVP (below 5 cmH<sub>2</sub>O) with close monitoring during hepatic surgery is advocated. Balanced crystalloid should be preferred over 0.9 % saline or colloids to maintain intravascular volume and avoid hyperchloremic acidosis or renal dysfunction, respectively.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### **Minimally invasive surgery (MIS)**

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below.

- **ERAS<sup>®</sup> Society Recommendation:** The choice of incision is at the surgeon's discretion. It depends on the patient's abdominal shape and location in the liver of the lesion to be resected. Mercedes-type incision should be avoided due to higher incisional hernia risk. Laparoscopic liver resections can be performed by hepato-biliary surgeons experienced in laparoscopic surgery, in particular left lateral sectionectomy and resections of lesions located in anterior segments. There is currently no proven advantage of robotic liver resection in ERAS. Its use should be reserved for clinical trials.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Incision (Moderate), Minimally invasive approach (Moderate), Robotic surgery (Low)

- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Incision (Strong), Minimally invasive approach (Strong), Robotic surgery (Weak)

#### Prevention of delayed gastric emptying (DGE)

**ERASAlberta Recommendation:** There is insufficient evidence to support the routine use of an omentum flap after left-sided hepatectomy.

- **ERAS<sup>®</sup> Society Recommendation:** An omentum flap to cover the cut surface of the liver reduces the risk of DGE after left-sided hepatectomy.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** High
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### Nasogastric intubation

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below.

- **ERAS<sup>®</sup> Society Recommendation:** Prophylactic nasogastric intubation increases the risk of pulmonary complications after hepatectomy. Its routine use is not indicated.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** High
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### Surgical site drains

**ERASAlberta Recommendation:** The routine use of surgical site drains is not recommended.

- **ERAS<sup>®</sup> Society Recommendation:** The available evidence is non-conclusive and no recommendation can be given for the use of prophylactic drainage or against it after hepatectomy.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Low
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Weak

#### Urinary drainage

**ERASAlberta Recommendation:** If a urinary catheter is required for post-operative bladder drainage, it should be used for a short period, preferably less than 24 hours post-operatively.

- **ERAS<sup>®</sup> Society Recommendation:** None
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** N/A
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** N/A

#### Prevention of post-operative ileus

**ERASAlberta Recommendation:** Bowel motility optimization may include gum chewing. Stimulation of bowel movement with laxatives is not indicated.

- **ERAS<sup>®</sup> Society Recommendation:** Stimulation of bowel movement after liver surgery is not indicated.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** High
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### Post-operative analgesia

**ERASAlberta Recommendation:** The use of multimodal opioid sparing strategies is recommended and can include regional anesthesia (transversus abdominis plane [TAP] block, rectus sheath block) or thoracic epidural analgesia (TEA). All are acceptable options for post-operative analgesia. There is insufficient evidence to recommend one over the other.

- **ERAS<sup>®</sup> Society Recommendation:** Routine thoracic epidural analgesia (TEA) cannot be recommended in open liver surgery for ERAS patients. Wound infusion catheter or intrathecal opiates can be good alternatives combined with multimodal analgesia.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### Post-operative glucose control

**ERASAlberta Recommendation:** Same as the ERAS<sup>®</sup> Society recommendation below.

Note: The AHS Provincial Clinical Knowledge Topic: [Perioperative Management of Patients with Diabetes Mellitus, Adult - Inpatient](#) provides recommendations for patients with diabetes mellitus.

- **ERAS<sup>®</sup> Society Recommendation:** Insulin therapy to maintain normoglycemia is recommended.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

#### Post-operative nutritional care

**ERASAlberta Recommendation:** Patients should be encouraged to take normal food as tolerated, as soon as awake and alert after surgery. Oral nutritional supplements (ONS) should be used to supplement total caloric and protein intake.

- **ERAS<sup>®</sup> Society Recommendation:** Most patients can eat normal food at day one after liver surgery. Postoperative enteral or parenteral feeding should be reserved for malnourished patients or those with prolonged fasting due to complications (e.g. ileus >5 days, delayed gastric emptying).
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Early oral intake (Moderate), Oral nutritional supplements (ONS) (Moderate), No routine postoperative artificial nutrition (High)
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Early oral intake (Strong), ONS (Weak), No routine postoperative artificial nutrition (Strong)

#### Early mobilization

**ERASAlberta Recommendation:** Patients should be encouraged to mobilize, starting the evening of post-operative day 0.

- **ERAS<sup>®</sup> Society Recommendation:** Early mobilization after hepatectomy should be encouraged from the morning after the operation until hospital discharge
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Low
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Weak

#### Audit outcomes and compliance

**ERAS Alberta Recommendation:** A systematic audit is essential to determine clinical outcomes and measure overall compliance with clinical recommendations. Reporting on patient experience and functional recovery using validated tools may also be useful. Using more evidence-based elements of perioperative care from an ERAS guideline are likely to improve outcomes further.

