ERAS

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ERAS

- This enhanced recovery after surgery (ERAS) guideline for perioperative care in cesarean delivery will provide best practice, evidenced-based, recommendations for preoperative, intraoperative, and postoperative phases with, primarily, maternal focus.
The focused pathway process for scheduled and unscheduled cesarean delivery for this ERAS cesarean delivery guideline will consider from the time from decision to operate (starting with the 30-60 minutes before skin incision) to hospital discharge.
The ERAS cesarean delivery guideline/pathway has created a maternal focused pathway (for scheduled and unscheduled surgery starting from 30-60 minutes before skin incision to maternal discharge) with ERAS cesarean delivery consensus recommendations:

- **Preoperative** elements:
  - anesthetic medications,
  - Fasting
  - carbohydrate supplementation,
  - prophylactic antibiotics/skin preparation
A. **Intraoperative elements:**
- anesthetic management,
- maternal hypothermia prevention,
- surgical technique,
- hysterectomy creation and closure,
- management of peritoneum,
- subcutaneous space, and skin closure)
B. perioperative fluid management, and
c. postoperative elements:
  ❖ chewing gum,
  ❖ management of nausea and vomiting,
  ❖ Analgesia
  ❖ timing of food intake,
  ❖ glucose management,
  ❖ antithrombotic prophylaxis,
  ❖ timing of ambulation,
  ❖ urinary management,
  ❖ and timing of maternal and neonatal discharge).
ERAS Cesarean Delivery

**Intra-Operative**
- Prophylactic antibiotics
- Fluid coload/prophylactic phenylephrine infusion
- Active warming
- Neuraxial anesthesia and neuraxial opioids
- PONV prophylaxis
- Delayed cord clamping
- Skin to skin contact/breastfeeding

**Pre-Operative**
- Patient education; 1:1 meeting with provider
- Educational material in print provided to patient or accessible via the web
- Breastfeeding education
- Discuss NPO status, fluid and caloric intake (Fluids up to 2 hrs prior to surgery, carbohydrate drink)
- Hemoglobin optimization
- Contact patient the day before delivery to review ERAS goals

**Post-Operative**
- Early oral intake
- Regular oral and multimodal analgesia
- Early mobilization
- Early removal of urinary catheter
- Lactation consultant
- Neonatology team visit
- Audit of compliance and outcomes
FIGURE
Checklist for focused Enhanced Recovery After Surgery (ERAS) cesarean delivery patient “informed knowledge”

The patient/maternal has a clear understanding of the following factors:
1. The reason/indication for the cesarean delivery
2. The location and type of abdominal laparotomy incision
3. The abdominal skin incision closure technique that is used by the attending surgeon (randomized controlled trial evidence supports subcuticular skin closure for patient satisfaction and cosmetic outcome^1^)
4. The preventive efforts that are used to minimize postoperative maternal infective morbidity (wound/uterus/pelvis/bladder); estimated prevalence of 3–15%^2,3^
5. The patient’s estimated individualized postoperative risk assessment for thromboembolism and whether additional medical prophylaxis is needed beyond the standard mechanical techniques (elastic stockings or sequential compression devices); estimated prevalence is 0.5–2.2 per 1000 pregnancies or prevalence of venous thromboembolism ranges from 1–2 per 1000, with 80% an indication of antepartum deep vein thrombosis and 20–25% an indication of pulmonary embolism^4^; pulmonary embolism, 40–60% after delivery^5^
6. The gastrointestinal/oral intake plans for pre- and postoperative time periods
7. The anticipated postoperative activities and locations of mother and baby

List of ERAS cesarean delivery elements:
Preoperative
1. Anesthetic medications
2. Fasting
3. Carbohydrate supplementation
4. Antimicrobial prophylaxis
5. Skin wash/vaginal preparation to minimize infectious risk
6. Procedures for prevention of intraoperative hypothermia

