Recommendations for Enhanced Recovery After Cesarean (ERAC)

by **R_2 Natirat Limprasert**
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Outline

- ERAC Pathway Elements for…
  - Preoperative
  - Perioperative
  - Postoperative

SPECIAL ARTICLE

Society for Obstetric Anesthesia and Perinatology: Consensus Statement and Recommendations for Enhanced Recovery After Cesarean

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The purpose of this article is to provide a summary of the Enhanced Recovery After Cesarean delivery (ERAC) protocol written by a Society for Obstetric Anesthesia and Perinatology (SOAP) committee and approved by the SOAP Board of Directors in May 2019. The goal of the consensus statement is to provide both practical and where available, evidence-based recommendations regarding ERAC. These recommendations focus on optimizing maternal recovery, maternal-infant bonding, and perioperative outcomes after cesarean delivery. They also incorporate management strategies for this patient cohort, including recommendations from existing guidelines issued by professional organizations such as the American College of Obstetricians and Gynecologists and the American Society of Anesthesiologists. This consensus statement focuses on anesthesia-related and perioperative components of an enhanced recovery pathway for cesarean delivery and provides the level of evidence for each recommendation. (Anesth Analg XXX;XXX:00–00)

1.

Preoperative

ERAC Recommendations

Preoperative ERAC Recommendations

Preoperative ERAC elements

- Limited fasting intervals
- Nonparticulate liquid carbohydrate loading
- Patient education
- Lactation/breastfeeding education
- Hemoglobin optimization

Limit Fasting Interval

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Oral intake up to limits of the ASA guidelines
  - Clear fluids up to 2 hr before C/S
  - Solids up to 8 hr before cesarean delivery
- Reduces aspiration risk
  while limiting hypovolemia, metabolic stress, and ketosis

Limit Fasting Interval

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

*A. Fasting Recommendations**

Ingested Material	Minimum Fasting Period†
• Clear liquids‡	2h
• Breast milk	4h
• Infant formula	6h
• Nonhuman milk§	6h
• Light meal**	6h
• Fried foods, fatty foods, or meat	Additional fasting time (*e.g.*, 8 or more hours) may be needed

*These recommendations apply to healthy patients who are undergoing elective procedures. They are not intended for women in labor. Following the guidelines does not guarantee complete gastric emptying.

†The fasting periods noted above apply to all ages.

‡Examples of clear liquids include water, fruit juices without pulp, carbonated beverages, clear tea, and black coffee.

§Since nonhuman milk is similar to solids in gastric emptying time, the amount ingested must be considered when determining an appropriate fasting period.

**A light meal typically consists of toast and clear liquids. Meals that include fried or fatty foods or meat may prolong gastric emptying time. Additional fasting time (*e.g.*, 8 or more hours) may be needed in these cases. Both the amount and type of foods ingested must be considered when determining an appropriate fasting period.

https://pubs.asahq.org/anesthesiology/article/126/3/376/19733/Practice-Guidelines-for-Preoperative-Fasting-and

Nonparticulate Liquid Carbohydrate Loading

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Balance needs to be struck between desire to limit preoperative fasting and selecting appropriate oral intake parameters to prevent aspiration in this high-risk population
- Reduces maternal hypoglycemia and metabolic stress
- Particulate carbohydrate loading is *not* advisable
  - Lethal aspiration pneumonitis/pneumonia hazards

Nonparticulate Liquid Carbohydrate Loading

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

TABLE 2.5 Changes in Gastrointestinal Physiology during Pregnancy[a]

	TRIMESTER				
Parameter	**First**	**Second**	**Third**	**Labor**	**Postpartum (18 h)**
Barrier pressure[b]	Decreased	Decreased	Decreased	Decreased	?
Gastric emptying	No change	No change	No change	Delayed	No change
Gastric acid secretion	No change	No change	No change	?	?
Proportion of women with gastric volume > 25 mL	No change	No change	No change	Increased	No change
Proportion of women with gastric pH < 2.5	No change	No change	No change	No change	No change

[a]Relative to nonpregnant state.
[b]Difference between intragastric pressure and tone of the lower esophageal high-pressure zone.

Chestnut's Obstetric Anesthesia Principles, 6th Edition

Nonparticulate Liquid Carbohydrate Loading

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Nonparticulate carbohydrate drink up to 2 hr before C/S (nondiabetic women only)
- 45 g carbohydrate is recommended
- *Omit* if mother is diabetic
  - Follow institutional protocols for maternal diabetes/neonatal monitoring
- Benefit of complex carbohydrate drinks (e.g. maltodextrin) for C/S is currently undefined and fetal effects unknown

Nonparticulate Liquid Carbohydrate Loading

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

Gatorade 32 oz;
54 g carbohydrate

Nutrition Facts
Serving Size 12 fl oz (355 mL)
Servings Per Container about 2.5

Amount Per Serving	
Calories 80	
	% Daily Value*
Total Fat 0g	**0%**
Sodium 160mg	**7%**
Potassium 45mg	**1%**
Total Carbohydrate 21g	**7%**
Sugars 21g	
Protein 0g	

Not a significant source of calories from fat, saturated fat, trans fat, cholesterol, dietary fiber, vitamin A, vitamin C, calcium and iron.

