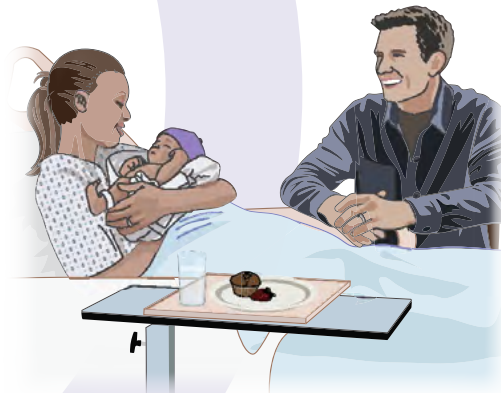


# Clinical Pathway for Cesarean Delivery

## Enhanced Recovery Canada:

A Collaborative to Improve Surgical Care



by Healthcare Excellence Canada and partners



CANADIAN ANESTHESIOLOGISTS' SOCIETY  
SOCIÉTÉ CANADIENNE DES ANESTHÉSIOLOGISTES

# Author List

This work was made possible with support from Healthcare Excellence Canada (HEC), the amalgamated organization that brings together the Canadian Patient Safety Institute and Canadian Foundation for Healthcare Improvement. HEC is an independent not-for-profit organization funded by Health Canada.

HEC would like to acknowledge the Enhanced Recovery Canada (ERC) Governance Committee for their time and expertise in shaping and presenting this important work.

## Governance Committee

Claude LaFlamme, Chair  
Carla Williams, Project Manager  
Leah Gramlich  
Ahmer Karimuddin  
Gregg Nelson  
Erin Ballah  
Debbie Watson  
Melinda Baum  
Pascal-André Vendittoli  
Gabriele Baldini  
Tom Wallace

HEC would like to thank all members of the Cesarean Expert Panel for their time, energy, and expertise in the development of this resource, including:

## Clinical Pathway Chair

Jackie Thomas, MD, MSc, FRCSC, Toronto ON

## ERC Obstetrics and Gynecology Lead

Gregg Nelson, MD PhD FRCSC, Calgary AB

## Patient Advisors

Erin Ballah, St. John's NL  
Ruth Tannenbaum, Toronto ON

## Obstetricians and Gynecologists

Caitlin Jago, MD MSc FRCSC, Calgary AB  
Michael Sexter, MD MSc FRCSC, Calgary AB

## Anesthesiologists

Kelly Au, MD FRCPC, St. John's NL  
Dolores McKeen, MD FRCPC MSc CCPE, Halifax NS

## Registered Nurses

Nancy Watts, CNS, Toronto ON  
Ann-Marie Cloutier, RN, Saint-Georges de Beauce QC  
Melanie Singh, RN IBCLC, Regina SK

# Author List

## Acknowledgments

The Cesarean Expert Panel thanks Naveed Siddiqui, MD, MSc, Toronto ON for drafting the general anesthesia content, as well as registered dietitians Robyn Kelly, Sarah Van Berkel, and Tiffany LaFleur from Alberta Health Services for reviewing and augmenting the nutrition management recommendations.

## Society of Obstetricians & Gynaecologists of Canada (SOGC) Guideline Management Oversight Committee Review and Comments:

R. Douglas Wilson, MD MSc FRCSC

Diane Francoeur, MD FRCSC, Montréal QC (CEO)

Elissa Cohen, MD FRCSC, Newtonville NS (Co-Chair Clinical Practice Obstetrics Committee)

Michael Helewa, MD, FRCSC, FACOG, FSOGC, Winnipeg MB

Sebastian Hobson, MD PhD MPH FRANZCOG FACOG FRCSC, Toronto ON (Co-Chair Clinical Practice Obstetrics Committee)

### Disclaimer:

The recommendations made in this document are a synthesis of currently accepted approaches based on a review of relevant scientific literature. HEC has no obligation to update such information or advise on further developments concerning topics mentioned in this document. Clinicians using this resource should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care. The views expressed in this document are those of the authors and do not necessarily represent the views of HEC or Health Canada. This information is provided “AS IS” without any representations, warranties, or conditions of any kind, express or implied including without limitation implied warranties or conditions of fitness for a particular purpose or use or non-infringement.



# Table of Contents

## Preamble

<b>About ERC clinical pathway</b> .....	1
Scope and purpose	
Target population	
Target audience	
Stakeholder involvement	
Development	
Editorial independence	

## ERC Cesarean Delivery Clinical Pathway

<b>Overarching recommendations</b> .....	7
<b>Patient and support person engagement</b>	
Engage patients and support persons in their care.....	5
Patient education.....	6
Shared decision-making.....	7
<b>Patient optimization</b>	
Prenatal visits.....	8
Medical comorbidities and preoperative testing.....	9
Smoking and alcohol cessation.....	10
Chronic opioid use.....	10
Nutrition.....	11
Mobility and physical activity.....	11
<b>Preoperative</b>	
Engage patients and support persons in their care.....	12
Skin preparation.....	12
Bowel preparation.....	12
Modified fasting.....	13
Carbohydrate supplementation.....	13
Preoperative medication management.....	14
Maintenance of normothermia.....	15
Maintenance of euvolemia.....	15
<b>Intraoperative</b>	
Accommodation of patient preferences.....	16
Surgical safety checklist.....	16
Approach to anesthesia.....	16
Prevention of spinal anesthesia-induced hypotension.....	16
Bladder catheterization.....	18
Nausea and vomiting prophylaxis.....	18
Maintenance of euvolemia.....	18
Maintenance of normothermia.....	19
Multimodal opioid-sparing analgesia.....	19
Antimicrobial prophylaxis and skin preparation.....	20

# Table of Contents

Surgical approach and considerations .....	21
Prevention of uterine atony and postpartum hemorrhage .....	22
Immediate newborn care .....	22
Promotion of skin-to-skin bonding .....	23
<b>Postoperative</b>	
Analgesia .....	24
Engage patients and support persons in their care .....	24
Support breast and chest feeding .....	24
Multimodal opioid-sparing pain management .....	25
Urinary drainage .....	27
Venous thromboembolism prophylaxis .....	28
Anemia remediation .....	28
Fluid management .....	29
Diet and gastrointestinal function recovery .....	29
In-hospital mobilization .....	30
Promotion of resting periods .....	31
<b>Discharge</b>	
Engage patients and their support persons in their care .....	32
Analgesia .....	33
Wound care .....	33
Symptom management .....	34
Nutrition .....	34
Post-discharge physical activity .....	34

# About ERC Clinical Pathways

## Scope and Purpose

The purpose of this clinical pathway is to provide healthcare professionals in Canada with evidence-based strategies to improve maternal health outcomes in patients requiring a cesarean delivery. The clinical pathway is based on six core principles applicable to all surgeries: patient and family engagement, surgical best practices, multi-modal opioid sparing analgesia, fluid management, nutrition management, and mobility and physical activity.

The goals of the pathway include to:

- increase patient and support person engagement and satisfaction<sup>1</sup>
- reduce pain while minimizing opioid use
- prevent nausea and vomiting
- reduce infections and infectious complications
- increase breast and chest feeding success rate
- promote bonding between patient and their newborn
- reduce length of stay
- ensure equity of care for all patients

## Target Population

All pregnant people (hereinafter referred to as the patient) who require cesarean delivery should be considered for Enhanced Recovery After Surgery (ERAS) management using the recommendations provided in this clinical pathway. Cesarean deliveries include elective surgeries (for example patients having an elective repeat cesarean), and unplanned urgent or emergent surgeries (for example fetal distress or lack of progress in labour), which in this document, will be referred to as intrapartum cesarean deliveries. These recommendations should be applied to patients undergoing elective and intrapartum cesarean deliveries.

When ERAS management is applied to intrapartum cesarean deliveries it should be noted that:

- many recommendations are based on research done in only elective procedures
- some elements may not be appropriate or achievable in intrapartum deliveries, and
- their outcome should be collected but analyzed separately from elective cesarean deliveries due to their added complexities – see Appendix C

## Target Audience

Obstetricians, other surgeons providing cesarean deliveries, obstetrical care providers (such as midwives, family practice physicians), anesthesiologists, nurses, other providers (such as pharmacists, physiotherapists, nutritionists), and healthcare leaders involved in care of patients requiring cesarean delivery.

## Stakeholder Involvement

This clinical pathway was developed by a multidisciplinary group of clinicians from across the country experienced in cesarean delivery. Patients were included in the pathway working group to ensure the patient perspective was integrated and prioritized.

# About ERC Clinical Pathways

## Development

The clinical pathway work was guided by Dr. Jackie Thomas, MD, MSc, FRCSC, Obstetrician and Gynecologist at Mount Sinai Hospital in Toronto in conjunction with all members of the working group. The pathway includes approaches to incorporate evidence-based practices into existing clinical pathways. For a comprehensive summary of the literature on enhanced recovery after cesarean delivery, please refer to guidelines and consensus statements from the ERAS Society,<sup>2-4</sup> Society for Obstetric Anesthesia and Perinatology consensus statement and recommendations,<sup>5</sup> and the National Institute for Health and Care Excellence.<sup>6</sup>

**Notes:** Drugs and dosages are provided throughout the pathway, where appropriate, as examples. Only non-proprietary (generic) names are provided. Please consult with a pharmacist when developing individual institutional clinical pathways.


## Editorial Independence

All working group members signed a member agreement form indicating that they had no conflicts of interest in relation to the project.

# Overarching Recommendations

- 1.** Six core principles should be endorsed to shift the surgical care paradigm: patient and family engagement, surgical best practices, multi-modal opioid sparing analgesia, fluid management, nutrition management, and mobility and physical activity.
- 2.** Enhanced recovery after surgery protocols have traditionally been applied to elective surgery. However, a growing number of specialties have implemented ERAS in emergency settings and reported successful implementation and positive outcomes. Most of the recommendations in this pathway can, and should, be applied to all cesarean deliveries to the maximum extent possible.
- 3.** Local champions should be identified from each discipline (such as obstetrics, anesthesiology, nursing) to lead implementation and address discipline-specific issues and concerns. Where available, an individual(s) with quality improvement (QI) training should also be involved to help facilitate the QI process. Finally, a champion in hospital administration should be identified to optimize organizational buy-in and help to secure resources for the pathway.<sup>7</sup>
- 4.** Standardized order sets should be used as part of ERAS pathways to facilitate effectiveness. A sample order set is provided in Appendix B.
- 5.** A recognized QI method should be used to systematically enhance the ways care is delivered to patients. This requires the infrastructure to collect data. A framework for evaluating the impact of the pathway on the quality of care is presented in Appendix C (Data Collection and Measurement) and Appendix D (Process and Outcome Variables).
- 6.** Patients and support persons should be engaged as active participants in their care. As such, for patients undergoing a planned cesarean delivery, preoperative discussion of milestones, discharge criteria and the patient's role in the recovery process should take place with the patient and their support persons prior to surgery. This discussion should begin and be documented in the obstetrical care provider's office and continue throughout the continuum of care.



- 
- Phase **1** Patient and Support Person Engagement
  - Phase **2** Patient Optimization
  - Phase **3** Preoperative
  - Phase **4** Intraoperative
  - Phase **5** Postoperative
  - Phase **6** Discharge

# 1 Patient and Support Person Engagement

## Engage Patients and Support Persons in their Care



### Recommendations

- To enhance patient and support persons experience of ERAS we recommend that healthcare professionals:<sup>1, 8-19</sup>
  - have an awareness and understanding of health literacy of the patient and support persons and assess and address patient and family's health literacy as needed
  - use inclusive language for transgender and gender diverse patients
  - use strategies to communicate effectively
  - refer patients and their support persons to reliable websites for health information



### Tools and equipment

- [Patient Optimization Booklet](#)
- [Animated Cesarean Delivery Guide](#)

# 1 Patient and Support Person Engagement

## Patient Education

### Recommendations

- Patients and support persons should receive preoperative education. Educational materials should be offered in patient preferred formats. Verbal information from healthcare professionals, written material, and digital media are all effective patient education formats.<sup>20</sup>
- Patients should be informed about all events that will occur before, during, and after cesarean delivery and this information should be adapted to whether the cesarean delivery is elective or intrapartum.<sup>2</sup>
- At minimum, patients should have a clear understanding of the following:<sup>2</sup>
  - reason/indication for cesarean delivery
  - type of anesthetic
  - location and type of incision and closure
  - potential intra- and postoperative complications, and strategies to minimize them
  - pre- and postoperative gastrointestinal or oral intake plans
  - postoperative pain management and expectations
  - anticipated postoperative activities (including breast or chest feeding) and locations of patient and their baby
  - expected length of stay

By the day of surgery, patients and support persons should be prepared, as much as possible, to minimize stress, feel confident in their care team and know how they are expected to participate in their own care, including:

- preoperative fasting
- skin cleansing before hospitalization
- skin-to-skin with the newborn
- early attempted breast and chest feeding
- early ambulation
- early nutrition for the patient
- safe oral medication administration
- avoidance or minimal use of opioids
- discharge planning
- appropriate follow-up information and who to contact in case of emergency (patient or newborn)

### Tools and equipment

- [Patient Optimization Booklet](#)
- [Animated Cesarean Delivery Guide](#)
- [Pregancyinfo.ca](http://Pregancyinfo.ca), The Society of Obstetricians and Gynecologists of Canada

### Data collection

- Patient education

# 1 Patient and Support Person Engagement

## Shared Decision-Making



### Recommendation

Consent for cesarean delivery should only be sought after providing patients with evidence-based information. Ensure the patient's dignity, privacy, views and culture are respected while considering the patient's clinical situation.<sup>6</sup>

## 2 Patient Optimization

The antenatal period is a unique opportunity for healthcare professionals to optimize patient risk factors over an extended period. Early identification and management of these risk factors is vital for optimizing outcomes for both the patient and their newborn. The following section applies to all patients regardless of delivery method and should be considered routine prenatal care.

### Risk Assessment and Management

## Prenatal Visits



### Recommendations

- The frequency of obstetric visits should be individualized based on patient preference and an assessment of risk. For a patient of average obstetrical risk, generally 8 to 10 visits are recommended.<sup>21</sup> This frequency of visits may provide an opportunity to optimize risk factors for surgery.
- Selective utilization of virtual prenatal visits appear to be as safe as in-person prenatal care, associated with high patient satisfaction, and result in improved access to regular and specialized care for people in rural and remote areas.<sup>21</sup>

## 2 Patient Optimization

### Medical Comorbidities and Preoperative Testing



#### Recommendations

- All patients with any comorbidity should be optimized during pregnancy. This may involve a multidisciplinary approach with participation from other specialists. Appropriate referral and management can be guided by institutional protocols and established national guidelines.