Intraoperative
1. Pre- and intraoperative anesthetic management
2. Abdominal/vaginal antimicrobial cleansing
3. Cesarean delivery surgical techniques (opening-delivery-closure)
4. Perioperative fluid management
5. Neonatal immediate care/delayed cord clamping

Postoperative
1. ERAS sham feeding/chewing gum
2. Nausea and vomiting management
3. Analgesia
4. Perioperative nutritional care/early feeding
5. Glucose control
6. Thromboembolism prevention
7. Early mobilization
8. Urinary drainage management

Maternal and neonate discharge

Preoperative pathway:

- Although rare aspiration pneumonitis is still a cause of maternal death during anesthesia for a cesarean delivery, even in well-resourced countries.
- Interventions to reduce the risk of aspiration pneumonitis, at cesarean delivery, have been considered.
Although the quality of evidence was poor, it was found that the preoperative administration of a combination of antacids (nonparticulate sodium citrate to neutralize gastric acid) and histamine H$_2$ receptor antagonists (ranitidine act by inhibiting the secretion of acid into the stomach decreasing both volume and acidity) was more effective than no intervention and was superior to antacids alone in the prevention of low gastric pH.
the administration of benzodiazepines in pregnancy have been associated with floppy baby syndrome, disturbed neonatal thermogenesis, and lower Apgar scores.

A cochrane review of sedative premedication for adult outpatient surgery found that there was an impairment in psychomotor function up to 3 hours after the operation.

Therefore considering the potential for maternal and neonatal side-effect, **preoperative sedation should be avoided.**
Summary and recommendation:

1. **Antacid and histamine H2 receptor antagonists** should be administered as premedication to reduce the risk from aspiration pneumonitis.

2. **Preoperative sedation should not be used** for scheduled cesarean delivery because of the potential for detrimental effects on the mother and neonate.
Bowel preparation

- Preoperative oral and/or mechanical bowel preparation has been used primarily in colorectal surgery to prevent postoperative infection and anastomotic leak.
- However, a recent metaanalysis, which includes gynecologic surgery trials, found no benefit of bowel preparation. The only clear effect was to cause a more unpleasant patient experience.
- Oral or mechanical bowel preparation should not be used before cesarean delivery.
Preoperative fasting:

- Preoperative fasting was first described as a measure to prevent vomiting after the use of either anesthetics.
- The European Society of Anaesthesiology guideline recommends that adults and children should be encouraged to drink clear fluids up to 2 hours before elective surgery (including cesarean delivery).
- Solid food should be prohibited in adults and children.
1) Women should be encouraged to drink clear fluids (pulp-free juice, coffee, or tea without milk) until 2 hours before surgery.

2) A light meal may be eaten up to 6 hours before surgery.
Preoperative carbohydrate supplementation:

- There have been multiple trials of oral carbohydrate supplementation use up to 2 hours before surgery.
- A cochrane review found most trials had a high risk of bias and treatment was associated with only a small reduction in the length of stay (0.3 days) and a decreased time to passage of flatus (0.39 days).
- Overall, postoperative complication were not changed, and there were no reported cases of aspiration pneumonia.
The use of carbohydrate loading, preoperatively, is controversial and unaccepted for pregnant women with diabetes mellitus.

- Oral carbohydrate fluid supplementation, 2 hours before cesarean delivery, may be offered to nondiabetic pregnant women.
The ERAS CD guideline/pathway has initiated a focused pathway (for scheduled and unscheduled surgery starting from 30-60 minutes before skin incision to maternal discharge) with 4 focused preoperative elements with 6 recommendations are strong for their use,