- **ERAS<sup>®</sup> Society Recommendation:** Systemic audit improves compliance and clinical outcome in healthcare practice.
- **ERAS<sup>®</sup> Society Recommendation - Quality of Evidence:** Moderate
- **ERAS<sup>®</sup> Society Recommendation - Strength of Recommendation:** Strong

## Clinical Decision Support

The ERAS Liver Surgery, Adult - Inpatient Topic is intended to guide clinicians in enhancing surgical care for all patients who meet the inclusion criteria for the ERAS care pathway. The ERAS clinical knowledge and patient information contained within this Topic are intended to be used as a comprehensive package applied to a surgical care population. All recommendations should be applied to all eligible patients. The anticipated benefits of care management are reduced if the care pathway is applied selectively.

Clinical decision support tools relevant to the ERAS Liver Surgery, Adult - Inpatient care pathway include the following

[AHS Pre-Operative Fasting and Carbohydrate Loading Prior to Surgical Interventions - Adults Guideline](#)

[AHS Recommended Drug Regimens for Surgical Prophylaxis in Adult Patients](#)

[AHS Safe Surgery Checklist](#)

[AHS Use of Aprepitant \(Emend<sup>®</sup>\) for Prevention of Postoperative Nausea and Vomiting \(PONV\) in Adults](#)

[AHS Venous Thromboembolism Prophylaxis Guideline](#)

AHS VTE Prophylaxis Weight-Band Table – *please see AHS internal website*

[Bugs & Drugs](#)

[Canadian Anesthesiologists' Society Guidelines to the Practice of Anesthesia - Revised Edition 2019<sup>6</sup>](#)

[Canadian Nutrition Screening Tool \(CNST\)](#)

[Choosing Wisely Canada: Drop the Pre-Op Toolkit](#)

[Choosing Wisely Canada: Recommendations and Resources, by Specialty](#)

[Consensus Guidelines for the Management of Postoperative Nausea and Vomiting<sup>8</sup>](#)

[Eating and Drinking Before Surgery: Patient Instructions](#)

Other important clinical information relevant to the ERAS Liver Surgery, Adult - Inpatient care pathway can be found in [References](#) and [Additional Information](#).

## ERAS Liver Surgery, Adult – Inpatient Pre-operative Order Set

### Order Set Components

**Order Set Keywords:** ERAS, Liver, Pre-admission, Pre-operative, Surgery

### Before Day of Procedure

#### Patient Teaching

- Teach: provide ERAS patient teaching material and discuss perioperative patient goals
  - [Your Surgery Journey – Patient Guide](#)

Refer to [AHS Pre-Operative Fasting and Carbohydrate Loading Prior to Surgical Interventions - Adults Guideline](#). Refer to [MyHealth.Alberta.ca](#) for specific patient instructions.

- Teach: Eating and Drinking Before Surgery: Patient Instructions – *Non-Diabetic*

#### OR

Choose ONE:

- Teach: Eating and Drinking Before Surgery: Patient Instructions – *Non-Diabetic, Fasting*
- Teach: Eating and Drinking Before Surgery: Patient Instructions - *Diabetic*
- Instruct patient to hold \_\_\_\_\_ medication(s) \_\_\_\_\_ days prior to scheduled surgery
- Instruct patient to stop all herbal supplements one week prior to scheduled surgery

#### Consults and Referrals

- Physician: Anesthesia
- Physician: Internal Medicine
- Screen for nutrition risk: use [Canadian Nutrition Screening Tool \(CNST\)](#)
  - Refer to Registered Dietitian if CNST score equals 2 Yes answers

#### Laboratory Investigations

- Complete Blood Count (CBC) with differential
- PT INR
- PTT
- Albumin
- ALP
- ALT
- AST
- Bilirubin Total
- Calcium (Ca)
- Creatinine/eGFR

- C-Reactive Protein
- Electrolytes (Na, K, Cl, CO<sub>2</sub>)
- GGT
- Glucose Random
- Hemoglobin A1C: if not performed within last 3 months
- Magnesium (Mg)
- Phosphate
- Protein Total
- Urea

**Tumour Markers**

- Alpha Fetoprotein
- CA 19-9
- CEA
- Type and Screen
- Red Blood Cells on Standby Request: \_\_\_\_\_ units Red Blood Cells

**Diagnostic Investigations**

- GR Chest, 2 Projections (Chest X-Ray PA and Lateral)
- Electrocardiogram

**Day of Procedure**

**Patient Care**

*Discuss Goals of Care with patient/Alternate Decision-Maker and complete or update Goals of Care Designation. Refer to AHS Provincial Clinical Knowledge Topic: [Advance Care Planning and Goals of Care Designations, All Ages – All Locations](#).*