Key comorbidities in pregnancy include:

- Gestational hypertension<sup>2, 22</sup>
  - Gestational hypertension is defined as systolic blood pressure of  $\geq 140$  mm Hg or diastolic blood pressure of  $\geq 90$  mm Hg, or both, on two occasions at least four hrs. apart after 20 wks. of gestation in a pregnant person with a previously normal blood pressure.<sup>23</sup>
  - Patients are considered to have severe gestational hypertension when the systolic level reaches 160 mm Hg or the diastolic level reaches 110 mm Hg, or both. These patients should be managed with the same approach as for patients with severe preeclampsia.<sup>23</sup>
- Gestational diabetes<sup>2, 24</sup>
  - Patients at high risk of undiagnosed type 2 diabetes mellitus should be screened early (<20 wks.) with a glycated hemoglobin (HbA1C) test.<sup>25</sup>
  - Gestational diabetes should be diagnosed using a 50 g glucose challenge test, followed, if abnormal, by a 75 g oral glucose tolerance test. Diagnosis is made if one plasma glucose value is abnormal (such as fasting  $\geq 5.3$  mmol/L, 1 hr.  $\geq 10.6$  mmol/L, 2 hrs.  $\geq 9.0$  mmol/L).<sup>25</sup>
- Anemia<sup>2, 26</sup>
  - Before cesarean delivery, carry out a complete and full blood count to identify anemia, blood group and antibody screening and saving of serum.<sup>6</sup>
  - Ferritin and hemoglobin should be routinely assessed at the initial and 28-week prenatal visits.<sup>26</sup>
  - Iron deficiency anemia during pregnancy is diagnosed when the patient's hemoglobin level is  $< 110$  g/L and ferritin is  $< 30$  ug/L. Hemoglobin  $< 105$  g/L in the second trimester might also be considered anemic.<sup>26</sup>
- Maternal mental health<sup>27</sup>
  - Screen for anxiety and depression.
  - Screen at least once and early during the antenatal period for depression and anxiety using a validated tool. Referral to a mental health practitioner may be indicated.
- Gestational weight gain – see Nutrition and Mobility and Physical Activity below.<sup>2, 28, 29</sup>



#### Additional information

- Gestational diabetes left untreated leads to increased maternal and perinatal morbidity.<sup>25</sup>
- Maternal obesity (BMI  $> 40$  kg/m<sup>2</sup>) significantly increases the risk of maternal and fetal complications.<sup>2</sup>
- [Oral and parenteral iron preparations](#) – includes names, form and route, dosing, estimated cost.<sup>26</sup>

## 2 Patient Optimization

### Tools and equipment

- [Pregnancy Weight Gain Calculator](#) – Health Canada
- Anxiety and depression validated screening tool, such as the [Edinburgh Postnatal Depression Scale](#) (EPDS) or the [Patient Health Questionnaire 9](#) (PHQ-9).<sup>26</sup>
- [Diabetes and Pregnancy Clinical Practice Guideline](#), Diabetes Canada
- Information for patients:
  - [You have iron deficiency \(and you're having surgery\)](#), Sinai Health
  - [Intravenous \(IV\) iron infusion](#), Sinai Health

### Data collection

- Medical comorbidity optimization

## Smoking and Alcohol Cessation

### Recommendations

- Ask all patients about their tobacco, nicotine, cannabis and alcohol use.<sup>30</sup> This should include questions about non-cigarette alternatives like e-cigarettes, vaping products, patches, gum, etc.<sup>31, 32</sup>
- Encourage tobacco, nicotine, cannabis and alcohol cessation during pregnancy by advising users about the significant perinatal risks associated with the use of these products.<sup>2, 31</sup>
- Individualize care by offering psychosocial, behavioural and pharmacotherapy interventions.<sup>31</sup>

### Tools and equipment

- Brief screening tools like the [T-ACE](#), Best Start and [AUDIT-C](#), National Institute on Drug Abuse can be used if a patient discloses alcohol use.<sup>31</sup>

## Chronic Opioid Use

### Recommendations

- All patients should be screened for substance use at the first prenatal visit with a validated screening tool.<sup>33</sup>
- For pregnant people with an opioid use disorder, opioid agonist pharmacotherapy is the recommended therapy<sup>30</sup> and is preferable to medically supervised withdrawal, which is associated with high relapse rates leading to worse outcomes.<sup>33</sup>
- Access to adequate postpartum psychosocial support services, including substance use disorder treatment and relapse prevention programs should be made available.<sup>33</sup>

### Tools and equipment

- Use a validated screening tool like the [NIDA Quick Screen](#), National Institute on Drug Abuse or 4Ps.<sup>33</sup>

## 2 Patient Optimization

### Nutrition

#### Recommendations

- Discuss the importance of following a well-balanced diet with all patients. Follow Canada's Food Guide that addresses key nutrients such as calcium, vitamin D, iron, vitamin A, vitamin B12, folate, omega-3 fatty acids, choline, iodine and fibre.<sup>34</sup>
- Advise patients to choose a multivitamin and mineral supplement that contains 0.4 mg (400 mcg) folic acid, 16-20 mg of iron, vitamin B12, and 400 IU of vitamin D every day. Supplementation should continue throughout pregnancy and after birth, through the reproductive years.<sup>34</sup>
- Regardless of pre-pregnancy body mass index (BMI) category, all patients should be counselled about additional energy requirements of approximately 350 calories for the second and 450 calories for the third trimester.<sup>34</sup>
- Measure and discuss weight gain for pregnancy with all patients as early in pregnancy and as regularly as is feasible. Recommendations for the range of pregnancy-related weight gain should be based on the patient's pre-pregnancy BMI.<sup>35</sup> Send referral to a dietitian if the patient is outside of healthy nutrition targets.
- For patients with a BMI >40 kg/m<sup>2</sup>, special consideration should be given to both antepartum and intrapartum management.<sup>28, 29</sup>
- Review general food safety and food items to limit or avoid during pregnancy.<sup>34</sup>

#### Tools and equipment

- [Canada's Food Guide](#), Government of Canada
- [Nutrition Guideline for Pregnancy](#), Alberta Health Services

### Mobility and Physical Activity

#### Recommendations

- A thorough clinical evaluation should be conducted before recommending an exercise program to ensure there are no contraindications to exercise (such as ruptured membranes, premature labour, preeclampsia, etc.).<sup>36</sup>
- Encourage all patients without contraindications to be physically active every day throughout pregnancy.<sup>37</sup>
- Patients should aim for at least 150 mins. of moderate-intensity physical activity each week (accumulated over a minimum of three days per week) to attain clinically meaningful health benefits and to reduce pregnancy complications.<sup>37</sup>



## 3 Preoperative

### Patient and Support Person Engagement

## Engage Patients and Support Persons in their Care

### Recommendations

- Utilize adult education principles by:
  - including patient support persons in conversations
  - letting patients speak about their last hospitalization experience, if applicable
- Ensure patients and support persons receive consistent information from all members of the perioperative team.
- Encourage patients and support persons to bring back the [Patient Optimization Booklet](#) on the day of surgery and to refer to it during hospital stay.

### Tools and equipment

- [Patient Optimization Booklet](#)
- [Animated Cesarean Delivery Guide](#)

### *Day Before Surgery*

### Surgical Best Practice

## Skin Preparation

### Recommendation

- All patients should bathe or shower with an antimicrobial soap (such as 2 percent or 4 percent aqueous chlorhexidine gluconate) either the night before or the morning of their operation because it may help to reduce the chances of infection.<sup>38</sup> The antimicrobial soap can be provided to the patient prior to surgery as part of the education material.

### Tools and equipment

- Patient education sheet example: [Chlorhexidine Skin Cleaning Before Surgery](#), Fraser Health

## Bowel Preparation

### Recommendation

- Oral or mechanical bowel preparation should not be used before cesarean delivery.<sup>2, 39</sup>

## 3 Preoperative

### Night Before Surgery

#### Fluid Management

##### Modified Fasting

##### Recommendation

Prolonged preoperative fasting (NPO after midnight) should be abandoned. Unless contraindicated, patients should be encouraged to drink clear fluids up to 2 hrs. before elective cesarean deliveries.<sup>2, 5</sup>

##### Additional information

Clear fluid is a liquid that you can see through. Examples include water, complex carbohydrate beverages, pulp-free juice, and black coffee or tea (without milk or cream).

### Day of Surgery

#### Fluid Management

##### Modified Fasting: Day of Surgery

##### Recommendations

- Canadian Anesthesiologists' Society fasting policies should be followed. These fasting policies may need to be modified to account for pre-existing medical conditions (such as conditions that delay gastric emptying) and should apply to all forms of anesthesia.<sup>40</sup>
- Intrapartum cesarean deliveries should be undertaken after considering the risk of delaying surgery versus the risk of aspiration of gastric contents. The minimum duration of fasting before elective cesarean deliveries should be:<sup>2, 5</sup>
  - 8 hrs. after a large meal of solids particularly containing protein (meat or fatty foods)
  - 6 hrs. after a light meal (non-fatty meal such as toast) or milk
  - 2 hrs. after ingestion of clear fluids

##### Tools and equipment

- [Guidelines to the Practice of Anesthesia – Fasting Policies](#), Canadian Anesthesiologists' Society

##### Data collection

- Consumption of clear liquids

## 3 Preoperative

### Carbohydrate Supplementation

#### Recommendation

- Patient outcomes may be improved by a shorter fasting period preceded by carbohydrate intake. Non-particulate oral carbohydrate fluid supplementation may be offered to non-diabetic patients 2 hrs. before surgery (50 g).<sup>2</sup>



#### Additional information

- There is currently no evidence to recommend the use of maltodextrin in the cesarean delivery patient population.
- Examples of carbohydrate supplementation include 500 mL of sport drink, clear apple juice, or cranberry juice.

### Analgesia

### Preoperative Medication Management

#### Recommendations

- Non-particulate antacids and histamine H2 receptor antagonists (PO or IV) should be administered as premedication in the preoperative period to reduce the risk of aspiration pneumonitis.<sup>2, 40</sup>
- Preoperative sedation should not be used for elective cesarean deliveries because of the potential for detrimental effects on the patient and neonate.<sup>2</sup>
- Preoperative administration of gabapentin for postoperative pain management is not routinely recommended. Gabapentin may still be considered as part of a multimodal analgesic routine in patients with chronic pain or pain not relieved by standard treatment protocols.<sup>2, 41</sup>



#### Additional information

- Patient sedation may delay skin-to-skin contact between the patient and newborn and has the potential for side effects.<sup>2</sup>



#### Data collection

- Premedication

## 3 Preoperative

### *Prior to the Operating Room*

#### *Surgical Best Practice*

### Maintenance of Normothermia

#### Recommendation

- Forced-air warmers or underbody warming blankets (air-free to reduce possible contamination risk) should be used to avoid hypothermia and perioperative shivering.<sup>5,42</sup> This may start before entering the operating room, as the patient is being prepared for surgery.

#### *Fluid Management*

### Maintenance of Euvolemia

#### Recommendation

- Preoperative euvolemia should be maintained during the patient's perioperative care.<sup>3</sup> Excessive IV fluid administration with crystalloids should be avoided while the patient is awaiting cesarean delivery.

## 4 Intraoperative

### Patient and Support Person Engagement

## Accommodation of Patient Preferences

### Recommendations

- Accommodate the patient's preferences for their cesarean delivery whenever possible (such as music playing in the operating room, lowering the screen to see the newborn delivered, or silence so that the patient's voice is the first the newborn hears).<sup>6</sup>

### Surgical Best Practice

## Surgical Safety Checklist

### Recommendation

- Surgical care providers and their institutions should adopt a surgical safety checklist to improve patient safety. The surgical safety checklist may be modified or adapted for use in surgical obstetric cases.<sup>43</sup>

### Tools and equipment

- Society of Obstetricians and Gynaecologists of Canada – No. 286: Surgical Safety Checklist in Obstetrics and Gynaecology<sup>43</sup>
- [WHO Surgical Safety Checklist](#), World Health Organization

### Anesthetic Management

## Approach to Anesthesia

### Recommendations

- Neuraxial anesthesia is the preferred method of anesthesia for cesarean delivery as part of an enhanced recovery protocol.<sup>3, 5, 6</sup>
- There is limited role for general anesthesia in elective cesarean deliveries. However, there are certain conditions and emergency scenarios in which general anesthesia is the preferred option. Therefore, it is essential to consider the physiological changes of pregnancy and administer safe general anesthesia that minimizes the risks of aspiration, desaturation, failed intubation and awareness – see additional information.<sup>44, 45</sup>

## 4 Intraoperative



### Additional information

- Approximately six percent of patients who undergo cesarean delivery will require general anesthesia and tracheal intubation.<sup>46</sup>
- Safe general anesthesia recommendations:
  - aspiration of gastric contents is rare (two in 10,000 cases); identify risk factors and take precautions to reduce these risks (such as fasting, aspiration prophylaxis, rapid sequence induction [RSI], careful extubation and monitoring in the postoperative period) are imperative for aspiration prevention<sup>44, 45, 47</sup>
  - desaturation during RSI can be minimized by effective preoxygenation technique, gentle bag-mask ventilation, and apneic oxygenation techniques<sup>44, 45, 47</sup>
  - video laryngoscopes should be used as a first-line airway tool to maximize the success rate of intubation during RSI<sup>47, 48</sup>
  - in case of failed intubation, the use of second generation supra glottic airway device for oxygenation and ventilation is recommended<sup>48</sup>
  - if a failed airway is encountered, additional doses of induction agents should be given to reduce the risk of awareness<sup>49</sup>



### Data collection

- Use of neuraxial anesthesia

## Prevention of Spinal Anesthesia-Induced Hypotension



### Recommendations

- To prevent spinal anesthesia-induced hypotension, baseline maternal blood pressure should be maintained with prophylactic vasopressors (for example phenylephrine or norepinephrine infusion) started immediately after injection of spinal anesthesia medications.<sup>5</sup> Adjust the rate of infusion to keep maternal blood pressure at 90 percent or more of baseline value and avoid decreases to less than 80 percent of baseline.<sup>6</sup>
- When using phenylephrine infusion, IV ephedrine boluses should be given to manage hypotension during cesarean delivery (for example if the heart rate is low and blood pressure is <90% of baseline).<sup>6</sup>
- Crystalloid co-loading (1 L immediately and rapidly after spinal injection) is preferred over a preload, and in combination with vasopressors significantly reduces the incidence of spinal-induced hypotension.<sup>5, 6</sup>



### Additional information

- Vasopressor regimen may need to be modified in patients with preeclampsia as the degree of hypotension with spinal anesthesia may be less than that in non-preeclamptic patients.<sup>5</sup>
- Apply a left lateral tilt of up to 15 degrees or appropriate uterine displacement once the patient is in a supine position on the operating table to reduce maternal hypotension.<sup>6</sup>

## 4 Intraoperative

### Surgical Best Practice

## Bladder Catheterization



### Recommendation

- Patients who will receive neuraxial anesthesia should have an indwelling catheter placed to prevent over-distension of the bladder.<sup>6</sup>

## Intraoperative and Postoperative Nausea and Vomiting (IONV or PONV) Prophylaxis



### Recommendations

- Prophylactic vasopressor infusion is effective in the reduction of IONV or PONV.<sup>4, 5</sup>
- Uterine exteriorization is associated with IONV.<sup>5</sup> If this approach is used to repair the incision, a proactive antiemetic strategy should be applied to help reduce the incidence of IONV.
- A multimodal approach should be applied to prevent and treat IONV or PONV.<sup>4</sup> At least two prophylactic IV antiemetics are recommended.<sup>5</sup>



### Additional information

- Examples of antiemetics with different mechanisms of action include:
  - Dopamine antagonists (such as metoclopramide 5-10 mg IV, effective for IONV prevention)
  - Serotonin (5HT3) antagonists (such as ondansetron 4 mg IV)
  - Glucocorticoids (such as dexamethasone 4 mg IV, effective for PONV prevention)



### Data collection

- Antiemetic prophylaxis

### Fluid Management

## Maintenance of Euvolemia



### Recommendations

- Perioperative and intraoperative euvolemia are important factors in patient perioperative care and appear to lead to improved maternal and neonatal outcomes after cesarean delivery.<sup>3</sup>
- Although optimal fluid management goals for cesarean delivery have not been well established, expert consensus recommends limiting intravenous fluids to <3 L for routine cases. Postpartum hemorrhage should be recognized early and treated based on institutionalized massive hemorrhage protocols.<sup>5</sup>



### Data collection

- Volume of IV fluid administration

## 4 Intraoperative

### Maintenance of Normothermia

#### Recommendations

- Forced air warming, intravenous (IV) fluid warming and increased operating room temperature are all recommended to prevent hypothermia during cesarean delivery.<sup>3,5</sup> Specifically:<sup>6</sup>
  - warm IV fluids ( $\geq 500$  mL) and blood products to 37°C using a fluid warming device.
  - warm all irrigation fluids to 38 to 40°C in a thermostatically controlled cabinet.
  - consider forced air warming or underbody warming blankets.
- Appropriate temperature monitoring is recommended to avoid hyperthermia when applying warming devices.<sup>3,5</sup>



#### Additional information

- Forced air blankets should be used on the lower body to facilitate skin-to-skin contact with the newborn.