a) antacids and 
b) histamine H2 receptor antagonists, 
c) fasting only 2 hours, 
d) small meal within 6 hours before surgery
• 2 recommendations against their use,
  1) Maternal sedation, and
  2) bowel preparation,
<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td><strong>Antenatal pathway: OPTIMIZED</strong></td>
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<tr>
<td><strong>Preadmission information, education and counselling</strong></td>
<td>1. Although high-quality evidence is lacking, good clinical practice includes informing the patient about procedures before, during, and after cesarean delivery. The information should be adapted to whether cesarean delivery is an unscheduled or a scheduled surgery.</td>
<td>Very Low-Low</td>
<td>Strong</td>
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<td></td>
<td>2. Cesarean delivery without medical indication should not be recommended without a solid preadmission evaluation of harms and benefits, both for the mother and her baby.</td>
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<td><strong>Preoperative pathway: FOCUSED</strong></td>
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<tr>
<td><strong>Preanesthetic medications</strong></td>
<td>1. Antacids and histamine H2 receptor antagonists should be administered as premedication to reduce the risk from aspiration pneumonitis.</td>
<td>Low</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td>2. Preoperative sedation should not be used for scheduled cesarean delivery because of the potential for detrimental effects on the mother and neonate.</td>
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</tr>
<tr>
<td><strong>Preoperative bowel preparation</strong></td>
<td>1. Oral or mechanical bowel preparation should not be used before cesarean delivery.</td>
<td>High</td>
<td>Strong</td>
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<tr>
<td><strong>Preoperative fasting</strong></td>
<td>1. Women should be encouraged to drink clear fluids (pulp-free juice, coffee, or tea without milk) until 2 hours before surgery. 2. A light meal may be eaten up to 6 hours before surgery.</td>
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<td>Strong</td>
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<td><strong>Preoperative carbohydrate supplementation</strong></td>
<td>1. Oral carbohydrate fluid supplementation, 2 hours before cesarean delivery, may be offered to nondiabetic women.</td>
<td>Low</td>
<td>Weak</td>
</tr>
<tr>
<td><strong>Appendix: Preoperative maternal comorbidity optimization</strong></td>
<td>1. Maternal obesity (body mass index, &gt;40 kg/m²) significantly increases risks of maternal and fetal complications. Optimal gestational weight gain management should be used to control their weight during pregnancy. Surgical complexity requires multidisciplinary planning.</td>
<td>High</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td>2. Maternal hypertension should be managed during pregnancy because maternal chronic hypertension has been found to increase significantly the incidence of maternal and fetal morbidity and cesarean delivery.</td>
<td>High</td>
<td>Strong</td>
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<tr>
<td></td>
<td>3. Maternal gestational diabetes mellitus has been found to significantly increase the risk for maternal and fetal morbidity. Maternal diabetes should receive timely and effective management during preconception and pregnancy.</td>
<td>High</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td>4. Maternal anemia during pregnancy is associated with low birthweight, preterm birth, and increases perioperative morbidity and mortality rates. The cause of the anemia should be identified and corrected.</td>
<td>Moderate</td>
<td>Strong</td>
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<tr>
<td></td>
<td>5. Maternal cigarette smoking is associated with adverse medical and reproductive morbidity and should be stopped before or in early pregnancy.</td>
<td>High</td>
<td>Strong</td>
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</table>

Preoperative antimicrobial prophylaxis and skin preparation:

- A cesarean delivery performed before rupture of the membranes and without chorioamnionitis usually will be considered a clean (class 1) incision.

- However, a cesarean delivery in the setting of ruptured membranes, particularly in active phase of labor or second stage of labor or with chorioamnionitis, usually is classified as a clean contaminated (class 2) incision.
There could be an argument made that, at least, some of these latter incisions are contaminated (class 3) incision.

For cesarean delivery performed before rupture of the membranes, the standard of care has been to use a relatively narrow spectrum *first–generation cephalosporin* directed against skin flora for infectious prophylaxis, although similar benefits have been seen with other antibiotic regimens.
• it is now recommended to give the antibiotics 30–60 minutes before the cesarean delivery when possible.

• There is increasing evidence that broadening the preincision antibiotic spectrum might further reduce the risk of wound infections.

• In a recent, multicenter trial, the addition of azithromycin to the routine cephalosporins further reduced infectious complications from 12.0% to 6.1% ($P<.001$) and wound infections from 6.6–2.4%.
**Wound preparation**

Even before the hospital admission for a scheduled cesarean delivery, it is recommended that women shower with an antimicrobial soap if possible.