- Apply sequential compression device (SCD)
- Apply forced-air warming device

**Monitoring**

- Vital Signs: AM of surgery
- Weight: AM of surgery
- Blood Glucose Monitoring Point of Care Testing (POCT): AM of surgery

**Diet/Nutrition**

*Refer to [AHS Pre-Operative Fasting and Carbohydrate Loading Prior to Surgical Interventions - Adults Guideline](#).*

*The minimum duration of pre-operative fasting prior to the administration of anesthesia should be 8 hours after a meal that includes meat or fried or fatty foods, 6 hours after a light meal (such as toast and a clear fluid), 2 hours after clear fluids.<sup>6</sup>*

**Pre-operative eating and drinking**

- Clinical Communication: Final snack 8 hours prior to scheduled surgery
- Clinical Communication: Clear fluids until 3 hours prior to scheduled surgery
- NPO 2 hours prior to scheduled surgery

*Refer to AHS Provincial Clinical Knowledge Topic: [Perioperative Management of Patients with Diabetes Mellitus, Adult - Inpatient](#). The recommendation is to avoid carbohydrate loading<sup>3</sup> patients with diabetes mellitus until prospective trials have been completed.*

***Clinicians should use independent medical judgement in the context of individual clinical circumstances and delete the following order if required.***

### Pre-operative carbohydrate loading

- Clear apple juice or cranberry cocktail (*refer to [Appendix A](#)*) 500 mL PO 3 hours prior to scheduled surgery. Must be consumed by 2 hours prior to scheduled surgery
  - If patient's admission is greater than 3 hours prior to scheduled surgery, provide carbohydrate load
- Assess and document last consumption of food and fluids (including carbohydrate load)

### Intravenous Therapy

- Intravenous Cannula: insert intra-operatively
- Intravenous Cannula: insert pre-operatively, apply saline lock

### Medications

#### VTE Prophylaxis

*Refer to AHS Provincial Clinical Knowledge Topic: VTE Prophylaxis, Adult – Acute Care (link to be added once available). Refer to [AHS Venous Thromboembolism Prophylaxis Guideline](#).*

- heparin 5000 units SUBCUTANEOUSLY once pre-operatively

#### Antibiotic Prophylaxis

*Antibiotics should be given within 60 minutes prior to incision.*

*Choose ONE option:*

*Option 1:*

- ceFAZolin 2 g IV once pre-operatively

*Option 2 if patient has ceFAZolin allergy or severe non-IgE mediated reaction to any  $\beta$ -lactam:*

- gentamicin (1.5 mg/kg) \_\_\_\_\_ mg IV once pre-operatively

**AND**

- clindamycin 600 mg IV once pre-operatively

*Option 3 if patient has ceFAZolin allergy or severe non-IgE mediated reaction to any  $\beta$ -lactam:*

- gentamicin (1.5 mg/kg) \_\_\_\_\_ mg IV once pre-operatively

**AND**

- metroNIDAZOLE 500 mg IV once pre-operatively

#### Analgesics

*Consider dose reduction if patient is elderly.*

- acetaminophen 650 mg PO once pre-operatively, to be given 1 hour prior to surgery. Maximum of 4000 mg acetaminophen in 24 hours from all sources
- gabapentin 300 mg PO once pre-operatively, to be given 1 hour prior to surgery

#### Antiemetics

*If patient has 3 or 4 of the following risk factors for post-operative nausea and vomiting (PONV)<sup>7</sup>*

- female gender
- non-smoker
- history of PONV or motion sickness

- *post-operative use of opioids*

**AND** patient meets one of the following criteria

- *High risk of developing PONV within 24 hours after surgery AND history of being refractory to other antiemetic treatments*
- *Risk of medical sequelae of vomiting (i.e. jaw wiring, neurosurgery, upper gastrointestinal surgery)*

Choose aprepitant:

- aprepitant 80 mg PO once pre-operatively, to be given 1 hour prior to surgery

### **Glycemic Management Medications**

Refer to AHS Provincial Clinical Knowledge Topic: [Perioperative Management of Patients with Diabetes Mellitus, Adult - Inpatient](#).

- Intravenous insulin infusion for NPO adult diabetic patient as per local institutional practices

## **ERAS Liver Surgery, Adult – Inpatient Intra-operative Guidance**

### **Normothermia**

- Operating Room temperature at least 20°C
- Monitor patient's temperature intra-operatively
- Use forced-air warming device for all procedures lasting longer than 30 minutes to achieve/maintain a temperature between 36°C to 38°C throughout the perioperative period
- Use fluid warmers for procedures in which greater than 1 litre fluid is expected to be administered

### **Post-operative Nausea and Vomiting (PONV) Prophylaxis**

- Provide multimodal prophylaxis with consideration to patient's PONV risk score and administration of pre-operative PONV prophylaxis<sup>8</sup>