#### Tools and equipment

- [Guidelines to the Practice of Anesthesia – Perioperative Temperature Management](#), Canadian Anesthesiologists' Society
- [Hypothermia: Prevention and Management in Adults having Surgery](#), National Institute for Health and Care Excellence



#### Data collection

- Patient warming
- Patient temperature at beginning and end of surgery, or on arrival to PACU

### Analgesia

### Multimodal Opioid-Sparing Analgesia

#### Recommendations

- A multimodal approach to analgesia should be initiated. At least two analgesics are recommended, which, unless contraindicated, include:<sup>5</sup>
  - Neuraxial long-acting opioid (for example preservative-free morphine, 50-150 mcg intrathecal or 1-3 mg epidural).<sup>50, 51</sup>
  - Acetaminophen: PO (975 or 1000 mg) or PR before delivery (20mg/kg or 1300 mg for >70 kg) or IV after delivery (weight  $\geq 50$  kg: 1000 mg every 6 hrs.; weight <50 kg: 15 mg/kg every 6 hrs.)
  - Non-steroidal anti-inflammatory drugs (NSAIDs) (for example ketorolac 15-30 mg IV or naproxen (500 mg PO) after fascial closure).
  - If neuraxial morphine is not administered, consider local anesthetic techniques such as transversus abdominis plane (TAP) block, local anesthetic wound infiltration, or quadratus lumborum (QL) block.

#### Data collection

- Multimodal opioid-sparing analgesia initiation



## 4 Intraoperative

### Surgical Best Practices

## Antimicrobial Prophylaxis and Skin Preparation



### Recommendations

- IV antibiotics should be administered routinely within 15-60 mins. before the skin incision.<sup>52, 53</sup> In all patients a first-generation cephalosporin (for example cefazolin) is recommended using weight-based dosing (for example 1 g if patient weight <50 kg, 2 g if patient weight >50 kg).
- For patients in labour or with ruptured membranes, the addition of azithromycin (500 mg IV infused over 1 hr.) provides additional reduction in postoperative infections.<sup>3, 53, 54</sup>
- Chlorhexidine-alcohol is preferred to aqueous povidone-iodine solution for abdominal skin cleansing before cesarean delivery.<sup>3, 6, 55</sup>
- Vaginal preparation with povidone-iodine solution should be considered for the reduction of post-cesarean delivery infections in patients with ruptured membranes to reduce the risk of endometritis.<sup>3, 56</sup> If aqueous iodine vaginal preparation is unavailable or contraindicated, aqueous chlorhexidine vaginal preparation can be used.<sup>6</sup>



### Additional information

- For patients with a BMI >40 (or weight >120 kg), consider administering a 3 g dose of pre-operative antibiotic with a first-generation cephalosporin.<sup>57, 58</sup>
- For patients with a severe penicillin allergy (such as anaphylaxis), clindamycin or erythromycin can be used.<sup>52</sup>
- Use azithromycin with caution in patients who have, or are at increased risk for a prolonged QT interval, including those prescribed other QT-prolonging medications (such as ondansetron).
- If the cesarean delivery is expected to be long (>3 hrs.) or estimated blood loss to be high (>1500 mL), an additional dose of antibiotic may be given 3-4 hrs. after the first dose.<sup>52</sup>
- Chlorhexidine-alcohol requires approximately 3 min. dry time to reduce flammability risk and may therefore be unfavourable in urgent intrapartum cesarean deliveries. Povidone-iodine (no dry time) may be used as an acceptable alternative.



### Tools and equipment

- [Use of Prophylactic Antibiotics in Labor and Delivery](#), American College of Obstetricians and Gynecologists
- [Antibiotic Prophylaxis in Obstetrics Procedures](#), Society of Obstetricians and Gynaecologists of Canada



### Data collection

- Antimicrobial prophylaxis

## 4 Intraoperative

### Surgical Approach and Considerations

#### Recommendations

- Use a transverse abdominal incision (referenced in some literature as the Joel-Cohen technique) to reduce postoperative pain and to improve cosmesis compared with a midline incision.<sup>6</sup> This technique includes:
  - 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.<sup>3</sup>
- Separate surgical blades to incise the skin and the deeper tissues are not needed as this will not decrease wound infection.<sup>6</sup>
- Inform patients that the risk of fetal lacerations at cesarean delivery is approximately two percent.<sup>6</sup>
- Controlled cord traction is preferred to manual removal of the placenta to reduce the risk of endometritis.<sup>6</sup>
- Perform paired umbilical artery and vein measurements of cord blood gases after cesarean delivery for suspected fetal compromise to allow for assessment of fetal wellbeing and guide ongoing care of the neonate.
- Intraperitoneal repair of the uterus can be performed. Uterine exteriorization is associated with IONV.<sup>5</sup> If this approach is used to repair the incision, a proactive antiemetic strategy should be utilized.
- Single or double-layer uterine closure can be used depending on the clinical circumstances. Single layer closure does not increase the risk of postoperative bleeding or uterine rupture in a subsequent pregnancy.<sup>6</sup>
- Closure of the peritoneum is not necessary as it is not associated with improved outcomes and increases operative time.<sup>3, 6</sup> Evidence for prevention of adhesion formation is limited and inconsistent.<sup>59</sup>
- If a midline abdominal incision is used, use mass closure with delayed absorbable continuous sutures as this results in fewer incisional hernias and less dehiscence than a layered closure.<sup>6</sup>
- Do not routinely reapproximate the subcutaneous tissue space unless the patient has  $\geq 2$  cm subcutaneous tissue, as it does not reduce the incidence of wound infection.<sup>3, 6</sup>
- In most cases, skin closure should be performed with subcuticular suture rather than staples to reduce wound complications, specifically lower incidence of wound separation.<sup>3, 6</sup>
- Superficial wound drains should be avoided as they do not decrease the incidence of wound infection or hematoma.<sup>6</sup>
- Prophylactic closed incision negative pressure wound therapy may be effective in reducing surgical site infections (SSIs) in patients with class III obesity. Use in obese patients should be balanced with the risk of skin blistering with individual products available.<sup>60</sup>

#### Data collection

- Surgical techniques

## 4 Intraoperative

### Prevention of Uterine Atony and Postpartum Hemorrhage

#### Recommendations

- Use lowest effective dose of uterotonic necessary to achieve adequate uterine tone and minimize side effects.<sup>5</sup>
  - Elective cesarean delivery: bolus 1 IU oxytocin; start oxytocin infusion at 2.5-7.5 IU·h<sup>-1</sup> (0.04-0.125 IU·min<sup>-1</sup>).<sup>5</sup> Alternatively, consider carbetocin 100 mcg given as an IV bolus over 1 min.<sup>61, 62</sup>
  - Intrapartum cesarean delivery: 3 IU oxytocin over ≥30 sec.; start oxytocin infusion at 7.5-15 IU·h<sup>-1</sup> (0.125-0.25 IU·min<sup>-1</sup>).<sup>5</sup>
- In the case of hemorrhage caused by uterine atony, transition to institutional resuscitation protocol.<sup>5</sup>
- 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<sup>63, 64</sup> and may be a useful preventative measure with minimal side effects.<sup>65</sup>



#### Additional information

- Carbetocin has a longer half-life than oxytocin, thus does not require an infusion and may decrease the need for additional uterotonic measures.



#### Data collection

- Optimal uterotonic use

### Immediate Newborn Care

#### Recommendations

- 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.<sup>3</sup>
- Newborn body temperature should be measured and maintained between 36.5°C and 37.5°C after birth through admission and stabilization.<sup>3, 6</sup>
- Routine suctioning of the airway or gastric aspiration should be avoided and used only for symptoms of an obstructive airway (by secretions or meconium).<sup>3</sup>
- Routine neonatal supplementation with room air is recommended in term newborns as the use of supplemental oxygen during resuscitation may be associated with harm.<sup>3</sup>
- In all settings that perform cesarean delivery, a capacity for immediate neonatal resuscitation is mandatory.<sup>3, 6</sup>



#### Additional information

- Resuscitation of newborns ≥35 wks. gestation begins with 21 percent oxygen (room air). Resuscitation of newborns <35 wks. gestation begins with 21 percent to 30 percent oxygen.<sup>66</sup>

## 4 Intraoperative

### Tools and equipment

- Pulse oximetry should be used to assess newborn oxygenation status.<sup>66</sup>
- [Umbilical Cord Management in Preterm and Term Infant](#), Canadian Paediatric Society
- Society of Obstetricians and Gynaecologists of Canada – Guideline No. 424: Umbilical Cord Management in Preterm and Term Infants<sup>67</sup>

### Data collection

- Delayed cord clamping

## Patient and Family Engagement

### Promotion of Skin-to-Skin Bonding

#### Recommendations

- Skin-to-skin contact should occur as soon as possible in the operating room as appropriate, based on patient and neonatal condition. After the initial period of skin-to-skin contact, patients should be encouraged to continue this contact through their hospital stay.<sup>5, 6</sup>
- Offer support to patients who wish to breast or chest feed to help them to start as soon as possible after the birth of their newborn.<sup>6</sup>

#### Additional information

- Skin-to-skin contact:
  - supports the “golden hour” of breast or chest feeding initiation within 1 hr. of birth.<sup>5</sup>
  - supports a safe transition of the newborn from intrauterine life to extrauterine life.<sup>5</sup>
  - facilitates patient and newborn bonding.<sup>5</sup>
  - may require additional nurse support intraoperatively (follow hospital guideline for safe positioning for the newborn during skin-to-skin contact).<sup>5</sup>
- Ways to facilitate skin-to-skin contact intraoperatively include moving electrocardiogram leads and electrodes to the patient’s back to clear space on the chest; moving equipment to allow nursing personnel space to safely assist skin-to-skin contact; maintain efforts to keep patient and neonatal temperature consistent (for example forced air warmer, warmed blankets).<sup>5</sup>
- In the event the patient is unable to participate in skin-to-skin contact, this should be initiated with their support persons.

### Data collection

- Skin-to-skin with patient or support person

## 5 Postoperative

### Immediate Postoperative Period

## Analgesia

### Recommendations

- The intensity, frequency, and duration of respiratory monitoring should be based on patient risk factors and perioperative risk assessment.<sup>5</sup>
- Prior to transfer to the ward, the Modified Bromage scale can be used to assess recovery from the neuraxial block.

### Tools and equipment

- [Monitoring recommendations for prevention and detection of respiratory depression associated with administration of neuraxial morphine for cesarean delivery analgesia](#), Society for Obstetric Anesthesia and Perinatology Consensus Statement
- Measure of motor block: [Modified Bromage scale](#), Anesthesia UK

## Postpartum Care

### Patient and Family Engagement

## Engage Patients and Support Persons in their Care

### Recommendations

- Use communication tools (such as a whiteboard at patient bedside) to facilitate communication between healthcare professionals and patients and support persons.<sup>15, 68</sup>
- Consider bedside handoffs that includes the patient and support persons to improve communications with shift-to-shift handoffs.<sup>16</sup>
- Remind the patient and support persons to refer to their patient material (booklet and video) for goals of recovery each day following surgery.

## Support Breast or Chest Feeding

### Recommendations

- Provide educational material on breast and chest feeding, and access to lactation consultant as needed.<sup>5</sup>
  - educational material on breast and chest feeding should be available in different formats (for example unit classes, printed and video links) to increase accessibility and understanding.
  - all postpartum nurses should be able to provide basic breast and chest feeding assistance with a focus on skin-to-skin contact, establishing the lactating person's milk supply and collaborating with support persons to formulate a feeding plan for discharge.

## 5

## Postoperative

- access to a lactation consultant to provide a more detailed assessment of any lactation related problems, quality breast and chest feeding support, and management is ideal.
- 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.<sup>69</sup>
- 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.



### Additional information

- Early breast and chest feeding improves newborn and maternal outcomes, including promoting emotional attachment, reduced newborn infectious complications and reduced risk for sudden infant death syndrome.<sup>5</sup>
- A system should be in place to identify patients who have made an informed choice not to breast or chest feed so that they are not continually questioned.



### Tools and equipment

- [Breastfeeding](#), Public Health Agency of Canada
- [Breastfeeding](#), Centers for Disease Control and Prevention
- [Information and Education for Providers and Mothers](#), Academy of Breastfeeding Medicine

## Analgesia

### Multimodal Opioid-Sparing Pain Management



#### Recommendations

- Pain management expectations and options should be discussed with patients, including:<sup>6</sup>
  - pain can be controlled with oral or IV medications
  - medication choice will depend on the severity of pain and whether the patient has had spinal or epidural anesthesia
  - most pain relief medications will not interfere with breast or chest feeding or caring for their newborn.
- Multimodal analgesia that includes scheduled delivery (vs. PRN) of NSAIDs and acetaminophen is recommended.<sup>4, 6, 70, 71</sup>
- Use of parenteral or oral opioids should be reserved for patients with breakthrough pain.<sup>70</sup> If the patient chooses to take stronger medications, consider a short course of opioids (such as morphine or hydromorphone) at the lowest effective dose for the shortest duration.
- Nonpharmacologic and pharmacologic therapies are important elements of postpartum pain management.<sup>70</sup>
- A stepwise, multimodal approach to analgesia is recommended for postpartum pain management.<sup>70</sup>
- Patients who are prescribed opioid analgesics should be counselled about the risk of central nervous system depression both in the patient and the breast or chest fed newborn.