The Centers for Disease Control recommendations encourage the use of the chlorhexidine-alcohol scrub over the povidone-iodine solution to prepare the abdomen before surgery.

Although there is a wider body of literature in other surgeries, the evidence is more scant in the setting of cesarean deliveries.

: the 2014 Cochrane review did not demonstrate a difference.
However, there have been 2 large studies since that systematic review.

One large study demonstrated a lower rate of wound infections with the chlorhexidine-alcohol scrub.

However, another recent large, randomized trial demonstrated no difference.
Vaginal preparation

There is an increasing body of evidence to suggest that an antimicrobial vaginal preparation with a povidone-iodine solution before cesarean delivery in women in labor or with rupture of membranes reduces the risk of infectious complications.

In the most recent Cochrane review, the risk of endometritis was reduced from 8.3–4.3%.

In stratified analyses, this was true for women both in labor and with ruptured membranes.
Summary and recommendation

1. Intravenous antibiotics should be administered routinely within 60 minutes before the cesarean delivery skin incision.

In all women, a first-generation cephalosporin is recommended;

in women in labor or with ruptured membranes, the addition of azithromycin confers additional reduction in postoperative infections (evidence level: high/recommendation grade: strong).
2. **Chlorhexidine-alcohol** is preferred to aqueous povidone-iodine solution for abdominal skin cleansing before cesarean delivery (evidence level: low/recommendation grade: **strong**).

3. **Vaginal preparation** with povidone-iodine solution should be considered for the reduction of infections after cesarean delivery (evidence level: moderate/recommendation grade: **weak**).
Pre- and intraoperative anesthetic management (focused element)

- Regional anesthesia has been found to have a positive impact for enhanced recovery outcomes in terms of pain control, organ function, mobility, postoperative nausea and vomiting, number of days spent in hospital, and adverse events.
- Obstetric anesthesia regional techniques are thought to be safer than general anesthesia.
Prevention of intraoperative hypothermia (focused element)

- Perioperative hypothermia can occur in 50–80% of patients who undergo spinal anesthesia for cesarean delivery.
- Several randomized control studies showed that perioperative hypothermia is associated with complications in nonpregnant patients.
These complications have included surgical site infection, myocardial ischemia, altered drug metabolism, coagulopathy, prolonged duration of hospitalization, shivering, reduced skin integrity, and poor patient satisfaction.

Hypothermia can also have adverse effects on neonates, such as temperature, umbilical pH, Apgar score.
A randomized controlled study showed fluid warming combined with forced air warming to be effective in decreasing the incidence of perioperative hypothermia and improving maternal thermal comfort.

Ambient operating room temperature can affect maternal and neonatal temperature.
• **Summary and recommendation**

• 1. Appropriate patient temperature monitoring is needed to apply warming devices and avoid hypothermia (evidence level: low/recommendation grade: strong).

• 2. Forced air warming, intravenous fluid warming, and increasing operating room temperature are all recommended to prevent hypothermia during cesarean delivery (evidence level: moderate/recommendation grade: strong).
The uterine incision is repaired commonly in 1 or 2 layers with a continuous unlocked suture. Generally, a 2-layer closure has been used because of nonrandomized trial evidence that suggests a higher rate of uterine rupture in women who had pregnancies after a previous cesarean delivery with hysterotomies closed in a single layer. However, the most recent Cochrane review did not find a difference in outcomes between 1- or 2-layer closure.
The use of a delayed absorbable monofilament (Monocryl; Ethicon Inc, Bridgewater, NJ) has been described, as has chromic catgut and Vicryl (Ethicon Inc), without strong evidence to support a particular suture.

Historically, the visceral and parietal peritoneum were closed; however, in systematic reviews, there is no evidence that outcomes such as intraabdominal adhesions are different and that the operative times are shorter leaving the peritoneum open.
Similarly, the rectus muscles commonly were sutured at the midline, but there is no evidence to support closure, and there is concern that intramuscular sutures will tear through.