### **Pain Management**

- Consider the use of regional anesthesia (transversus abdominis plane [TAP] block or rectus sheath block) or thoracic epidural analgesia (TEA) if applicable, and discuss decision with surgical team
- Use opioids sparingly. If needed, short acting opioids are recommended. Long acting opioids should be avoided. Patients with pre-operative chronic pain may require additional assessment based on their Best Possible Medication History (BPMH). Consider non-opioid analgesia or appropriate opioid-sparing adjuncts

### **Additional Guidance**

- Consider the use of total intravenous anesthesia (TIVA) instead of inhalation anesthetic
- Avoid routine nasogastric intubation
- Fluid therapy goal is to maintain euvolemia. If appropriate, use goal-directed fluid management to guide fluid therapy especially for high risk patients and for patients undergoing surgery with significant intravascular volume losses anticipated
- Avoid use of prophylactic surgical site drains

- Remove indwelling urinary catheter, if applicable, upon completion of procedure or as soon as clinically indicated

## ERAS Liver Surgery, Adult – Inpatient Post-operative Order Set

### Order Set Components

**Order Set Keywords:** ERAS, Liver, Post-operative, Surgery

### Admit, Transfer, Discharge

- Anticipated Date of Discharge: \_\_\_\_\_

### Patient Care

*Discuss Goals of Care with patient/Alternate Decision-Maker and update Goals of Care Designation, if applicable. Refer to AHS Provincial Clinical Knowledge Topic: [Advance Care Planning and Goals of Care Designations, All Ages – All Locations](#).*

- Sequential compression device (SCD): discontinue when ambulating well

### Monitoring

- Vital Signs: assess as per local institutional practices
- Opioid Monitoring: monitor as per local institutional practices
- Pain Score and Nausea Score: assess at least every 4 hours x 3 days **and then** every 8 hours
- Blood Glucose Monitoring Point of Care Testing (POCT): BID x 48 hours. Notify most responsible health practitioner if blood glucose is less than 4 mmol/L or greater than 12 mmol/L

### Activity

- Activity as tolerated
  - Post-operative day (POD) 0: stand at bedside, up in chair, walk to doorway and back; activity goal is 2 hours
  - POD 1: up in chair each meal, ambulate at least 3 times daily; activity goal is 4 hours
  - POD 2 until discharge: up in chair each meal, ambulate at least 3 times daily; activity goal is 6 hours
- Notify physiotherapist if pre-operative mobility concerns or if patient requires more than one-person assist

### Intake and Output

- Intake and Output: assess every 8 hours x 4 days, include strict oral intake
- Indwelling Urinary Catheter: remove on POD 1 in AM
- In and Out Urinary Catheter: insert PRN for urinary retention once indwelling urinary catheter removed
- Weight: assess daily x 3 days, start on POD 1

### Diet/Nutrition

- Clinical Communication: offer patient oral fluids; intake goal 500 mL on POD 0
- Post-Surgical Transition Diet: start on POD 0
- Regular Diet: start on POD 1

- Regular Diabetic - Adult Diet: start on POD 1

**Protein/Calorie Dense Oral Nutritional Supplements**

*Appropriate when patient is on any type of oral diet including Gluten-free and Diabetic - Adult. Suitable for lactose intolerance but NOT appropriate for dairy allergy. Achieve a supplement intake of 300 kcal/day on POD 0 and 600 kcal/day on POD 1 until discharge.*

- Ensure Protein Max: 90 mL PO 3 times daily, start on POD 0 **and then** 90 mL PO 5 times daily, start on POD 1 until discharge

**Wound Care**

- Surgical Incisions: assess every 8 hours and PRN
- Wound Dressing Instructions: \_\_\_\_\_

**Respiratory Care**

- Incentive Spirometry: perform every 1 hour while awake
- Oxygen Therapy: titrate to saturation, maintain SpO<sub>2</sub> greater than 92%
- Head of Bed: elevate to at least 30 degrees while patient on opioids or epidural

**Laboratory Investigations**

- Complete Blood Count (CBC) with differential, start on POD 1 in AM and repeat daily x 5 days

*If patient is receiving VTE prophylaxis choose repeat CBC with differential:*

- Complete Blood Count (CBC) with differential, start on POD 1 in AM and repeat every 3 days x 5 times
- PT INR, start on POD 1 in AM and repeat daily x 5 days
- PTT, start on POD 1 in AM and repeat daily x 5 days
- Albumin, start on POD 1 in AM and repeat daily x 5 days
- ALP, start on POD 1 in AM and repeat daily x 5 days
- ALT, start on POD 1 in AM and repeat daily x 5 days
- AST, start on POD 1 in AM and repeat daily x 5 days
- Bilirubin Total, start on POD 1 in AM and repeat daily x 5 days
- Calcium (Ca), start on POD 1 in AM and repeat daily x 5 days
- Creatinine, start on POD 1 in AM and repeat daily x 5 days
- Electrolytes (Na, K, Cl, CO<sub>2</sub>), start on POD 1 in AM and repeat daily x 5 days
- GGT, start on POD 1 in AM and repeat daily x 5 days
- Glucose Random, start on POD 1 in AM and repeat daily x 5 days
- LD, start on POD 1 in AM and repeat daily x 5 days
- Lipase, start on POD 1 in AM and repeat daily x 5 days
- Magnesium (Mg), start on POD 1 in AM and repeat daily x 5 days
- Phosphate, start on POD 1 in AM and repeat daily x 5 days
- Urea, start on POD 1 in AM and repeat daily x 5 days