## 5

## Postoperative

- A shared decision-making approach to discharge opioid prescription can optimize pain control and reduce the number of unused opioid tablets.<sup>70</sup>
- Use of opiate prescriptions should be limited to the shortest reasonable course and at the lowest effective dose expected to treat acute pain, and not for more than 3 days without close supervision.<sup>6, 70</sup>
- For patients taking opioids, consider:<sup>6</sup>
  - antiemetics, if needed for nausea and vomiting (such as dimenhydrinate)
  - laxatives to prevent constipation.
- Patients with preoperative pain, chronic pain conditions and opioid use disorders are at risk for suboptimal postpartum pain control. Consider individualized care plans in collaboration with an obstetric anesthesiologist or pain medicine specialist.<sup>70</sup>
- Codeine is not recommended as first-line therapy to provide pain control. Potential pharmacogenomic and metabolic variability in the patient and newborn can impact efficacy and induce dangerous side effects, including increased risk for newborn overdose.<sup>6, 72-74</sup> Consider other forms of opioid analgesics.
- Patients should be taught how to effectively assess their pain. For patients with severe pain after cesarean delivery and when current pain relief is not sufficient:<sup>6</sup>
  - perform a full assessment to exclude other causes for the pain (for example sepsis, hemorrhage, urinary retention)
  - discuss the availability of stronger pain relief medications with the patient
  - ensure that the patient is aware that these pain relief medications could increase the risk of neonatal sedation and respiratory depression if taken while breast or chest feeding.



### Additional information

- Suggested multimodal post-operative analgesia regimen:<sup>75-77</sup>
  - Acetaminophen 1 g PO every 8 hrs. for 48-72 hrs.
  - NSAIDs for 48-72 hrs.
    - Ibuprofen 600 mg PO every 6 hrs. or 800 mg PO every 8 hrs.
    - OR Naproxen 500 mg PO every 12 hrs.
    - OR Ketorolac 10 mg PO every 6 hrs.
  - Opioids should be reserved for treating breakthrough pain when analgesia is inadequate to achieve functional goals such as care for self and baby, ambulation, and rest.
    - Examples:
      - Hydromorphone 1-2 mg PO every 4 hrs. PRN
      - Morphine 5-10 mg PO every 4 hrs. PRN
- Acetaminophen and NSAIDs have an additive analgesic effect, and unless contraindicated, should be routinely given together on a scheduled rather than PRN basis.<sup>78</sup>



### Tools and equipment

- Consider using a pain assessment scale such as the [Wong-Baker FACES® Pain Rating Scale](#)



### Data collection

- Continuation of multimodal opioid-sparing analgesia
- Day IV analgesics discontinued

## 5 Postoperative

### Surgical Best Practices

## Urinary Drainage

### Recommendations

- Depending on the level of regression of the regional anesthetic, consideration should be made for early removal of the urinary catheter to reduce the risk of infection and increase the patient's ability to mobilize and care for their newborn.
- Recommendations on the duration of urinary catheterization after cesarean delivery are unclear. One key guideline recommends immediate removal,<sup>4</sup> while another recommends removal by 6-12 hrs. postpartum.<sup>5</sup>
- Because the catheter will be removed early, each institution should develop a policy for assessment of patients who may have difficulty voiding (such as overdistended bladder or patient discomfort). A bladder scan can be performed in patients who do not void 6-8 hrs. after removal of the catheter. As an example, a volume of 400-600 mL can trigger intermittent catheterization.



### Additional information

- Prolonged urinary catheterization is associated with a high incidence of urinary tract infection, ureteral pain, urine retention, mobilization challenges and increased length of stay.
- A dose of neuraxial local anesthetic and opioid can impact catheter removal time.<sup>5</sup>



### Data collection

- Foley removal



## 5 Postoperative

### Venous Thromboembolism (VTE) Prophylaxis

#### Recommendations

- All patients should undergo a documented assessment of risk factors for VTE intrapartum or immediately postpartum to guide risk-based management.<sup>6, 79</sup>
- Low molecular weight heparin (LMWH) is the preferred pharmacologic agent over unfractionated heparin for thromboprophylaxis.<sup>80</sup> Heparin should not be used routinely for VTE prophylaxis in patients after cesarean delivery.<sup>4</sup>
- Pneumatic compression stockings starting before surgery should be used to prevent thromboembolic disease in all patients who undergo cesarean delivery.<sup>4, 81</sup> Stockings should be used until the patient is fully ambulatory.<sup>81</sup>



#### Additional information

- The risk of VTE with cesarean delivery compared to vaginal delivery is approximately double, but in otherwise healthy patients the absolute risk is low.<sup>5</sup>



#### Tools and equipment

- Institutions should develop a patient safety bundle with an institutional protocol for VTE prophylaxis among patients who undergo cesarean delivery.<sup>81</sup>
- Society of Obstetricians and Gynaecologists of Canada – Venous Thromboembolism and Antithrombotic Therapy in Pregnancy.<sup>82</sup>



#### Data collection

- VTE prophylaxis

### Anemia Remediation

#### Recommendations

- Patients should be screened for anemia and treated if necessary. Consider checking hemoglobin on postoperative day (POD) 1 or 2 in patients with severe (for example >1 L) intraoperative bleeding or preexisting anemia.<sup>5</sup>
- Patients who require treatment for anemia should preferably be treated in-hospital with IV iron.<sup>83</sup>
- Patients with low iron stores at the time of delivery and following childbirth should be counselled that they may experience fatigue, altered cognition, or depressive symptoms.<sup>84</sup>



#### Additional information

- Compared with oral iron, patients receiving IV iron had higher hemoglobin concentrations at 6 wks. postpartum and a lower risk of gastrointestinal side-effects.<sup>83</sup>



#### Data collection

- Anemia remediation

## 5 Postoperative

### Fluid Management



#### Recommendations

- Ice chips or water may be offered within 60 mins post-cesarean admission to the post-anesthesia care unit (PACU).<sup>5</sup>
- Once the patient is tolerating fluids (for example able to drink and keep fluids down without nausea +/- vomiting), urine output is adequate, and the uterotonic infusion is complete, the IV can either be removed or saline and heparin locked.<sup>5</sup>



#### Data collection

- IV fluid discontinuation

### Nutrition Management

### Diet and Gastrointestinal Function Recovery



#### Recommendations

- Patients should resume their normal diet as early as possible on the same day of surgery.<sup>6, 85</sup>
- Chewing gum appears to be effective and is low risk. It may be unnecessary if a policy for early oral intake and reduced opioid consumption is used. However, it should be considered if delayed oral intake is planned.<sup>4, 5</sup>



#### Tools and equipment

- [Canada's Food Guide](#), Government of Canada



#### Data collection

- Date tolerating oral intake

## 5 Postoperative

### Mobility and Physical Activity

## In-Hospital Mobilization

### Recommendations

- Early mobilization after adequate return of motor function is recommended following cesarean delivery for several reasons, including to promote return of bowel function and decrease insulin resistance, muscle atrophy, hypoxia, and VTE.<sup>4, 5</sup>
- To assess the patient's potential for safe mobilization, conduct a simple assessment like the Step Test (see below). A healthcare professional should always attend the first mobilization.
- Patients who are evaluated to be at risk of falling should be assessed by a healthcare professional to determine how much assistance will be required to ambulate.

### Additional information

- The step test assesses the power of the quadriceps and hamstring muscles, as well as balance. If the patient is ready to mobilize, complete the step test:
  - using a stepping stool, ask the patient to step on the stool, one foot at a time, and then back down (with assistance by their side for support if needed). If the patient can perform this task independently, they have passed the step test.
- Suggested approach to mobilization following surgery:<sup>5</sup>
  - 0-6 hrs. postoperative
    - sit on edge of bed
    - out of bed to chair
    - ambulation as tolerated
  - 6-12 hrs. postoperative
    - ambulation as tolerated
    - walk: 1-2 times or more in hall
  - 24-48 hrs. postoperative
    - walk: 3-4 times or more in hall
    - out of bed for 8 hrs.

### Data collection

- First postoperative mobilization

## 5 Postoperative

### Promotion of Resting Periods

#### Recommendations

- Optimize sleep and rest to avoid patient fatigue-related adverse outcomes.<sup>5</sup>
- Encourage clustered interventions (for example vital signs assessment in coordination with analgesic administration; or timing of oral analgesics contemporaneously).<sup>5</sup>

#### Tools and equipment

- Consider using laminated “Do not disturb” signs that patients and families can hang on their doors to get more rest.

## 6 Discharge

### Patient and Family Engagement

## Engage Patients and their Support Persons in their Care

### Recommendations

- Standardized written discharge instructions should be used to facilitate discharge counselling.<sup>4</sup>
- Discharge planning on POD 1 should ideally include pediatric and lactation teams.<sup>5</sup>
- Offer patients who are recovering well, are afebrile, and do not have complications, discharge from hospital after 24 hrs., as this is not associated with more readmissions for newborns or the patient.<sup>6</sup>
- Discuss with patients that, after a cesarean delivery compared to patients who deliver vaginally, they are not at increased risk of depression, post-traumatic stress symptoms, pain on sexual intercourse, fecal incontinence, or difficulties with breast or chest feeding.<sup>6</sup>
- While patients are in hospital after having an intrapartum cesarean delivery, give them the opportunity to discuss with healthcare professionals the reasons for the cesarean delivery, and provide both verbal and printed information about birth options for any future pregnancies. If the patient prefers, provide this later.<sup>6</sup>
- All healthy term newborns must have an appropriate discharge plan, including identification of the newborn's primary healthcare professional and assessment by a healthcare professional 24-72 hrs. after discharge.<sup>86</sup>
- Ideally, the patient should have contact with a maternal care provider within the first 3-6 wks. postpartum. This initial assessment should be followed up with ongoing care as needed, consulting with a comprehensive postpartum visit no later than 12 wks. after birth. The comprehensive postpartum visit should:<sup>87</sup>
  - be individualized and patient centered
  - include a full assessment of physical, social, and psychological well-being.



### Additional information

- Encourage patients and support persons to review the “at home” section of their booklet prior to discharge, and to ask questions.
- Patients should be made aware of warning signs of health problems after birth, and who to contact, in case of an emergency.
- Ensure relevant members of the healthcare team are available to respond to questions or concerns patients and support persons may have about the discharge plan.



### Tools and equipment

- [Patient Optimization Booklet](#)
- [Animated Cesarean Delivery Guide](#)
- [Facilitating Discharge from Hospital of the Healthy Term Infant](#), Canadian Paediatric Society

## 6

## Discharge

### Analgesia



#### Recommendation

- If, after delivery, the patient is discharged home on opioids, advise the patient to contact their healthcare provider if they are concerned about their newborn (for example drowsiness, difficulties breathing, constipation, or difficulty feeding).<sup>6</sup>



#### Data collection

- Opioids prescribed at discharge

### Surgical Best Practices

### Wound Care



#### Recommendations

- When using standard (not negative pressure) wound dressings consider that:<sup>6</sup>
  - no type of wound dressing is better than another at reducing the risk of wound infections.
  - there is no difference in the risk of wound infection when dressings are removed 6 hrs. postoperatively, compared with 24 hrs. postoperatively.
- Consider negative pressure wound therapy for patients with class III obesity to reduce the risk of wound infections.<sup>60</sup>
- Ensure wound care includes:<sup>6</sup>
  - removing standard dressings 6 to 24 hrs. after the delivery
  - specific monitoring for fever
  - assessing the wound for signs of infection (such as increasing pain, redness, or discharge), separation or dehiscence
  - encouraging the patient to wear loose, comfortable clothes and cotton underwear
  - gently cleaning and drying the wound daily
  - if needed, planning for the removal of sutures or clips.

## 6 Discharge

### Symptom Management

#### Recommendations

- For patients who have urinary symptoms, consider possible diagnoses of:<sup>6</sup>
  - urinary tract infection
  - stress incontinence
  - urinary tract injury
  - urinary retention
- For patients who have heavy or irregular vaginal bleeding, consider whether this is more likely to be because of endometritis than retained products of conception and manage accordingly.<sup>6</sup>
- Because of the increased risk of thromboembolic disease (deep vein thrombosis and pulmonary embolism), pay special attention to patients who have respiratory symptoms (such as a cough or shortness of breath) or leg symptoms (such as a painful swollen calf).<sup>6</sup>
- Review risks for postpartum depression particularly in those who have symptoms intrapartum.

### Nutrition

#### Recommendations

- Emphasize the need for a well-balanced diet to support meeting nutrient needs for optimal health and lactation. Lactation recommendations emphasize:<sup>88</sup>
  - inclusion of dietary sources of docosahexaenoic (DHA)
  - avoiding or limiting certain foods (such as mercury, caffeine, alcohol, herbal products)
  - taking a daily multivitamin and mineral supplement with vitamin D and folic acid
- Encourage gradual weight loss after breast or chest feeding is established. Additional energy requirements of 350-400 calories per day is needed for lactation and takes into consideration gradual weight loss.<sup>88</sup>
- Discuss the benefits of exclusive breast or chest feeding for improving short- and long-term health outcomes for both the patient and the newborn.<sup>35</sup>
- The patient should be advised to drink to thirst to stay hydrated, alleviate constipation and support milk production.

#### Tools and equipment

- [Canada's Food Guide](#), Government of Canada
- [Nutrition for Lactation Nutrition Guideline](#), Alberta Health Services

### Mobility and Physical Activity

### Post-Discharge Physical Activity

#### Recommendations

- Patients should be encouraged to mobilize and resume activities of daily living (such as light housework and running errands) progressively after hospital discharge.
- Criteria for safe resumption of physical activity should be considered. Patients should initially avoid strenuous physical effort (including core exercise, such as crunches or sit-ups) and lift nothing heavier than their baby for the first 6 wks. after delivery.

# Cesarean Delivery

1. Accreditation Canada. Standards Set: Obstetric Services. 2020.
2. Wilson RD, Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, et al. Guidelines for antenatal and preoperative care in cesarean delivery: Enhanced recovery after surgery society recommendations (part 1). *Am J Obstet Gynecol*. Dec 2018;219(6):523.e1-523.e15.
3. Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, Norman M, et al. Guidelines for intraoperative care in cesarean delivery: Enhanced recovery after surgery society recommendations (part 2). *Am J Obstet Gynecol*. Dec 2018;219(6):533-544.
4. Macones GA, Caughey AB, Wood SL, Wrench IJ, Huang J, Norman M, et al. Guidelines for postoperative care in cesarean delivery: Enhanced recovery after surgery (ERAS) society recommendations (part 3). *Am J Obstet Gynecol*. Sep 2019;221(3):247.e1-247.e9.
5. Bollag L, Lim G, Sultan P, Habib AS, Landau R, Zakowski M, et al. Society for obstetric anesthesia and perinatology: Consensus statement and recommendations for enhanced recovery after cesarean. *Anesth Analg*. May 1 2021;132(5):1362-1377.
6. National Institute for Health and Care Excellence. Caesarean birth. NICE guideline [NG192]. 2021.
7. Feldman LS, Delaney CP, Ljungqvist O, Carli F. *The SAGES/ERAS society manual of enhanced recovery programs for gastrointestinal surgery*. 1 ed. Springer International Publishing; 2015.
8. Patient Engagement Action Team. Engaging patients in patient safety - a Canadian guide. Canadian Patient Safety Institute. Accessed September 30, 2021. [www.patientsafetyinstitute.ca/engagingpatients](http://www.patientsafetyinstitute.ca/engagingpatients)
9. Bellows M, Kovacs Burns K, Jackson K, Surgeoner B, Gallivan J. Meaningful and effective patient engagement: What matters most to stakeholders. *Patient Experience Journal*. 2015;2(1):18-28.
10. Kessels RP. Patients' memory for medical information. *J R Soc Med*. May 2003;96(5):219-22.
11. Wizowski L, Harper T, Hutchings T. Writing health information for patients and families. Hamilton Health Sciences. Accessed July 30, 2020. [https://muhcpatienteducation.mcgill.ca/Writing\\_HI\\_Edition4.pdf](https://muhcpatienteducation.mcgill.ca/Writing_HI_Edition4.pdf)
12. Roberts L. Health information and the Internet: The 5 Cs website evaluation tool. *Br J Nurs*. Mar 11-24 2010;19(5):322-5.
13. Gillis C, Gill M, Marlett N, MacKean G, GermAnn K, Gilmour L, et al. Patients as partners in enhanced recovery after surgery: A qualitative patient-led study. *BMJ Open*. Jun 24 2017;7(6):e017002.
14. Houts PS, Doak CC, Doak LG, Loscalzo MJ. The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient Educ Couns*. May 2006;61(2):173-90.
15. Caligtan CA, Carroll DL, Hurley AC, Gersh-Zaremski R, Dykes PC. Bedside information technology to support patient-centered care. *Int J Med Inform*. Jul 2012;81(7):442-51.
16. Mardis T, Mardis M, Davis J, Justice EM, Riley Holdinsky S, Donnelly J, et al. Bedside shift-to-shift handoffs: A systematic review of the literature. *J Nurs Care Qual*. Jan-Mar 2016;31(1):54-60.
17. Dorvil B. The secrets to successful nurse bedside shift report implementation and sustainability. *Nurs Manage*. Jun 2018;49(6):20-25.