The abdominal fascia is usually closed with a continuous suture, PDS or Vicryl.
• The subcutaneous tissue, when it is <2 cm in thickness is often not reapproximated.
• However, in women whose subcutaneous tissue is ≥2 cm in thickness, reapproximation with catgut or Vicryl suture has been demonstrated to reduce wound complications.
• Placement of a subcutaneous drain even with wounds >4 cm in thickness has not been demonstrated to improve outcomes and has been associated with worse wound outcomes.
The skin can be closed with staples or subcuticular/intracutaneous techniques with Vicryl or Monocryl.

The most recent Cochrane metaanalysis found no difference between the 2 approaches with regards to wound infections or complications overall.
Summary and recommendation

1. Blunt expansion of a transverse uterine hysterotomy at time of cesarean delivery is recommended to reduce surgical blood loss (evidence level: moderate/recommendation grade: weak).

2. Closure of the hysterotomy in 2 layers may be associated with a lower rate of uterine rupture (evidence level: low/recommendation grade: weak).
3. The peritoneum does not need to be closed because closure is not associated with improved outcomes and increases operative times (evidence level: low / recommendation grade: weak).

4. In women with ≥2 cm of subcutaneous tissue, reapproximation of that tissue layer should be performed (evidence level: moderate/recommendation grade: weak).

5. The skin closure should be closed with subcuticular suture in most cases, because of evidence of reduced wound separation in those whose staples were removed ≤4 days after surgery (evidence level: moderate/recommendation grade: weak).
Perioperative fluid management:

- Perioperative euvoolemia is an important factor to obtain optimal outcomes after cesarean delivery. Intravascular volume determines not only blood pressure but also cardiac output and oxygen delivery.
- Perioperative fluid overload has higher risks of increased cardiovascular work and pulmonary edema in pregnant women.
The incidence of hypotension, after spinal anesthesia, is high and can cause severe effects on the mother and fetus.

Studies show that a combination of vasopressors and adequate fluid therapy could be effective in reducing the incidence and severity of hypotension during spinal anesthesia for cesarean delivery.
More complex areas include patients with cardiovascular disease, such as severe preeclampsia and preexisting cardiac disease.

These patients should have multidisciplinary preoperative assessment and planning and may require invasive blood pressure monitoring and cardiac output measurements to optimize both fluid management and the use of vasoactive drugs or inotropes.
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<tr>
<td>Intraoperative pathway focused: preoperative antimicrobial prophylaxis and skin preparation (focused elements)</td>
<td>1. Intravenous antibiotics should be administered routinely within 60 min before the cesarean delivery skin incision. In all women, a first-generation cephalosporin is recommended; in women in labor or with ruptured membranes, the addition of azithromycin confers additional reduction in postoperative infections.</td>
<td>High</td>
<td>Strong</td>
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<td>2. Chlorhexidine-alcohol is preferred to aqueous povidone-iodine solution for abdominal skin cleansing before cesarean delivery.</td>
<td>Low</td>
<td>Strong</td>
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<td>3. Vaginal preparation with povidone-iodine solution should be considered for the reduction of postcesarean infections.</td>
<td>Moderate</td>
<td>Weak</td>
</tr>
<tr>
<td>Intraoperative pathway focused</td>
<td>1. Regional anesthesia is the preferred method of anesthesia for cesarean delivery as part of an enhanced recovery protocol.</td>
<td>Low</td>
<td>Strong</td>
</tr>
<tr>
<td>Pre- and intraoperative anesthetic management (focused element)</td>
<td>2. Forced air warming, intravenous fluid warming, and increasing operating room temperature are all recommended to prevent hypothermia during cesarean delivery.</td>
<td>High</td>
<td>Strong</td>
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<td>Prevention of intraoperative hypothermia (focused element)</td>
<td>1. Appropriate patient monitoring is needed to apply warming devices and avoid hypothermia.</td>
<td>Low</td>
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<td>Cesarean delivery surgical techniques/considerations (focused element)</td>
<td>1. Blunt expansion of a transverse uterine hysterotomy at time of cesarean delivery is recommended to reduce surgical blood loss.</td>
<td>Moderate</td>
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<td>2. Closure of the hysterotomy in 2 layers may be associated with a lower rate of uterine rupture.</td>
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<td>3. The peritoneum does not need to be closed because closure is not associated with improved outcomes and increases operative times.</td>
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<td>4. In women with ≥2 cm of subcutaneous tissue, reapproximation of that tissue layer should be performed.</td>
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<td>5. The skin closure should be closed with subcuticular suture in most cases, because of evidence of reduced wound separation in those women whose staples were removed ≤4 days postoperatively.</td>
<td>Moderate</td>
<td>Weak</td>
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<td>Perioperative fluid management (focused element)</td>
<td>1. Perioperative and intraoperative euvoolemia are important factors in patient perioperative care and appear to lead to improved maternal and neonatal outcomes after cesarean delivery.</td>
<td>Low-moderate</td>
<td>Strong</td>
</tr>
</tbody>
</table>