**Intravenous Therapy**

- sodium chloride 0.9% lock when patient tolerating oral fluid intake
- lactated ringer's infusion IV at 100 mL/hour if patient **not** tolerating oral fluid intake, lock when patient tolerating oral fluid intake

- potassium chloride 20 mmol in dextrose 5% (D5W) – sodium chloride 0.45% infusion IV at 100 mL/hour if patient **not** tolerating oral fluid intake, lock when patient tolerating oral fluid intake

## Medications

### VTE Prophylaxis

Refer to AHS Provincial Clinical Knowledge Topic: VTE Prophylaxis, Adult – Inpatient (link to be added once available). Refer to AHS VTE Prophylaxis Weight-Band Table (see AHS internal website) if patient has reduced renal function or is less than 40 kg or greater than 100 kg. If patient has undergone abdominopelvic cancer surgery or is at increased risk of VTE (refer to [AHS Venous Thromboembolism Prophylaxis Guideline](#)) consider extended prophylaxis (up to 4 weeks post-discharge) with low molecular weight heparin (LMWH).

Choose ONE:

- tinzaparin 4500 units SUBCUTANEOUSLY once daily at \_\_\_\_\_ hours (hh mm), start on POD \_\_\_\_\_ until discharge
- tinzaparin 4500 units SUBCUTANEOUSLY once daily at \_\_\_\_\_ hours (hh mm), start on POD \_\_\_\_\_ and extend therapy for 28 days
- Teach LMWH self-injection in preparation for discharge

### Antilucer Agents and Acid Suppressants

- pantoprazole EC tab 40 mg PO daily before breakfast until discharge

If patient is unable to tolerate oral or enteral medication choose BOTH:

- pantoprazole 40 mg IV daily x 48 hours

#### AND THEN

- pantoprazole EC tab 40 mg PO daily before breakfast until discharge, start after 48 hours of IV pantoprazole

### Bowel Stimulation

- Chew gum 3 times daily (minimum 30 minutes each time), as tolerated

Choose ONE:

- magnesium gluconate 1000 mg PO BID, start on POD 1 and discontinue after first bowel movement
- polyethylene glycol 3350 powder 17 g PO daily until discharge, start on POD 1

### Analgesics

Consider non-opioid analgesia or appropriate opioid-sparing multimodal analgesia. If needed, short acting opioids are recommended. Long acting opioids should be avoided.

- Follow Anesthesia/Acute Pain Service orders for continuous regional epidural, nerve block therapy and/or patient controlled analgesia (PCA)
- Follow Surgery orders for patient controlled analgesia (PCA)

### Prophylaxis Analgesics

Consider dose reduction if patient is elderly.

- acetaminophen 650 mg PO every 6 hours x 48 hours **and then** acetaminophen 650 mg PO every 6 hours PRN for pain. Maximum of 4000 mg acetaminophen in 24 hours from all sources

Use caution if patient has renal impairment or is at high risk of acute kidney injury.

- ibuprofen 400 mg PO every 6 hours x 48 hours **and then** ibuprofen 400 mg PO every 6 hours PRN for pain

**PRN Oral Opioids** (for pain not controlled by non-opioid analgesia)

Consider dose reduction if patient is elderly or opiate-naïve.

- oxyCODONE 5 to 10 mg PO every 4 hours PRN for pain not controlled by non-opioid analgesia

**PRN Parenteral Opioids** (for pain not controlled by oral opioids, or oral analgesia is contraindicated)

Consider dose reduction if patient is elderly or opiate-naïve.

Choose ONE:

- morphine 1 to 10 mg IV/SUBCUTANEOUSLY every 4 hours PRN for pain not controlled by oral opioids
- HYDROMORPHONE 0.5 to 2 mg IV/SUBCUTANEOUSLY every 4 hours PRN for pain not controlled by oral opioids

**Antiemetics<sup>8</sup>**

**Prophylaxis Antiemetics**

Consider dose reduction if patient is elderly or has reduced renal function.