## Cesarean Delivery

18. Health care for transgender and gender diverse individuals: ACOG Committee Opinion, No. 823. *Obstet Gynecol.* Mar 1 2021;137(3):e75-e88.
19. Agency for Healthcare Research and Quality. Communicate clearly: Tool #4. September 30, 2021. <https://www.ahrq.gov/health-literacy/improve/precautions/tool4.html>
20. Schnitman G, Wang T, Kundu S, Turkdogan S, Gotlieb R, How J, et al. The role of digital patient education in maternal health: A systematic review. *Patient Educ Couns.* Jun 24 2021;
21. Alberta Health Services. Maternal newborn child & youth strategic clinical network. Alberta Antenatal Pathway. Version 2.1. Accessed September 30, 2021. <https://www.albertahealthservices.ca/assets/about/scn/ahs-scn-mncy-antenatal-pathway.pdf>
22. Magee LA, Smith GN, Bloch C, Côté AM, Jain V, Nerenberg K, et al. Guideline No. 426-Hypertensive disorders of pregnancy: diagnosis, prediction, prevention, and management. *J Obstet Gynaecol Can.* May 2022;44(5):547-571.e1.
23. Gestational hypertension and preeclampsia: ACOG Practice Bulletin No. 222. *Obstet Gynecol.* Jun 2020;135(6):e237-e260.
24. Berger H, Gagnon R, Sermer M. Guideline No. 393-Diabetes in pregnancy. *J Obstet Gynaecol Can.* Dec 2019;41(12):1814-1825.e1.
25. Feig DS, Berger H, Donovan L, Godbout A, Kader T, Keely E, et al. Diabetes and pregnancy. *Can J Diabetes.* Apr 2018;42 Suppl 1:S255-s282.
26. Malinowski AK, Murji A. Iron deficiency and iron deficiency anemia in pregnancy. *CMAJ.* Jul 26 2021;193(29):E1137-e1138.
27. ACOG Committee Opinion No. 757: Screening for perinatal depression. *Obstet Gynecol.* Nov 2018;132(5):e208-e212.
28. Maxwell C, Gaudet L, Cassir G, Nowik C, McLeod NL, Jacob C, et al. Guideline No. 391-Pregnancy and maternal obesity part 1: Pre-conception and prenatal care. *J Obstet Gynaecol Can.* Nov 2019;41(11):1623-1640.
29. Maxwell C, Gaudet L, Cassir G, Nowik C, McLeod NL, Jacob C, et al. Guideline No. 392-Pregnancy and maternal obesity part 2: Team planning for delivery and postpartum care. *J Obstet Gynaecol Can.* Nov 2019;41(11):1660-1675.
30. Ordean A, Wong S, Graves L. No. 349-Substance use in pregnancy. *J Obstet Gynaecol Can.* Oct 2017;39(10):922-937.e2.
31. Graves L, Carson G, Poole N, Patel T, Bigalky J, Green CR, et al. Guideline No. 405-Screening and counselling for alcohol consumption during pregnancy. *J Obstet Gynaecol Can.* Sep 2020;42(9):1158-1173.e1.
32. Committee Opinion No. 722: Marijuana use during pregnancy and lactation. *Obstet Gynecol.* Oct 2017;130(4):e205-e209.
33. Committee Opinion No. 711: Opioid use and opioid use disorder in pregnancy. *Obstet Gynecol.* Aug 2017;130(2):e81-e94.

## Cesarean Delivery

34. Alberta Health Services. Nutrition Services. Pregnancy nutrition guideline. Accessed September 30, 2021. <https://www.albertahealthservices.ca/assets/info/nutrition/if-nfs-ng-pregnancy.pdf>
35. O'Connor DL, Blake J, Bell R, Bowen A, Callum J, Fenton S, et al. Canadian consensus on female nutrition: Adolescence, reproduction, menopause, and beyond. *J Obstet Gynaecol Can.* Jun 2016;38(6):508-554.e18.
36. Physical activity and exercise during pregnancy and the postpartum period: ACOG Committee Opinion, No. 804. *Obstet Gynecol.* Apr 2020;135(4):e178-e188.
37. Mottola MF, Davenport MH, Ruchat SM, Davies GA, Poitras V, Gray C, et al. No. 367-2019 Canadian guideline for physical activity throughout pregnancy. *J Obstet Gynaecol Can.* Nov 2018;40(11):1528-1537.
38. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, et al. Centers for Disease Control and Prevention guideline for the prevention of surgical site infection, 2017. *JAMA Surg.* Aug 1 2017;152(8):784-791.
39. Ertas IE, Ince O, Emirdar V, Gultekin E, Biler A, Kurt S. Influence of preoperative enema application on the return of gastrointestinal function in elective Cesarean sections: a randomized controlled trial. *J Matern Fetal Neonatal Med.* Jun 2021;34(11):1822-1826.
40. Dobson G, Chow L, Filteau L, Hurdle H, McIntyre I, Milne A, et al. Guidelines to the practice of anesthesia - revised edition 2021. *Can J Anaesth.* Jan 2021;68(1):92-129. Guide d'exercice de l'anesthésie de la SCA – Édition révisée 2021.
41. Sutton CD, Carvalho B. Optimal pain management after Cesarean delivery. *Anesthesiol Clin.* Mar 2017;35(1):107-124.
42. Sultan P, Habib AS, Cho Y, Carvalho B. The effect of patient warming during Caesarean delivery on maternal and neonatal outcomes: a meta-analysis. *Br J Anaesth.* Oct 2015;115(4):500-10.
43. Singh SS, Mehra N, Hopkins L. No. 286-Surgical safety checklist in obstetrics and gynaecology. *J Obstet Gynaecol Can.* Mar 2018;40(3):e237-e242.
44. Practice guidelines for obstetric anesthesia: An updated report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology. *Anesthesiology.* Feb 2016;124(2):270-300.
45. Lesage S. Cesarean delivery under general anesthesia: Continuing professional development. *Can J Anaesth.* May 2014;61(5):489-503.
46. Juang J, Gabriel RA, Dutton RP, Palanisamy A, Urman RD. Choice of anesthesia for Cesarean delivery: An analysis of the national anesthesia clinical outcomes registry. *Anesth Analg.* Jun 2017;124(6):1914-1917.
47. Kinsella SM, Winton AL, Mushambi MC, Ramaswamy K, Swales H, Quinn AC, et al. Failed tracheal intubation during obstetric general anaesthesia: a literature review. *Int J Obstet Anesth.* Nov 2015;24(4):356-74.
48. Mushambi MC, Kinsella SM, Popat M, Swales H, Ramaswamy KK, Winton AL, et al. Obstetric Anaesthetists' Association and Difficult Airway Society guidelines for the management of difficult and failed tracheal intubation in obstetrics. *Anaesthesia.* Nov 2015;70(11):1286-306.

## Cesarean Delivery

49. Pandit JJ, Andrade J, Bogod DG, Hitchman JM, Jonker WR, Lucas N, et al. The 5th National Audit Project (NAP5) on accidental awareness during general anaesthesia: summary of main findings and risk factors. *Anaesthesia*. Oct 2014;69(10):1089-101.
50. Sultan P, Gutierrez MC, Carvalho B. Neuraxial morphine and respiratory depression: finding the right balance. *Drugs*. Oct 1 2011;71(14):1807-19.
51. Palmer CM, Nogami WM, Van Maren G, Alves DM. Postcesarean epidural morphine: a dose-response study. *Anesth Analg*. Apr 2000;90(4):887-91.
52. van Schalkwyk J, Van Eyk N. No. 247-Antibiotic prophylaxis in obstetric procedures. *J Obstet Gynaecol Can*. Sep 2017;39(9):e293-e299.
53. ACOG Practice Bulletin No. 199: Use of prophylactic antibiotics in labor and delivery. *Obstet Gynecol*. Sep 2018;132(3):e103-e119.
54. Tita AT, Szychowski JM, Boggess K, Saade G, Longo S, Clark E, et al. Adjunctive azithromycin prophylaxis for cesarean delivery. *N Engl J Med*. Sep 29 2016;375(13):1231-41.
55. Hadiati DR, Hakimi M, Nurdiati DS, Masuzawa Y, da Silva Lopes K, Ota E. Skin preparation for preventing infection following caesarean section. *Cochrane Database Syst Rev*. Jun 25 2020;6(6):Cd007462.
56. Haas DM, Morgan S, Contreras K, Kimball S. Vaginal preparation with antiseptic solution before cesarean section for preventing postoperative infections. *Cochrane Database Syst Rev*. Apr 26 2020;4(4):Cd007892.
57. Ahmadzia HK, Patel EM, Joshi D, Liao C, Witter F, Heine RP, et al. Obstetric surgical site infections: 2 grams compared with 3 grams of cefazolin in morbidly obese women. *Obstet Gynecol*. Oct 2015;126(4):708-715.
58. Maggio L, Nicolau DP, DaCosta M, Rouse DJ, Hughes BL. Cefazolin prophylaxis in obese women undergoing cesarean delivery: a randomized controlled trial. *Obstet Gynecol*. May 2015;125(5):1205-1210.
59. Bamigboye AA, Hofmeyr GJ. Closure versus non-closure of the peritoneum at caesarean section: short- and long-term outcomes. *Cochrane Database Syst Rev*. Aug 11 2014;(8):Cd000163.
60. Gillespie BM, Webster J, Ellwood D, Thalib L, Whitty JA, Mahomed K, et al. Closed incision negative pressure wound therapy versus standard dressings in obese women undergoing caesarean section: multicentre parallel group randomised controlled trial. *BMJ*. May 5 2021;373:n893.
61. Leduc D, Senikas V, Lalonde AB. No. 235-Active management of the third stage of labour: prevention and treatment of postpartum hemorrhage. *J Obstet Gynaecol Can*. Dec 2018;40(12):e841-e855.
62. Su LL, Chong YS, Samuel M. Carbetocin for preventing postpartum haemorrhage. *Cochrane Database Syst Rev*. Apr 18 2012;(4):Cd005457.
63. World Health Organization. Updated WHO recommendation on tranexamic acid for the treatment of postpartum haemorrhage. Accessed September 30, 2021. <https://apps.who.int/iris/bitstream/handle/10665/259379/WHO-RHR-17.21-eng.pdf?sequence=1>
64. Practice Bulletin No. 183: Postpartum hemorrhage. *Obstet Gynecol*. Oct 2017;130(4):e168-e186.

## Cesarean Delivery

65. Sentilhes L, Sénat MV, Le Lous M, Winer N, Rozenberg P, Kayem G, et al. Tranexamic acid for the prevention of blood loss after cesarean delivery. *N Engl J Med*. Apr 29 2021;384(17):1623-1634.
66. Weiner G, Zaichkin J. *Textbook of neonatal resuscitation*. 8th ed. American Academy of Pediatrics; 2021.
67. McDonald SD, Narvey M, Ehman W, Jain V, Cassell K. Guideline No. 424: Umbilical cord management in preterm and term infants. *J Obstet Gynaecol Can*. Mar 2022;44(3):313-322.e1.
68. Goodridge D, McDonald M, New L, Scharf M, Harrison E, Rotter T, et al. Building patient capacity to participate in care during hospitalisation: a scoping review. *BMJ Open*. Jul 3 2019;9(7):e026551.
69. Barriers to breastfeeding: supporting initiation and continuation of breastfeeding: ACOG Committee Opinion Summary No. 821. *Obstet Gynecol*. Feb 1 2021;137(2):396-397.
70. Pharmacologic stepwise multimodal approach for postpartum pain management: ACOG Clinical Consensus No. 1. *Obstet Gynecol*. Sep 1 2021;138(3):507-517.
71. Laksono I, Matelski J, Flamer D, Gold S, Selk A. Evaluation of a quality improvement bundle aimed to reduce opioid prescriptions after Cesarean delivery: an interrupted time series study. *Can J Anaesth*. Nov 8 2021;Évaluation d'un ensemble d'améliorations de la qualité visant à réduire les ordonnances d'opioïdes après un accouchement par césarienne : une étude de séries chronologiques interrompues.
72. National Library of Medicine. Specialized Information Services. Codeine. LactMed <https://www.ncbi.nlm.nih.gov/books/NBK501212/>
73. Madadi P, Moretti M, Djokanovic N, Bozzo P, Nulman I, Ito S, et al. Guidelines for maternal codeine use during breastfeeding. *Can Fam Physician*. Nov 2009;55(11):1077-8.
74. Food and Drug Administration. FDA Drug Safety Communication: FDA restricts use of prescription codeine pain and cough medicines and tramadol pain medicines in children; recommends against use in breastfeeding women. Accessed September 30, 2021. <https://www.fda.gov/drugs/drug-safety-and-availability/fda-drug-safety-communication-fda-restricts-use-prescription-codeine-pain-and-cough-medicines-and>
75. Valentine AR, Carvalho B, Lazo TA, Riley ET. Scheduled acetaminophen with as-needed opioids compared to as-needed acetaminophen plus opioids for post-cesarean pain management. *Int J Obstet Anesth*. Aug 2015;24(3):210-6.
76. Zeng AM, Nami NF, Wu CL, Murphy JD. The analgesic efficacy of nonsteroidal anti-inflammatory agents (NSAIDs) in patients undergoing cesarean deliveries: a meta-analysis. *Reg Anesth Pain Med*. Nov/Dec 2016;41(6):763-772.
77. Carvalho B, Butwick AJ. Postcesarean delivery analgesia. *Best Pract Res Clin Anaesthesiol*. Mar 2017;31(1):69-79.
78. Ituk U, Habib AS. Enhanced recovery after cesarean delivery. *F1000Res*. 2018;7.
79. Royal College of Obstetricians and Gynaecologists. Reducing the risk of venous thromboembolism during pregnancy and the puerperium. Green-top Guideline No. 37a. Accessed September, 2021. <https://www.rcog.org.uk/globalassets/documents/guidelines/gtg-37a.pdf>