Neonate pathway:

1. Delayed cord clamping for at least 1 minute at a term delivery is recommended (evidence level: moderate/recommendation grade: strong).

2. Delayed cord clamping for at least 30 seconds at a preterm delivery is recommended (evidence level: low-moderate/recommendation grade: strong).

3. Body temperature should be measured and maintained at between 36.5°C and 37.5°C after birth, through admission and stabilization (evidence level: low-moderate/recommendation grade: strong).
4. Routine suctioning of the airway or gastric aspiration should be avoided and used only for symptoms of an obstructive airway (by secretions or meconium; evidence level: low/recommendation grade: strong).

5. Routine neonatal supplementation with room air is recommended because the use of inspired air with oxygen is not recommended and may be associated with harm (evidence level: low-moderate/recommendation grade: strong).

6. In all settings that perform cesarean delivery, a capacity for immediate neonatal resuscitation is mandatory (evidence level: high/recommendation grade: strong).
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<tr>
<td>Neonate pathway focused: Immediate care of the newborn infant at delivery (focused element)</td>
<td>1. Delayed cord clamping for at least 1 minute at a term delivery is recommended.</td>
<td>Moderate</td>
<td>Strong</td>
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<tr>
<td></td>
<td>2. Delayed cord clamping for at least 30 seconds at a preterm delivery is recommended.</td>
<td>Low-moderate</td>
<td>Strong</td>
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<td>3. Body temperature should be measured and maintained between 36.5°C and 37.5°C after birth through admission and stabilization.</td>
<td>Low-moderate</td>
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<td>4. Routine suctioning of the airway or gastric aspiration should be avoided and used only for symptoms of an obstructive airway (by secretions or meconium).</td>
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<td>Strong</td>
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<td>5. Routine neonatal supplementation with room air is recommended because the use of inspired air with oxygen may be associated with harm.</td>
<td>Low-moderate</td>
<td>Strong</td>
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<td>6. In all settings that perform cesarean delivery, a capacity for immediate neonatal resuscitation is mandatory.</td>
<td>High</td>
<td>Strong</td>
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Postoperative:

- ERAS sham feeding (chewing gum) after cesarean delivery

- Sham postoperative feeding (chewing gum) after abdominal surgery has been evaluated in multiple clinical trials and, in a Cochrane review, appeared to reduce the time to recovery of gastrointestinal function.