Choose BOTH:

- ondansetron 8 mg PO/NG (or ODT if difficulty swallowing or active vomiting with no IV access) every 8 hours x 48 hours **and then** ondansetron 4 mg PO/NG every 8 hours PRN
- ondansetron 4 mg IV every 8 hours x 48 hours **and then** ondansetron 4 mg IV every 8 hours PRN if oral dose is **not** tolerated

**PRN Antiemetics**

Consider dose reduction if patient is elderly or has reduced renal function.

- metoclopramide 10 mg PO/NG/IV/IM every 6 hours PRN
- dimenhyDRINATE 25 to 50 mg PO/IV/IM every 4 hours PRN

**Glycemic Management Medications**

Refer to AHS Provincial Clinical Knowledge Topic: [Perioperative Management of Patients with Diabetes Mellitus, Adult - Inpatient](#).

- [AHS Basal Bolus Insulin Therapy \(BBIT\)](#)

**Consults and Referrals**

- Physiotherapy
- Registered Dietitian
- Social Work
- Transition Services

**Rural Considerations**

The ERAS clinical knowledge and patient information contained within each Topic are intended to be used as a comprehensive package to maximize the anticipated benefits of care management. Considerations for application of ERAS care pathways (developed for Breast

Reconstruction, Colorectal, Cystectomy, Gynecologic Oncology, Liver, Major Gynecology, Major Head and Neck, and Pancreas surgery) in rural surgical facilities within Alberta include

- Surgical procedure criteria must be met (see the Rationale section in each ERAS Topic).
  - Adult patients scheduled for Breast Reconstruction, Colorectal, Cystectomy, Gynecologic Oncology, Liver, Major Gynecology, Major Head and Neck, or Pancreas surgery who do not meet the inclusion criteria for the ERAS care pathway may still be considered for applicable recommendations of that pathway (see the Recommendations section in each ERAS Topic)
  - Adult patients scheduled for any other type of surgery may be considered for the Enhanced Recovery for All Surgeries, Adult – Inpatient, Ambulatory care pathway
- Clinical expertise (e.g. surgeon, anesthesia and nursing), clinical support services (e.g. nutrition services, pharmacy, physiotherapy, laboratory, diagnostic imaging), and additional resources (e.g. medications, nutritional supplements, sequential compression devices, active warming devices) are available for the duration of clinical care from admission to discharge (see the Recommendations section in each ERAS Topic)
  - There must also be site physician and operations leadership, a site team focused on learning and collaboration, and processes and resources to audit outcomes and compliance

## Disposition Planning

### Discharge

Prior to patient discharge from the ERAS care pathway, the following should be considered

- Patient is medically stable
- Patient is functioning close to or at pre-operative level for activities of daily living
- Patient is passing gas or stool
- Patient is tolerating solid food
- Patient's pain is well controlled on oral analgesia
- Patient's nausea is well controlled with no vomiting
- Patient's incisions and/or wounds are healing and managed with appropriate wound care products
- Patient is able to manage drains and/or self-injection, if appropriate
  
- Discharge medication list and prescription(s) have been provided to patient
- Discharge teaching is complete and a copy has been provided to patient
- Transition Services/Home Care Services have been arranged, if required
- Wound care/negative-pressure wound therapy supplies have been arranged, if required
  
- Patient has been referred to the following education resources
  - [Your Surgery Journey – Patient Guide](#)
  - MyHealth.Alberta.ca
    - [Patient Care Webpages](#) including After Surgery and [Incision Care After Surgery](#)
    - [Patient Care Handouts](#) including Before and After Surgery - Adult - [What to Expect at Home](#)

- [Patient Care Videos](#) including Before and After Surgery – [Preventing Problems After Surgery](#)

**Outpatient follow-up**

- If applicable, patient to have staples removed in 7 to 10 days by family physician or in surgeon’s clinic
- Patient to follow up with family physician or surgeon in 4 to 6 weeks

**Analytics**

**Outcome Measure #1**

<b>Name of Measure</b>	ERASAlberta coverage rate
<b>Definition</b>	Number of surgeries performed that were verified ERAS surgeries divided by the total surgeries performed that were eligible ERAS surgeries, multiplied by 100. Calculated provincially, by zone, by site.
<b>Rationale</b>	Intended to measure the ability of ERASAlberta to provide enhanced recovery after surgery.

**Outcome Measure #2**

<b>Name of Measure</b>	ERASAlberta length of stay (LOS) rates
<b>Definition</b>	Number of surgeries performed that were verified ERAS surgeries and resulted in <ul style="list-style-type: none"> <li>• acute LOS less than or equal to acute LOS benchmark</li> <li>• ICU LOS less than or equal to ICU LOS benchmark</li> <li>• readmission LOS less than or equal to readmission LOS benchmark</li> <li>• total LOS less than or equal to total LOS benchmark</li> </ul> divided by the total surgeries performed that were verified ERAS surgeries, multiplied by 100. Calculated provincially, by zone, by site.
<b>Rationale</b>	Demonstrates how ERAS impacts patient care by decreasing post-operative complications and accelerating recovery, thereby allowing for earlier discharge.