## Cesarean Delivery

80. ACOG Practice Bulletin No. 196: Thromboembolism in pregnancy. *Obstet Gynecol.* Jul 2018;132(1):e1-e17.
81. Pacheco LD, Saade G, Metz TD. Society for Maternal-Fetal Medicine Consult Series #51: Thromboembolism prophylaxis for cesarean delivery. *Am J Obstet Gynecol.* Aug 2020;223(2):B11-b17.
82. Chan WS, Rey E, Kent NE, Corbett T, David M, Douglas MJ, et al. Venous thromboembolism and antithrombotic therapy in pregnancy. *J Obstet Gynaecol Can.* Jun 2014;36(6):527-53.
83. Sultan P, Bampoe S, Shah R, Guo N, Estes J, Stave C, et al. Oral vs intravenous iron therapy for postpartum anemia: a systematic review and meta-analysis. *Am J Obstet Gynecol.* Jul 2019;221(1):19-29. e3.
84. World Health Organization. Guideline: Iron supplementation in postpartum women. Accessed September 30, 2021. <https://www.ncbi.nlm.nih.gov/books/NBK379991/>
85. Weimann A, Braga M, Carli F, Higashiguchi T, Hübner M, Klek S, et al. ESPEN guideline: Clinical nutrition in surgery. *Clin Nutr.* Jun 2017;36(3):623-650.
86. Canadian Paediatric Society. Position statement: Facilitating discharge from hospital of the healthy term infant. Accessed September 30, 2021. <https://www.cps.ca/en/documents/position/facilitating-discharge-from-hospital-of-the-healthy-term-infant>
87. ACOG Committee Opinion No. 736: Optimizing postpartum care. *Obstet Gynecol.* May 2018;131(5):e140-e150.
88. Alberta Health Services. Nutrition Services. Nutrition for Lactation Nutrition Guideline. Accessed September 30, 2021. <https://albertahealthservices.ca/assets/info/nutrition/if-nfs-ng-nutrition-for-lactation.pdf>

# Abbreviations

**BMI**, body mass index  
**DHA**, docosahexaenoic  
**DVT**, deep vein thrombosis  
**EPDS**, Edinburgh Postnatal Depression Scale  
**ERAS**, Enhanced Recovery After Surgery  
**ERC**, Enhanced Recovery Canada  
**HEC**, Healthcare Excellence Canada  
**IONV**, intraoperative nausea and vomiting  
**IV**, intravenous  
**LMWH**, low molecular weight heparin  
**NPO**, nothing by mouth  
**NSAID**, non-steroidal anti-inflammatory drug  
**QI**, quality improvement  
**QL**, quadratus lumborum  
**PACU**, post-anesthesia care unit  
**PE**, pulmonary embolism  
**PHQ-9**, patient health questionnaire 9  
**PO**, orally by mouth  
**POD**, postoperative day  
**PONV**, postoperative nausea and vomiting  
**PR**, rectally  
**PRN**, as needed  
**RSI**, rapid sequence induction  
**SSI**, surgical site infection  
**TAP**, transversus abdomens plane  
**VTE**, venous thromboembolism

# Template for Physician Order Sets

## Enhanced Recovery After Cesarean Delivery – PATIENT OPTIMIZATION

Patient Name	
Healthcare Number	
Date of Birth	

Weight:	Height:	Allergy(s):
<p><b>PREOPERATIVE EVALUATIONS</b></p> <ul style="list-style-type: none"> <li>• Evidence-informed preoperative assessment</li> <li>• All patient comorbidities and operative risk factors should be optimized, including:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Gestational hypertension</li> <li><input type="checkbox"/> Gestational diabetes</li> <li><input type="checkbox"/> Anemia</li> <li><input type="checkbox"/> Maternal mental health</li> <li><input type="checkbox"/> Gestational weight gain</li> <li><input type="checkbox"/> Substance abuse (smoking, alcohol, drugs)</li> </ul> </li> </ul> <p><b>Consults Requested</b></p> <ul style="list-style-type: none"> <li>• Appropriate referral and management can be guided by institutional protocols               <ul style="list-style-type: none"> <li><input type="checkbox"/> Cardiologist</li> <li><input type="checkbox"/> Hematologist</li> <li><input type="checkbox"/> Endocrinologist</li> <li><input type="checkbox"/> Registered Dietitian</li> <li><input type="checkbox"/> Other(s): _____</li> </ul> </li> </ul> <p><b>PATIENT EDUCATION</b></p> <ul style="list-style-type: none"> <li>• Patients and support persons should receive preoperative education about all events that will occur before, during and after cesarean delivery               <ul style="list-style-type: none"> <li><input type="checkbox"/> Patient booklet (hard copy and or digital) provided</li> <li><input type="checkbox"/> Precare video provided</li> </ul> </li> <li>• Patients should know how they are expected to participate in their own care going into surgery               <ul style="list-style-type: none"> <li><input type="checkbox"/> Instructions for preoperative fasting provided</li> <li><input type="checkbox"/> Instructions for cleaning skin with chlorhexidine before hospital admission provided</li> </ul> </li> </ul>		

# Template for Physician Order Sets

## Enhanced Recovery After Cesarean Delivery - PREOPERATIVE

Patient Name	
Healthcare Number	
Date of Birth	

Weight:	Height:	Allergy(s):
<p><b>PREOPERATIVE PREPARATIONS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Solid foods until 6-8 h before surgery and clear fluids until 2 h before surgery</li> <li><input type="checkbox"/> Non-particulate oral carbohydrate fluid supplementation (50 g, non-diabetic patients)</li> <li><input type="checkbox"/> Chlorhexidine skin cleansing before hospital admission</li> </ul> <p><b>PHARMACOTHERAPY</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Non-particulate antacid and histamine H2 receptor (PO or IV)</li> </ul> <p><b>NORMOTHERMIA MANAGEMENT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Forced air warming or underbody warming blanket</li> </ul> <p><b>FLUID MANAGEMENT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Maintenance of euvolemia</li> </ul>		



# Template for Physician Order Sets

## Enhanced Recovery After Cesarean Delivery - INTRAOPERATIVE

Patient Name	
Healthcare Number	
Date of Birth	

Weight:	Height:	Allergy(s):
<p><b>TYPE OF CESAREAN DELIVERY</b></p> <p><input type="checkbox"/> Elective   <input type="checkbox"/> Intrapartum</p> <p><b>NORMOTHERMIA MANAGEMENT</b></p> <p><input type="checkbox"/> Forced air warming or underbody warming blanket</p> <p><input type="checkbox"/> Warm IV fluids and blood products</p> <p><input type="checkbox"/> Warm irrigation fluids</p> <p><input type="checkbox"/> Temperature monitoring</p> <p><b>MECHANICAL VTE PROPHYLAXIS</b></p> <p><input type="checkbox"/> Pneumatic compression stockings</p> <p><b>PHARMACOTHERAPY</b></p> <ul style="list-style-type: none"> <li>• <b>≥ 2 IV antiemetics</b>, including: <ul style="list-style-type: none"> <li><input type="checkbox"/> Metoclopramide 5-10 mg IV</li> <li><input type="checkbox"/> Ondansetron 4 mg IV</li> <li><input type="checkbox"/> Dexamethasone 4 mg IV</li> <li><input type="checkbox"/> Other _____</li> </ul> </li> <li>• <b>IV antibiotic</b>, 15-60 mins. before skin incision <ul style="list-style-type: none"> <li><input type="checkbox"/> First-generation cephalosporin (weight-based dosing) <b>or</b></li> <li><input type="checkbox"/> Clindamycin or erythromycin (penicillin allergy)</li> <li><input type="checkbox"/> Azithromycin (patients in labour or with ruptured membranes)</li> <li><input type="checkbox"/> Additional dose(s): _____</li> </ul> </li> <li>• <b>Anesthesia</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Neuraxial anesthesia (preferred) <b>or</b></li> <li><input type="checkbox"/> General anesthesia</li> </ul> </li> <li>• <b>Vasopressors</b> (spinal anesthesia cases only) <ul style="list-style-type: none"> <li><input type="checkbox"/> Phenylephrine + IV ephedrine <b>or</b></li> <li><input type="checkbox"/> Norepinephrine</li> </ul> </li> <li>• <b>≥ 2 analgesics</b>, including (unless contraindicated) <ul style="list-style-type: none"> <li><input type="checkbox"/> Neuraxial long-acting opioid (such as preservative-free morphine, 50-150 mcg intrathecal or 1-3 mg epidural)</li> <li><input type="checkbox"/> Acetaminophen: PO (975 or 1000 mg) or PR before delivery (20mg/kg or 1300 mg for &gt;70 kg) or IV after delivery (weight ≥50 kg: 1000 mg every 6 hrs.; weight &lt;50 kg: 15 mg/kg every 6 hrs.)</li> <li><input type="checkbox"/> NSAIDs: such as ketorolac 15-30 mg IV or naproxen (500 mg PO) after fascial closure</li> <li><input type="checkbox"/> Other _____</li> </ul> </li> </ul>		

# Template for Physician Order Sets

## Enhanced Recovery After Cesarean Delivery - INTRAOPERATIVE

Patient Name	
Healthcare Number	
Date of Birth	

Weight:	Height:	Allergy(s):
<p>• <b>Uterotonic and antifibrinolytic</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Elective, bolus 1 IU oxytocin; start oxytocin infusion at 2.5-7.5 IU·h<sup>-1</sup> (0.04-0.125 IU·min<sup>-1</sup>) <b>or</b></li> <li><input type="checkbox"/> Elective, carbetocin 100 mcg given as an IV bolus over 1 min</li> <li><input type="checkbox"/> Intrapartum, 3 IU oxytocin over ≥30 sec.; start oxytocin infusion at 7.5-15 IU·h<sup>-1</sup> (0.125-0.25 IU·min<sup>-1</sup>)</li> <li><input type="checkbox"/> Adjuvant tranexamic acid, 1 g IV bolus over 10 mins. within 3 hrs. of delivery</li> <li><input type="checkbox"/> Other _____</li> </ul> <p><b>FLUID MANAGEMENT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Indwelling catheter</li> <li><input type="checkbox"/> Crystalloid co-load (1 L immediately after spinal injection)</li> <li><input type="checkbox"/> IV fluids &lt;3 L (routine cases)</li> </ul> <p><b>SURGICAL APPROACH</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Chlorhexidine cleansing before skin incision</li> <li>• Vaginal preparation: <input type="checkbox"/> Aqueous iodine (preferred) <input type="checkbox"/> Aqueous chlorhexidine</li> <li><input type="checkbox"/> Transverse abdominal incision</li> <li><input type="checkbox"/> Controlled cord traction</li> <li><input type="checkbox"/> Paired umbilical artery and vein measurement of cord blood gases (suspected fetal compromise)</li> <li><input type="checkbox"/> Intraperitoneal repair of uterus</li> <li><input type="checkbox"/> Peritoneum not closed</li> <li><input type="checkbox"/> Closure of subcutaneous tissue (≥2 cm subcutaneous fat)</li> </ul> <ul style="list-style-type: none"> <li>• Uterine closure: <input type="checkbox"/> Single layer <input type="checkbox"/> Double layer</li> <li>• Skin closure: <input type="checkbox"/> Sutures (recommended) <input type="checkbox"/> Staples <input type="checkbox"/> Negative pressure wound therapy (class III obesity)</li> </ul> <p><b>NEWBORN CARE</b></p> <ul style="list-style-type: none"> <li>• Delayed cord clamping: <input type="checkbox"/> ≥1 min. (term delivery) <input type="checkbox"/> 30 sec. (preterm delivery) <ul style="list-style-type: none"> <li><input type="checkbox"/> Skin-to-skin contact initiated</li> <li><input type="checkbox"/> Support breast or chest feeding (if patient willing)</li> </ul> </li> <li>• Vital Signs <ul style="list-style-type: none"> <li><input type="checkbox"/> Temperature monitoring (maintain between 36.5°C and 37.5°C)</li> <li><input type="checkbox"/> Oxygen saturation monitoring</li> </ul> </li> </ul>		

# Template for Physician Order Sets

## Enhanced Recovery After Cesarean Delivery – POSTOPERATIVE

Patient Name	
Healthcare Number	
Date of Birth	

Weight:	Height:	Allergy(s):
<p><b>ASSESSMENTS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Respiratory monitoring (based on patient risk factors and perioperative risk assessment)</li> <li><input type="checkbox"/> Measurement of motor block prior to transfer to ward (Modified Bromage scale recommended)</li> <li><input type="checkbox"/> Step Test</li> <li><input type="checkbox"/> Assessment of pain levels (Wong-Baker FACES® recommended)</li> <li><input type="checkbox"/> VTE risk factors</li> <li><input type="checkbox"/> Anemia screening</li> <li><input type="checkbox"/> Breast or chest feeding support (refer to Lactation Consultant if needed)</li> </ul> <p><b>EDUCATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Provide breast or chest feeding material in different formats (for example unit classes, print, and video)</li> </ul> <p><b>PHARMACOTHERAPY</b></p> <p><b>Multimodal Analgesia</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Acetaminophen 1 g PO every 8 hrs. for 48-72 hrs. <b>and</b></li> <li>• NSAIDs for 48-72 hrs. <ul style="list-style-type: none"> <li><input type="checkbox"/> Ibuprofen 600 mg PO every 6 hrs. or 800 mg PO every 8 hrs., <b>or</b></li> <li><input type="checkbox"/> Naproxen 500 mg PO every 12 hrs. <b>or</b></li> <li><input type="checkbox"/> Ketorolac 10 mg PO every 6 hrs.</li> </ul> </li> </ul> <p><b>Note:</b> Acetaminophen and NSAIDs should be given together on scheduled (vs. PRN) basis</p> <ul style="list-style-type: none"> <li>• Reserve opioids for breakthrough pain when analgesia is inadequate to achieve functional goals such as care for self and baby, ambulation, and rest. <ul style="list-style-type: none"> <li><input type="checkbox"/> Hydromorphone 1-2 mg PO every 4 hrs. PRN</li> <li><input type="checkbox"/> Morphine 5-10 mg PO every 4 hrs. PRN</li> </ul> </li> <li><input type="checkbox"/> Other: _____</li> </ul> <p><b>Note:</b> Use of opiate prescriptions should be limited to shortest reasonable course and at lowest effective dose expected to treat acute pain, and not for more than 3 days without close supervision</p> <p><b>For patients prescribed opioids</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Dimenhydrinate</li> <li><input type="checkbox"/> Laxative</li> <li><input type="checkbox"/> Other: _____</li> </ul> <p><b>Thromboprophylaxis</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> LMWH (preferred)</li> <li><input type="checkbox"/> Other: _____</li> </ul> <p><b>Lactation inhibition</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cabergoline, 2 x 0.5 mg PO as single dose on first day postpartum</li> </ul>		