- The regimens for gum chewing varied widely in studies: initiation from immediately after the operation to up to 12 hours after the operation, duration of each session of 15–60 minutes, and number of sessions per day from 3 to >6.
Gum chewing appears to be effective and is low risk. It may be a redundant treatment if a policy for early oral intake is being used. However, it should be considered if delayed oral intake is planned. (Evidence level: low/ recommendation grade: weak.)
Nausea and vomiting prevention:

- Nausea and vomiting are common symptoms that are experienced during cesarean delivery and that happen during the surgery if the patient is awake or after the procedure in the recovery room.
- Maternal symptoms can potentially prolong the duration of the surgery and increase the risk of bleeding and surgical trauma.
- Nausea and vomiting can increase the potential risk of aspiration, which is a recognized cause of maternal death.
• Maternal hypotension from regional anesthesia is a common cause.
• A Cochrane review showed that colloid or crystalloid preloading, the intravenous administration of ephedrine or phenylephrine, and lower limb compression (by bandages, stockings, or inflatable boots) reduced the incidence of spinal anesthesia–related hypotension.
• Antiemetic agents that have been used prophylactically during cesarean delivery under regional anesthesia are effective for the prevention of nausea and vomiting.

• A multimodal approach to nausea and vomiting prevention is quickly becoming a standard of care.

• A Cochrane review study demonstrated that 5-HT₃ antagonists (eg, ondansetron, granisetron), dopamine antagonists (eg, metoclopramide, droperidol), and sedatives (eg, midazolam, propofol) were effective in the reduction of intraoperative nausea and vomiting.
Summary and recommendation

(1) Fluid preloading, the intravenous administration of ephedrine or phenylephrine, and lower limb compression are effective in the reduction of hypotension and the incidence of intraoperative and postoperative nausea and vomiting. (Evidence level: moderate; recommendation grade: strong).

(2) Antiemetic agents are effective for the prevention of postoperative nausea and vomiting during cesarean delivery. Multimodal approach should be applied to treat postoperative nausea and vomiting. (Evidence level: moderate (multiple interventions); recommendation grade: strong.)
- **Corticosteroids** (such as dexamethasone) were found to reduce only *intra*operative nausea and vomiting.
- **Anticholinergic agents** (eg, scopolamine) were effective at the reduction of *post*operative nausea and vomiting.
- Other interventions (**opioids**, supplemental oxygen, supplemental intravenous fluid, acupressure/acupuncture) did *not* reduce *intra*operative nausea or *post*operative nausea and vomiting.
Postoperative analgesia

- Multimodal postoperative analgesia that includes regular NSAIDs and paracetamol is recommended for enhanced recovery for cesarean delivery. (Evidence level: moderate; recommendation grade: strong.)
Perioperative nutritional care:

- A regular diet within the 2 hours after cesarean delivery is recommended. (Evidence level: high; recommendation grade: strong.)
- Descriptions of postoperative diets vary.
- The postoperative diet should provide more servings of milk, fruit, vegetables, and calories to support breast feeding.
- That diet should provide adequate fiber to prevent constipation.
Perioperative glucose control:

- Patients with diabetes mellitus who undergo surgery have increased complications (particularly wound infections), length of hospital stay, and death.
- Generally, the dose of once daily long-acting insulins are reduced by 20% with more frequent injections of short-acting insulin or mixtures reduced by 50%.
- CBG are measured on admission to hospital.
• After delivery of the fetus, maternal insulin requirements fall rapidly, and CBG should be checked if the patient is receiving insulin.

• There is a further risk of hypoglycemia during breastfeeding too.

• Patients with gestational diabetes mellitus should discontinue therapy and those with type II diabetes mellitus can continue with metformin and glibenclamide even if breastfeeding.
Prophylaxis against thromboembolism

- Pregnant and postpartum women are at an increased risk of venous thromboembolism.
- A variety of modalities are available to reduce the risk of post–cesarean delivery thromboembolic disease that include mechanical methods (graduated compression stockings, intermittent pneumatic compression) and pharmacologic methods (unfractionated heparin, low molecular weight heparin).
Early mobilization after cesarean delivery:

- Early mobilization theoretically can improve a number of short-term outcomes after surgery, which include rapid return of bowel function, reduced risk of thrombosis, and decreased length of stay.
- Early mobilization after cesarean delivery is recommended. (Evidence level: very low; recommendation grade: weak.)
Urinary drainage after cesarean delivery:

- Urinary catheter placement during cesarean delivery is a widely accepted practice. It is believed generally that bladder drainage can measure urinary output,
  - reduce urinary system injuries,
  - and decrease postoperative urinary retention.
- However, urinary tract infection is 1 of the most common complications after cesarean delivery.
In women who do not need ongoing strict assessment of urine output, the urinary catheter should be removed immediately after cesarean delivery, if placed during surgery. (Evidence level: low; recommendation grade: strong.)
### TABLE 2
Guidelines for postoperative care in cesarean delivery: Enhanced Recovery After Surgery Society recommendations

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td><strong>Postoperative pathway</strong></td>
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</tr>
<tr>
<td>Chewing gum after cesarean section (focused element)</td>
<td>Gum chewing appears to be effective and is low risk. It may be a redundant treatment if a policy for early oral intake is being used. However, it should be considered if delayed oral intake is planned.</td>
<td>Low</td>
<td>Weak</td>
</tr>
<tr>
<td>Nausea and vomiting prevention (focused element)</td>
<td>(1) Fluid preloading, the intravenous administration of ephedrine or phenylephrine, and lower limb compression are effective ways to reduce hypotension and the incidence of intraoperative and postoperative nausea and vomiting.</td>
<td>Moderate (multiple interventions)</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td>(2) Antiemetic agents are effective for the prevention of postoperative nausea and vomiting during cesarean delivery. Multimodal approach should be applied to treat postoperative nausea and vomiting.</td>
<td>Moderate</td>
<td>Strong</td>
</tr>
<tr>
<td>Postoperative analgesia (focused element)</td>
<td>Multimodal analgesia that include regular nonsteroidal antiinflammatory drugs and paracetamol is recommended for enhanced recovery for cesarean delivery.</td>
<td>Moderate</td>
<td>Strong</td>
</tr>
<tr>
<td>Perioperative nutritional care (focused element)</td>
<td>A regular diet within the 2 hours after cesarean delivery is recommended.</td>
<td>High</td>
<td>Strong</td>
</tr>
<tr>
<td>Perioperative glucose control (focused element)</td>
<td>Tight control of capillary blood glucose is recommended.</td>
<td>Low</td>
<td>Strong</td>
</tr>
<tr>
<td>Prophylaxis against thromboembolism (focused element)</td>
<td>(1) Pneumatic compression stockings should be used to prevent thromboembolic disease in patients who undergo cesarean delivery.</td>
<td>Low</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td>(2) Heparin should not be used routinely for venous thromboembolism prophylaxis in patients after cesarean delivery.</td>
<td>Low</td>
<td>Weak</td>
</tr>
<tr>
<td>Early post—cesarean delivery mobilization (focused element)</td>
<td>Early mobilization after cesarean delivery is recommended.</td>
<td>Very low</td>
<td>Weak</td>
</tr>
<tr>
<td>Post—cesarean delivery urinary drainage (focused element)</td>
<td>Urinary catheter should be removed immediately after cesarean delivery, if placed during surgery.</td>
<td>Low</td>
<td>Strong</td>
</tr>
<tr>
<td><strong>Postoperative/postpartum mother pathway</strong></td>
<td>Discharge counselling (focused element)</td>
<td>Standardized written discharge instructions should be used to facilitate discharge counselling.</td>
<td>Low</td>
</tr>
</tbody>
</table>

Components of an Enhanced Recovery Program

- Preop
  - Optimization
  - Prehabilitation
  - ?bowel prep
  - Reduced fasting
  - CHO loading
  - Minimally Invasive
- Intraop
  - Normothermia
  - Regional anesthesia
- Activation
- Multimodal opioid sparing analgesia
- Postop
  - PONV and Ileus prophylaxis
  - Periop nutrition
  - Early mobilization
  - No NG
  - Early removal catheters & drains
  - Daily care maps
  - Discharge criteria
- Fast acting anesthetics
Thank you for your attention