**Outcome Measure #3**

<b>Name of Measure</b>	ERASAlberta readmission rate
<b>Definition</b>	Number of surgeries performed that were verified ERAS surgeries and resulted in greater than or equal to 1 unplanned readmission to acute care within 30 days of discharge date divided by the total surgeries performed that were verified ERAS surgeries, multiplied by 100. Calculated provincially, by zone, by site.
<b>Rationale</b>	Demonstrates how ERAS impacts patient care by decreasing post-operative complications and accelerating recovery, thereby reducing the risk of readmission.

**Outcome Measure #4**

<b>Name of Measure</b>	ERASAlberta compliance rates
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<b>Definition</b>	<p>Number of surgeries performed that were verified ERAS surgeries in which specific</p> <ul style="list-style-type: none"> <li>• ERAS pre-operative care</li> <li>• ERAS intra-operative care</li> <li>• ERAS post-operative care</li> </ul> <p>was provided in compliance with ERAS Alberta recommendations divided by the total surgeries performed that were verified ERAS surgeries, multiplied by 100. Calculated by site.</p>
<b>Rationale</b>	<p>Compliance with ERAS recommendations is an indicator of the appropriateness of the ERAS care pathway in achieving desired patient outcomes.</p>

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## Additional Information

AHS Enhanced Recovery after Surgery (ERAS)

[www.ahs.ca/ERAS](http://www.ahs.ca/ERAS)

AHS Knowledge Resource Service ERAS Subject Guide: Surgery Subject Guide

<https://krs.libguides.com/surgery/eras>

AHS Pre-Operative Fasting and Carbohydrate Loading Prior to Surgical Interventions - Adults Guideline

<https://extranet.ahsnet.ca/teams/policydocuments/1/clp-ahs-preop-fasting-carb-load-hcs-237-01.pdf>

AHS Provincial Clinical Knowledge Topic: *Advance Care Planning and Goals of Care Designations, All Ages – All Locations*

<https://extranet.ahsnet.ca/teams/policydocuments/1/klink/et-klink-ckv-advance-care-planning-goals-of-care-designations-all-ages-all-locations.pdf>

AHS Provincial Clinical Knowledge Topic: *Basal Bolus Insulin Therapy, Adult – Inpatient*

<https://www.albertahealthservices.ca/frm-20889.pdf>

The AHS Provincial Clinical Knowledge Topic: *Perioperative Management of Patients with Diabetes Mellitus, Adult – Inpatient*

<https://extranet.ahsnet.ca/teams/policydocuments/1/klink/et-klink-ckv-perioperative-diabetes-guidelines-adult-inpatient.pdf>

AHS Provincial Clinical Knowledge Topic: *VTE Prophylaxis, Adult – Inpatient*  
(link to be added once available)

AHS Recommended Drug Regimens for Surgical Prophylaxis in Adult Patients

<https://www.albertahealthservices.ca/assets/info/hp/as/if-hp-as-surgical-prophylaxis.pdf>

AHS Safe Surgery Checklist

<http://www.albertahealthservices.ca/assets/about/scn/ahs-scn-surg-ssc-checklist.pdf>

AHS Safe Surgery Checklist Policy

<https://extranet.ahsnet.ca/teams/policydocuments/1/clp-safe-surgery-checklist-ps-04-policy.pdf>

AHS Use of Aprepitant (Emend®) for Prevention of Postoperative Nausea and Vomiting (PONV) in Adults

<https://www.albertahealthservices.ca/assets/Infofor/hp/if-hp-phys-aprepitant-emend-ponv-summary-statement.pdf>

AHS Venous Thromboembolism Prophylaxis Guideline

<https://extranet.ahsnet.ca/teams/policydocuments/1/clp-venous-thromboembolism-prophylaxis-ps-09-01-guideline.pdf>

AHS Venous Thromboembolism Prophylaxis Policy

<https://extranet.ahsnet.ca/teams/policydocuments/1/clp-venous-thromboembolism-prophylaxis-ps-09-policy.pdf>

AHS Weight-Band Dosing for Subcutaneous Tinzaparin or Enoxaparin for Venous Thromboembolism (VTE) Prophylaxis in Acute Care Adult Inpatients  
(please see AHS VTE Prophylaxis Weight-Band Table on the AHS internal website)

Bugs & Drugs

<http://www.bugsanddrugs.org/>

Canadian Nutrition Screening Tool (CNST)

<http://nutritioncareinCanada.ca/sites/default/uploads/files/CNST.pdf>

Choosing Wisely Canada Drop the Pre-Op Toolkit

<https://choosingwiselycanada.org/perspective/preop-toolkit/>

Choosing Wisely Canada Recommendations and Resources, by Specialty

<https://choosingwiselycanada.org/recommendations/>

Eating and Drinking Before Surgery: Patient Instructions

<https://myhealth.alberta.ca/alberta/Pages/Your-Surgery-Resources.aspx>

MyHealth.Alberta.ca Health Information and Tools, Patient Care Handouts

<https://myhealth.alberta.ca/health/aftercareinformation/Pages/default.aspx>

MyHealth.Alberta.ca Health Information and Tools, Surgery – Incision Care After Surgery