# Template for Physician Order Sets

## Enhanced Recovery After Cesarean Delivery – POSTOPERATIVE

Patient Name	
Healthcare Number	
Date of Birth	

Weight:	Height:	Allergy(s):
<p><b>Anemia Remediation</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> IV iron</li> </ul> <p><b>MECHANICAL VTE PROPHYLAXIS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pneumatic compression stockings</li> </ul> <p><b>FLUID MANAGEMENT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Offer ice chips or water within 60 mins. of admission to PACU</li> <li><input type="checkbox"/> Heparin and saline lock IV early (once uterotonic infusion complete, patient tolerating fluids, urine output adequate)</li> </ul> <p><b>EARLY REMOVAL OF URINARY CATHETER</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Remove urinary catheter early (bladder scan if patient unable to void 6-8 hrs. post removal; intermittent catheterization for volume of 400-600 mL)</li> </ul> <p><b>DIET</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Encourage return to normal food intake as soon as possible</li> <li><input type="checkbox"/> Gum chewing (recommended if delayed oral intake planned)</li> </ul> <p><b>MOBILITY</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Encourage mobilization early after adequate motor function</li> </ul>		

# Template for Physician Order Sets

## Enhanced Recovery After Cesarean Delivery - DISCHARGE

Patient Name	
Healthcare Number	
Date of Birth	

Weight:	Height:	Allergy(s):
<p><b>CONTINUITY OF CARE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Follow-up appointment <u>for newborn</u> 24-72 hrs. after discharge</li> <li><input type="checkbox"/> Follow-up appointment <u>for patient</u> 3-6 wks. postpartum</li> </ul> <p><b>ANALGESIA, general guidelines:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> If patient discharged home on opioids, advise patient to contact healthcare provider if they are concerned about their newborn (for example drowsiness, difficulty breathing, constipation, or difficulty feeding)</li> </ul> <p><b>NUTRITION, general guidelines:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Emphasize need for a well-balanced diet to support meeting nutrient needs for optimal health and lactation</li> <li><input type="checkbox"/> Encourage gradual weight loss after breast or chest feeding established</li> <li><input type="checkbox"/> Discuss benefits of exclusive breast or chest feeding</li> </ul> <p><b>PHYSICAL ACTIVITY, general guidelines:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Encourage patients to mobilize and resume activities of daily living progressively after hospital discharge</li> <li><input type="checkbox"/> Patients should initially avoid strenuous physical effort and lift nothing heavier than their baby for first 6 wks. after delivery</li> </ul> <p><b>SURVEILLANCE, general guidelines:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Advise patients to seek medical advice in case of urinary issues, heavy or irregular vaginal bleeding, signs, or symptom of DVT or PE and wound infection</li> <li><input type="checkbox"/> Provide instructions about where to go and who to contact in case of emergency</li> </ul>		

# Data Collection and Measurement

## Summary

This resource is meant to guide clinicians through data collection and measurement to support the implementation and evaluation of the Enhanced Recovery Canada (ERC) cesarean delivery clinical pathway. It includes information about how to identify your study population, how to calculate an appropriate sample size, as well as what patient, process, and outcome data to collect.

Quality improvement (QI) publications should follow structured guidelines from inception to publication to ensure consistency and quality of research, including the reporting on ERAS compliance, outcomes, and elements research (RECOVER) checklist.<sup>1</sup>

## Study Population

It is helpful for teams to collect data on patients undergoing the same cesarean deliveries to allow for data aggregation and comparisons. This is possible because each acute care institution in Canada reviews patient's charts after discharge and classifies their surgeries based on a universal coding system.

The [Canadian Institute for Health Information \(CIHI\)](#) sets the national standard for morbidity data reporting in Canada and maintains, distributes, and supports the application of ICD-10-CA (the Canadian modification of ICD-10). Canadian Classification of Health Interventions (CCI) is the national standard for classifying healthcare procedures.

ICD-10-CA (International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada) was developed by the World Health Organization (WHO) and enhanced by CIHI to meet Canadian morbidity data needs. CCI was developed by CIHI to accompany ICD-10-CA. It was designed to be service-provider and service-setting neutral and can be used comprehensively throughout health systems in Canada.

Cesarean Section Delivery	With Use of Forceps	With Use of Vacuum	Without Instrumentation	With Use of Both Vacuum and Forceps
Cesarean hysterectomy	5.MD.60.RC	5.MD.60.RD	5.MD.60.KE	5.MD.60.CB
Classical section (vertical incision in upper segment)	5.MD.60.JZ	5.MD.60.KA	5.MD.60.JY	5.MD.60.CC
Extraperitoneal section	5.MD.60.KC	5.MD.60.KD	5.MD.60.KB	5.MD.60.CD
Inverted T incision	5.MD.60.RA	5.MD.60.RB	5.MD.60.KG	5.MD.60.CE
Laparotomy (for abdominal pregnancy)	5.MD.60.RE	5.MD.60.RF	5.MD.60.KF	–
Lower segment transverse incision	5.MD.60.JW	5.MD.60.JX	5.MD.60.AA	5.MD.60.CF
Other type of cesarean section NEC	5.MD.60.RG	5.MD.60.RH	5.MD.60.KT	5.MD.60.CG

<sup>1</sup> Elias KM, Stone AB, McGinagle K, Tankou JI, Scott MJ, Fawcett WJ, et al. The reporting on ERAS compliance, outcomes, and elements research (RECOVER) checklist: a joint statement by the ERAS® and ERAS®USA Societies. *World J Surg.* Jan 2019;43(1):1-8.

# Data Collection and Measurement

## Sampling

A suggested sampling calculation is provided below.<sup>2</sup> This calculation recommends how many patient charts should be reviewed during the baseline period selected and the ongoing data collection through the implementation phase. This sampling is based on the number of cesarean deliveries performed monthly. Simple random sampling separated by elective and intrapartum cases is recommended.

Average Monthly Population Size “N”	Minimum required sample “n”
<20	No sampling: 100% of population required
20-100	20
>100	15-20% of population size

## Collection Strategy

Before the initiation of a quality improvement (QI) project, specific data points must be identified for collection which will demonstrate the success of the project. These data points should demonstrate both the process changes (process variables) and the impact of these changes (outcome variables). These data points must be obtained before any changes are made, then at scheduled time periods throughout the implementation to reflect the progress of the project.

Baseline data collection should occur over a three-month period to ensure an accurate reflection of the surgical care provided. Monthly data collection and reporting is recommended to reflect the process changes and improvements in postoperative patient outcomes. Data should continue to be collected monthly until the team has determined that a level of sustainability has been reached.

It is recommended to collect patient and procedure characteristics, process, and outcome variables.

## Patient and Procedure Characteristics

Given that outcomes following cesarean delivery can be affected by patient factors as well as medical factors, any assessment of ERAS on outcomes needs to consider patient and procedural factors that may act as confounders. Included characteristics can be based on clinical knowledge or previous publications but will allow a comparison of those patients undergoing ERAS care and those undergoing usual care (pre-ERAS implementation) to ensure that the groups are similar. With this knowledge, any difference in outcome can be assessed for possible confounders and adjusted.

### At minimum, we recommend collecting the following patient and procedural data:

- Age (yrs.)
- BMI (kg/m<sup>2</sup>)
- Hypertension (chronic or gestational)
- Diabetes (chronic or gestational)
- Hemoglobin (pre- and postoperatively)
- American Society of Anesthesiologists (ASA) score
- Number of prior cesarean deliveries
- Elective versus intrapartum surgery\*
- Neuraxial versus general anesthesia\*
- Estimated blood loss (mL)

\*Intrapartum cesarean deliveries and those done under general anesthesia inherently add complexities that likely impact outcome. Therefore, we recommend separating outcomes for elective versus intrapartum deliveries and those done under neuraxial versus general anesthesia.

<sup>2</sup> Perla RJ, Provost LP, Murray SK. Sampling considerations for health care improvement. *Qual Manag Health Care*. Oct-Dec 2014;23(4):268-79

# Data Collection and Measurement

## Process Variables

Various process variables should be collected along the surgical continuum to ensure compliance to the pathway recommendations. A process variable evaluates whether the recommended intervention is being followed. For example, if an organization is trying to reduce postoperative urinary tract infection, it may measure the process of early urinary catheter removal.

It is anticipated that process variables will be found via manual chart review, whether your organization documents on paper or electronically. While QI initiatives are unique to each institution's needs and context, we recommended the process variables listed below be collected. A full description of each variable can be found in Appendix D.

Surgical Phase	Process Variable
<b>Preoperative</b>	Patient education
	Medical comorbidity optimization
	Consumption of clear liquids
	Premedication
<b>Intraoperative</b>	Use of neuraxial anesthesia
	Antiemetic prophylaxis
	Volume of IV fluid administration
	Patient warming
	Patient temperature at beginning and end of surgery or on arrival to PACU
	Multimodal opioid-sparing analgesia initiation
	Antimicrobial prophylaxis
	Surgical techniques
	Optimal uterotonic use
	Delayed cord clamping
	Skin-to-skin with patient or support person
<b>Postoperative</b>	Continuation of multimodal opioid-sparing analgesia
	Date IV analgesics discontinued
	Foley removal
	VTE prophylaxis
	Anemia remediation
	IV fluid discontinuation
	Date tolerating oral intake
	First postoperative mobilization
Opioids prescribed at discharge	



# Data Collection and Measurement

## Outcome Variables

An outcome variable determines if a specific intervention is having the desired effect on a clinical measure, such as reducing postoperative infection rates.

Recommended outcome variables are listed below, with full description found in Appendix D.

- Acute length of stay
- Complication rate
- Visits to emergency department within 30 days after discharge
- Readmission within 30 days after discharge

Patient charts are reviewed and coded on discharge. This information is entered into the Discharge Abstract Database (DAD), including postoperative complications, acute care length of stay and readmissions to hospital. It is suggested to liaise with your institution's Health Information Management and Technology department to extract this data, as it would significantly reduce data collection time. By providing the Health Information Management and Technology department with the list of ICD-10-CA/CCI codes used to define the cesarean delivery population, they can provide the number of cesarean deliveries and the patient outcomes from information which has already been collected in your institution.

# Process and Outcome Variables

## Process Variables

### Preoperative

#### 1. Patient education

<b>Intent of variable</b>	To capture whether the patient received education about what to expect, before, during, and after cesarean delivery.
<b>Definition</b>	<p>Patient education refers to the provision of information (verbal, written or digital) provided by healthcare professionals prior to cesarean delivery, which details, at minimum:</p> <ul style="list-style-type: none"> <li>• Reason or indication for cesarean delivery</li> <li>• Type of anesthetic</li> <li>• Location and type of incision and closure</li> <li>• Potential intra- and postoperative complications, and strategies to minimize them</li> <li>• Pre- and postoperative gastrointestinal or oral intake plans</li> <li>• Postoperative pain management and expectations</li> <li>• Anticipated postoperative activities (including breast or chest feeding) and locations of patient and their baby</li> <li>• Expected length of stay</li> </ul>
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: patient received education about their cesarean delivery prior to surgery.</li> <li>• <u>No</u>: patient did not receive education about their cesarean delivery prior to surgery.</li> <li>• <u>Data missing</u>.</li> </ul>
<b>Notes</b>	Institutions can meet these criteria by providing the ERC Patient Optimization Booklet, precare.ca video, or having their own similar instructions which address the topics outlined in the definition.

#### 2. Medical comorbidity optimization

<b>Intent of variable</b>	To capture whether the patient was optimized for key medical comorbidities in pregnancy.
<b>Definition</b>	Key medical comorbidities refer to gestational hypertension, anemia, and gestational diabetes.
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Blood pressure in normal range</u>: yes or no</li> <li>• <u>Hemoglobin &gt;110</u>: yes or no</li> <li>• <u>Ferritin &gt;30 ug/l</u>: yes or no</li> <li>• <u>If diabetic, sugar in a normal range</u>: yes or no</li> <li>• <u>Data missing</u>.</li> </ul>

## Process and Outcome Variables

### 3. Premedication

<b>Intent of variable</b>	To capture whether the patient was given a combination of non-particulate antacids and histamine H2 receptor antagonists (PO or IV).
<b>Definition</b>	Non-particulate antacids include sodium citrate solution, while histamine H2 receptor antagonists (for example famotidine and ranitidine).
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: patient was given a combination of non-particulate antacids and histamine H2 receptor antagonists.</li> <li>• <u>No</u>: patient was not given a combination of non-particulate antacids and histamine H2 receptor antagonists.</li> <li>• <u>Data missing or partial compliance</u>.</li> </ul>

### 4. Consumption of clear liquids

<b>Intent of variable</b>	To capture whether the patient consumed clear liquids up to 2 hrs. before cesarean delivery start time, rather than traditional fasting after midnight.
<b>Definition</b>	Clear liquids are transparent liquids that are easily digested, and include: water, complex carbohydrate beverages, pulp-free juice, and black coffee or tea (without milk or cream).
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: documentation that the patient consumed clear liquids up to 2 hrs. Prior to cesarean delivery.</li> <li>• <u>No</u>: no documentation that the patient consumed clear liquids up to 2 hrs. Prior to cesarean delivery.</li> <li>• <u>No, high-risk patient</u>: patient has a pre-existing medical condition.</li> <li>• <u>Data missing</u>.</li> </ul>

# Process and Outcome Variables

## Intraoperative

### 5. Use of neuraxial anesthesia

<b>Intent of variable</b>	To capture whether neuraxial anesthesia was used.
<b>Definition</b>	Examples of neuraxial long-acting opioids include preservative-free morphine, 50-150 mcg intrathecal or 1-3 mg epidural
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: neuraxial anesthesia was used.</li> <li>• <u>No</u>: general anesthesia was used.</li> <li>• <u>Data missing</u>.</li> </ul>

### 6. Antiemetic prophylaxis

<b>Intent of variable</b>	To capture whether antiemetic prophylaxis was used.
<b>Definition</b>	<p>2 or more prophylactic IV antiemetics used, including:</p> <ul style="list-style-type: none"> <li>• Dopamine antagonists (for example metoclopramide 5-10 mg IV, effective for IONV prevention)</li> <li>• Serotonin (5HT3) antagonists (for example ondansetron 4 mg IV)</li> <li>• Glucocorticoids (for example dexamethasone 4 mg IV, effective for PONV prevention)</li> </ul>
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: documentation that the patient received 2 or more IV antiemetics intraoperatively, as listed above.</li> <li>• <u>No</u>: no documentation that the patient received 2 or more IV antiemetics intraoperatively, as listed above.</li> <li>• <u>Data missing</u>.</li> </ul>

### 7. Volume of IV fluid administration

<b>Intent of variable</b>	To assess whether euvolemia was maintained.
<b>Definition</b>	IV fluids include crystalloid solutions.
<b>Options</b>	<p>Indicate the volume of IV fluids administered intraoperatively versus fluid or blood loss.</p> <ul style="list-style-type: none"> <li>• <u>Volume</u>:</li> <li>• <u>Data missing</u>.</li> </ul>

## Process and Outcome Variables

### 8. Patient warming

<b>Intent of variable</b>	To capture whether a method of maintaining normothermia is used.
<b>Definition</b>	Normothermia may be maintained using forced-air warmers or underbody warming blankets.
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: forced-air warmers or underbody warming blankets were used.</li> <li>• <u>No</u>: forced-air warmers or underbody warming blankets were not used.</li> <li>• <u>Data missing</u>.</li> </ul>

### 9. Patient temperature at beginning and end of surgery or on arrival to PACU

<b>Intent of variable</b>	To capture whether the patient was normothermic at the end of surgery or on arrival to PACU.
<b>Definition</b>	Normothermia is defined as central core temperature $\geq 36.0^{\circ}\text{C}$
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: patient's central core temperature was <math>\geq 36.0^{\circ}\text{C}</math> at the end of surgery or on arrival to PACU.</li> <li>• <u>No</u>: patient's central core temperature was <math>&lt; 36.0^{\circ}\text{C}</math> at the end of surgery or on arrival to PACU.</li> <li>• <u>Data missing</u>.</li> </ul>

### 10. Multimodal opioid-sparing analgesia initiation

<b>Intent of variable</b>	To capture whether multimodal opioid-sparing approaches to pain management were initiated intraoperatively.
<b>Definition</b>	<p>A multimodal approach to analgesia should be initiated. At least two analgesics are recommended, which, unless contraindicated, include:</p> <ul style="list-style-type: none"> <li>• Neuraxial long-acting opioid (see 'Use of Neuraxial Anesthesia' variable).</li> <li>• Acetaminophen</li> <li>• Non-steroidal anti-inflammatory drugs (NSAIDs)</li> <li>• If neuraxial morphine is not administered, consider local anesthetic techniques such as transversus abdominis plane (TAP) block, local anesthetic wound infiltration, or quadratus lumborum (QL) block</li> </ul>
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: <math>\geq 2</math> of the above analgesics was administered intraoperatively.</li> <li>• <u>No</u>: <math>&lt; 2</math> the above analgesics were not administered intraoperatively.</li> <li>• <u>Data missing</u>.</li> </ul>

## Process and Outcome Variables

### 11. Antimicrobial prophylaxis

<b>Intent of variable</b>	To capture whether antimicrobial prophylaxis was used.
<b>Definition</b>	<p>Prophylactic IV antibiotics should be administered within 15-60 mins. Before skin incision, including a first-generation cephalosporin, plus azithromycin for patients in labour or with ruptured membranes.</p> <p>For patients with a severe penicillin allergy (such as anaphylaxis), clindamycin or erythromycin can be used.</p> <p>For patients with a BMI &gt;40 (or weight &gt;120 kg), consider administering a 3 g dose of pre-operative antibiotic</p>
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: patient received first-generation cephalosporin (dose: ____).</li> <li>• <u>Yes</u>: patient received first-generation cephalosporin (dose: ____), plus azithromycin.</li> <li>• <u>Yes</u>: patient received clindamycin or erythromycin (dose: ____).</li> <li>• <u>No</u>: patient did not receive antimicrobial prophylaxis according to the definition above.</li> <li>• <u>Data missing</u>.</li> </ul>

### 12. Surgical techniques

<b>Intent of variable</b>	To capture the surgical techniques used in the cesarean delivery.
<b>Options</b>	<p><u>Type of incision</u>: Low transverse or low vertical or classical</p> <p><u>Closure of the peritoneum</u>: Yes or No</p> <p><u>Reapproximation of the subcutaneous tissue</u>: Yes or No</p> <p><u>Uterine exteriorization</u>: Yes or No</p> <p><u>Skin closure</u>: Subcuticular suture or staples</p>

### 13. Optimal uterotonic use

<b>Intent of variable</b>	To capture whether an appropriate dose of uterotonic was used.
<b>Definition</b>	<p>The lowest effective dose of uterotonic necessary to achieve adequate uterine tone and minimize side effects should be used. Example:</p> <p><u>Elective cesarean delivery</u>: Bolus 1 IU oxytocin; start oxytocin infusion at 2.5-7.5 IU·h<sup>-1</sup> (0.04-0.125 IU·min<sup>-1</sup>). Alternatively, consider carbetocin 100 mcg given as an IV bolus over 1 min.</p> <p><u>Intrapartum cesarean delivery</u>: 3 IU oxytocin over ≥30 sec.; start oxytocin infusion at 7.5-15 IU·h<sup>-1</sup> (0.125-0.25 IU·min<sup>-1</sup>).</p>
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: lowest effective dose of uterotonic was used.</li> <li>• <u>No</u>: higher dose of uterotonic than necessary was used.</li> <li>• <u>Data missing</u>.</li> </ul>

## Process and Outcome Variables

### 14. Delayed cord clamping

<b>Intent of variable</b>	To capture whether cord clamping is delayed.
<b>Definition</b>	Delayed cord clamping for $\geq 1$ min. at a term delivery and $\geq 30$ sec. at a preterm delivery is recommended if there is no concern about fetal well-being.
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: cord clamping delayed for <math>\geq 1</math> min. at a term delivery and <math>\geq 30</math> sec. at a preterm delivery</li> <li>• <u>No</u>: cord clamping occurred at <math>&lt; 1</math> min at a term delivery and <math>&lt; 30</math> sec. at a preterm delivery.</li> <li>• <u>Data missing</u>.</li> </ul>

### 15. Skin-to-skin with patient or support person

<b>Intent of variable</b>	To capture whether early skin-to-skin contact in the operating room occurred between the newborn and the patient, or support person.
<b>Definition</b>	Early skin-to-skin contact is defined as within 60 mins. after birth.
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: early skin-to-skin contact in the operating room occurred between the newborn and the patient, or support person.</li> <li>• <u>No</u>: patient or neonatal condition precluded early skin-to-skin contact in the operating room occurred between the newborn and the patient, or support person.</li> <li>• <u>Data missing</u>.</li> </ul>

## Process and Outcome Variables

### Postoperative

#### 16. Continuation of multimodal opioid-sparing analgesia

<b>Intent of variable</b>	To capture whether multimodal opioid-sparing approaches to pain management were continued postoperatively.
<b>Definition</b>	Postoperative multimodal opioid-sparing analgesia is defined as scheduled delivery (vs. PRN) of regular NSAIDs (such as ibuprofen, naproxen, ketorolac) and acetaminophen to be administered simultaneously. Opioids may be administered for patients with breakthrough pain but will not count towards this measure.
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: documentation that the patient received a scheduled regimen of regular NSAIDs and acetaminophen to be administered simultaneously.</li> <li>• <u>No</u>: no documentation that the patient received a scheduled regimen of regular NSAIDs and acetaminophen to be administered simultaneously.</li> <li>• <u>Data missing</u>.</li> </ul>

#### 17. Date IV analgesics discontinued

<b>Intent of variable</b>	To capture the date on which the patient's pain is controlled with oral (PO) medication alone.
<b>Definition</b>	First date on which pain is adequately controlled with oral pain medications alone for 24 hours without significant pain (significant pain is a score $\geq 4$ on a scale from 0 to 10).
<b>Options</b>	<p>Indicate the first date on which the patient has adequate pain control without the use of IV or epidural pain medications.</p> <ul style="list-style-type: none"> <li>• <u>Date</u>: mm/dd/yyyy</li> <li>• <u>Time</u>: hh:mm</li> <li>• <u>Data missing</u>.</li> </ul>



## Process and Outcome Variables

### 18. Foley removal

<b>Intent of variable</b>	To capture the date and time of urinary catheter removal following cesarean delivery.
<b>Definition</b>	Recommendations on the duration of urinary catheterization after cesarean delivery are unclear (range from immediate removal to removal by 6-12 hrs. postpartum).
<b>Options</b>	<p>Indicate the documented date and time of urinary catheter removal.</p> <ul style="list-style-type: none"> <li>• <u>Date</u>: mm/dd/yyyy</li> <li>• <u>Time</u>: hh:mm</li> <li>• <u>Other</u>: for example Foley not placed, discharged from hospital with Foley in place.</li> <li>• <u>Data missing</u>.</li> </ul> <p>Prolonged foley catheterization (for example Foley removal &gt;12 hrs. postpartum)? Yes or No</p> <ul style="list-style-type: none"> <li>• <u>Reason</u>: (for example urinary retention)</li> </ul> <p>Reinsertion of Foley? Yes or No</p> <ul style="list-style-type: none"> <li>• <u>Reason</u>: (for example unable to void)</li> </ul>
<b>Notes</b>	Enter date and time of foley removal, even if the patient is subsequently straight-cathetered or has their foley replaced for urinary retention.

### 19. VTE prophylaxis

<b>Intent of variable</b>	To capture whether, and what type of VTE prophylaxis the patient received.
<b>Definition</b>	<p>Pneumatic compression stockings starting before surgery should be used to prevent thromboembolic disease in all patients who undergo cesarean delivery.</p> <p>Patients with documented risk factors for VTE should receive chemoprophylaxis with low molecular weight heparin (LMWH).</p>
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: patient received only mechanical prophylaxis.</li> <li>• <u>Yes</u>: patient received mechanical prophylaxis and chemoprophylaxis.</li> <li>• <u>No</u>: patient received only chemoprophylaxis.</li> <li>• <u>No</u>: patient received no form of VTE prophylaxis.</li> </ul> <p><u>If the patient received chemoprophylaxis:</u></p> <ul style="list-style-type: none"> <li>• Document the agent: for example LMWH</li> </ul>

## Process and Outcome Variables

### 20. Anemia remediation

<b>Intent of variable</b>	To capture whether and how the patient was treated for anemia.
<b>Definition</b>	Hemoglobin checks on postoperative day (POD) 1 or 2 in patients with significant (for example >1L) intraoperative bleeding or preexisting anemia can guide the need for treatment.
<b>Options</b>	<ul style="list-style-type: none"> <li>• <u>Yes</u>: patient was treated with IV iron.</li> <li>• <u>No</u>: patient was treated with oral iron.</li> <li>• <u>No</u>: patient did not require treatment.</li> <li>• <u>Yes</u>: patient required a blood transfusion.</li> <li>• <u>No</u>: patient did not require a blood transfusion.</li> <li>• <u>Missing data</u>.</li> </ul>
<b>Notes</b>	Compared with oral iron, patients receiving IV iron had higher hemoglobin concentrations at 6 wks. postpartum and a lower risk of gastrointestinal side-effects.

### 21. IV fluid discontinuation

<b>Intent of variable</b>	To capture the date and time of maintenance IV fluid discontinuation following cesarean delivery.
<b>Definition</b>	Although optimal fluid management goals for cesarean delivery have not been well established, expert consensus recommends limiting IV fluids to <3 L for routine cases.
<b>Options</b>	<p>Indicate the date and time of maintenance IV fluids discontinuation:</p> <ul style="list-style-type: none"> <li>• <u>Date</u>: mm/dd/yyyy</li> <li>• <u>Time</u>: hh:mm</li> <li>• <u>Not applicable</u>: No postoperative IV fluids administered.</li> <li>• <u>Data missing</u>.</li> </ul>

## Process and Outcome Variables

### 22. Date tolerating oral intake

<b>Intent of variable</b>	To capture the date on which the patient first tolerated oral intake.
<b>Definition</b>	First date on which the patient tolerated oral intake including at $\geq 1$ solid meal and could drink liquids without the need for IV fluids.
<b>Options</b>	Indicate the first date on which the patient tolerated a diet <ul style="list-style-type: none"> <li>• <u>Date</u>: mm/dd/yyyy</li> <li>• <u>Data missing</u>.</li> </ul>
<b>Notes</b>	Solid food indicates non-liquid, non-puree food (for example regular diet, low residue diet, cardiac or diabetic diet). While vomiting may be a sign that a patient did not tolerate their diet, vomiting can be due to multiple factors, and there is no specific threshold defined for when vomiting indicates lack of tolerating diet. Documentation of emesis or vomiting by itself is not an indication that a patient did not tolerate the diet. However, if documentation indicates directly that a patient both was not tolerating a diet and had vomiting, then do not assign this variable.

### 23. First postoperative mobilization

<b>Intent of variable</b>	To capture the date and time when a patient first mobilized following cesarean delivery.
<b>Definition</b>	Patient can ambulate safely.
<b>Options</b>	Specify the first documented date and time of patient ambulation. <ul style="list-style-type: none"> <li>• <u>Date</u>: mm/dd/yyyy</li> <li>• <u>Time</u>: hh:mm</li> <li>• <u>Data missing</u>.</li> </ul>

### 24. Opioids prescribed at discharge

<b>Intent of variable</b>	To capture the number and dose of opioids prescribed to the patient post-discharge following cesarean delivery.
<b>Definition</b>	Opioid analgesics include but are not limited to hydromorphone and morphine.
<b>Options</b>	Specify the number of tablets and drug dosage prescribed post-discharge. <ul style="list-style-type: none"> <li>• <u>Number of tablets</u>:</li> <li>• <u>Drug dosage</u>:</li> <li>• <u>Data missing</u>.</li> </ul>
<b>Notes</b>	If the patient was prescribed two different medications (such as due to allergy or a lost prescription) and only took one medication, capture the medication which was used. Capture the total number of pills prescribed, adding refills to the total number of pills (for example if the patient is prescribed 30 pills at discharge with 1 refill, 60 pills should be entered).

## Outcome Variables

All definitions below were provided through Canadian Coding Standards and apply to all data sets submitted to the Discharge Abstract Database (DAD).

Outcome Variable	Definition
Complication rate	<p>Complication: a post-intervention condition or symptom that is not attributable to another cause arises during an uninterrupted, continuous episode of care within 30 days following the intervention, or a cause/effect relationship is documented, regardless of timeline. List of frequent complications to be recorded:</p> <ul style="list-style-type: none"> <li>• Pain control problem</li> <li>• Nausea</li> <li>• Vomiting</li> <li>• Bladder retention</li> <li>• Headache</li> <li>• Seizure</li> <li>• Hypotension or hypertension</li> <li>• Constipation</li> <li>• Edema</li> <li>• Hematoma</li> <li>• Wound discharge &gt;3 days</li> <li>• Fall</li> <li>• DVT</li> <li>• Anemia</li> <li>• Transfusion</li> <li>• SSI (superficial wound)</li> <li>• SSI (deep)</li> <li>• PE</li> <li>• Urinary tract infection</li> <li>• Unplanned return to operating room</li> <li>• Postpartum hemorrhage</li> <li>• Mortality</li> <li>• Other, describe: _____</li> </ul> <p>Complication rate is calculated by:</p> $\frac{\text{Number of patients who experienced a complication}}{\text{Total number of patients who underwent surgery}}$
Complication severity	<p>We recommend that institutions may consider classifying their complications based on the severity. One example of this is using the Clavien-Dindo grading system.<sup>1</sup> Institutions can then look at minor complication rates (Grades I-II) versus moderate or major complication rates (Grades III-IV).</p>

<sup>1</sup> Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, et al. The Clavien-Dindo classification of surgical complications *Ann Surg.* Aug 2009;250(2):187-96

## Process and Outcome Variables

Outcome Variable	Definition
Visits to emergency department within 30 days after discharge	<p>Patients who were discharged from an acute care institution after surgery but returned to hospital emergency department within 30 days after discharge.</p> <p>*Noted that there may be limitations to accessing information of patients who visit emergency departments outside the regional health authority.</p>
Readmission within 30 days after discharge	<p>Patients who were discharged from an acute care institution after surgery but were readmitted to an acute care institution within 30 days after the discharge.</p> <p>*Noted that there may be limitations to accessing information of patients who are readmitted outside the regional health authority.</p>
Acute length of stay	<p>Acute Length of Stay (LOS) is the calculated length of stay minus the number of alternate level of care (ALC) days. The ALC designation identifies a patient is occupying a bed in a facility and does not require the intensity of resources or services provided in that care setting.</p>



by Healthcare Excellence Canada and partners