<https://myhealth.alberta.ca/health/pages/conditions.aspx?Hwid=tc4128spec>

MyHealth.Alberta.ca Health Information and Tools, Surgery – What to Expect

<https://myhealth.alberta.ca/health/Pages/conditions.aspx?hwid=tw9795>

MyHealth.Alberta.ca Patient Care Videos including Before and After Surgery: ERAS – Your Surgery Journey (videos 1 – 14)

<https://myhealth.alberta.ca/Alberta/Pages/learning-surgery-journey-video-series.aspx>

Safer Healthcare Now! Prevent Surgical Site Infections

<http://www.patientsafetyinstitute.ca/en/toolsResources/Documents/Interventions/Surgical%20Site%20Infection/SSI%20Getting%20Started%20Kit.pdf>

Your Surgery Journey – Patient Guide

<https://myhealth.alberta.ca/YourSurgeryJourney>

## Appendix A – ERAS Nutrition Working Group Consensus: Juice as Carbohydrate Loading Products

Drawing from the best practices around the world, ERAS has been implemented in Alberta to enhance perioperative patient care, support patient recovery and reduce health care costs. Carbohydrate (CHO) loading is one of about 24 ERAS protocol elements and is an integral part of the preoperative care process<sup>1, 2</sup>. The main purpose is to attenuate postoperative insulin resistance, which contributes to negative nitrogen balance, leading to muscle mass loss and reduced muscle strength.<sup>1-6</sup> In addition, CHO loading hinders preoperative stress, hunger and thirst in surgical patients.<sup>1, 2, 7, 8</sup> According to ERAS guidelines, CHO loading involves ingestion of clear fluids that contain complex CHOs, mostly of maltodextrins. These products have been extensively researched and are recommended for preoperative use by the ERAS guidelines.<sup>9-19</sup>

ERAS and The European Society of Anaesthesiology Guidelines recommend the ingestion of CHO-rich beverages that are specifically developed for preoperative consumption up to two hours before surgery.<sup>1, 2, 9-20</sup> No specific guidelines are given regarding the type and/or brand of products to be used; however, it is suggested that not all CHOs are safe.<sup>20</sup> Gastric emptying is the major concern preoperatively, therefore beverages with lower osmolality assumed to be safer for preoperative consumption.<sup>21</sup> In addition, it was suggested that the insulin response to the beverage should reach 60 µIU/mL to achieve appropriate fed state that is believed to improve postoperative insulin resistance.<sup>2, 21</sup> All research that has been done involve only commercial products. The preoperative CHO loading product most often studied is Nutricia Preop® that contains 12.5% CHO from maltodextrin and has low osmolality (260 mOsm/kg H<sub>2</sub>O) to induce faster gastric emptying.<sup>22</sup> Nutricia Preop®, is in liquid form and is only available in Europe.<sup>22</sup>

PREcovery™ is a new CHO-containing product commercially available in Canada that contains 12.5% CHO from maltodextrin and has low osmolality (114 mOsmol/kgH<sub>2</sub>O).<sup>23</sup> Although it is a potential commercial product that can be used for ERAS, more studies are needed to explore the effectiveness of PREcovery™. As well, this product is in powder form and needs to be mixed with 400 mL of water<sup>23</sup>, which may lessen the practicality of using this product for ERAS. Decisions will need to be made on access and availability of the product, who will prepare the product, the process of preparing this product for patient safety and who will cover the product's cost.

Because of the limited availability and research of commercial CHO-containing products in Canada, the ERAS Nutrition Working Group (WG) continues to recommend the use of apple juice and cranberry cocktail juice. Although there are no published studies on the safety of juice as a preoperative CHO-loading product, no adverse effects have been reported on using juice for this purpose since ERAS was first implemented in Alberta in 2013. As well, based on an ERAS nutrition and environmental scan, Canadian sites using juice as the ERAS preoperative CHO-loading product reported no adverse effects.

The ERAS Nutrition WG recommendation continues to be based on the following criteria: availability, palatability, clinical considerations, volume needed, ease and process of administration, cost of product, infection control and simplicity (for patient use and nurses and physicians to discuss with and teach patients). Juice meets most of the beverage criteria as it is conveniently available and palatable, can be used at home or in hospital for minimal cost

compared to CHO-containing products, is already pre-packaged, simple to consume, and easy for physicians and health professionals to discuss with and teach patient as part of ERAS preoperative teaching. However, this WG's consensus may be updated once new research and products that meet the criteria are available.

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