* Percent Daily Values are based on a 2,000 calorie diet.

Clear apple juice 16 oz;
56 g carbohydrate

100% Juice

Nutrition Facts
1 serving per container
Serving size 10 fl. oz. (296mL)

Amount per serving
Calories 180

	% Daily Value*
Total Fat 0g	**0%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 0mg	**0%**
Total Carbohydrate 43g	**16%**
Dietary Fiber 0g	**0%**
Total Sugars 39g	
Includes 0g Added Sugars	**0%**
Protein 1g	

Vit. D 0mcg 0% • Calcium 0mg 0%
Iron 0mg 0% • Potas. 150mg 3%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Patient Education

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-NR

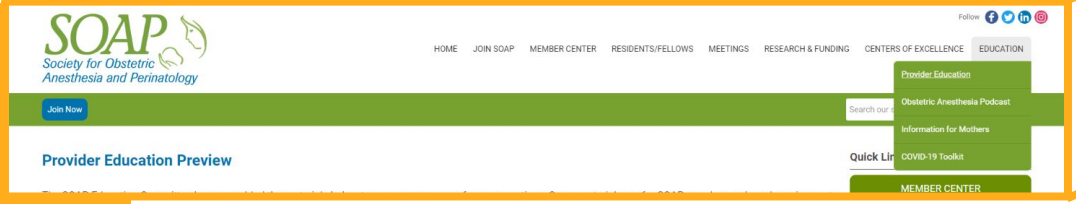
- Preoperative discussion
  - Routine preoperative evaluation before the day of C/S (Ideally)
  - ERAC goals
    - To set expectations, and to engage/empower patient to participate more completely in their care plan and recovery
      - Improving health outcomes
  - Patient education, information material and clear communication

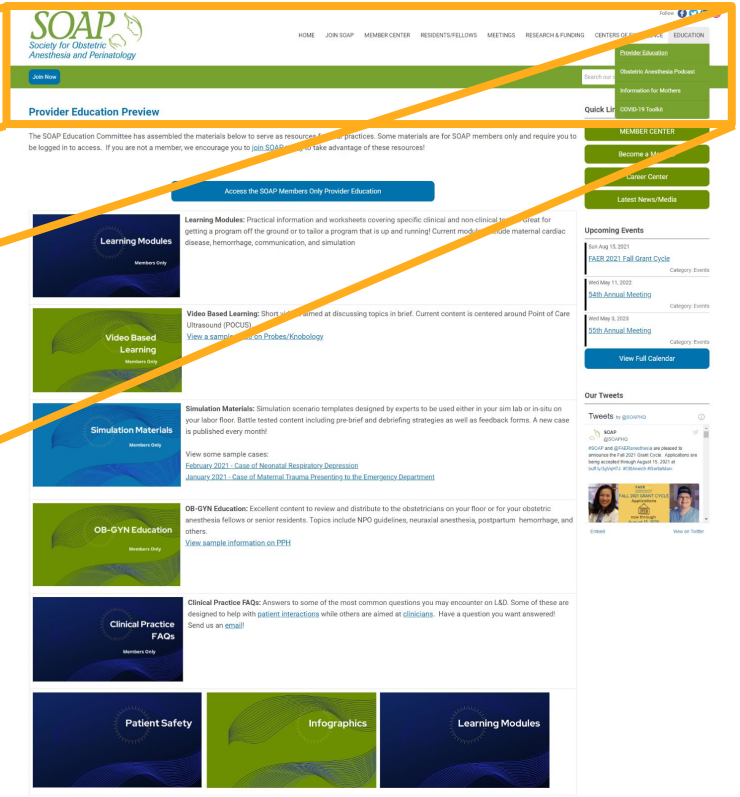
Patient Education

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-NR

- **Ideal**: Direct contact with patients with phone call/reminder or meeting before C/S
  - To remind patient of ERAC goals
- **Minimum:** Handout or other standardized educational tool or interaction at least 1 d before surgery
  - Pre-C/S instructions
  - What to expect during cesarean delivery
  - Enhanced recovery information





SOAP
Society for Obstetric Anesthesia and Perinatology

http://www.SOAP.org/

Lactation/Breastfeeding Preparation and Education

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- Early breastfeeding
  - Improves newborn and maternal outcomes
    - Promoting emotional attachment
    - Reduced infant infectious complications
    - Reduced risk for sudden infant death syndrome

Lactation/Breastfeeding Preparation and Education

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- World Health Organization (WHO) and American Academy of Pediatrics (AAP)
  - Many medical and neurodevelopmental advantages of breastfeeding
  - Consider infant nutrition to be a public health issue rather than a lifestyle choice

Lactation/Breastfeeding Preparation and Education

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- The US Surgeon General, Centers for Disease Control and Prevention (CDC), and The Joint Commission
  - Issued strategies to facilitate breastfeeding in the hospital and community settings

Lactation/Breastfeeding Preparation and Education

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- AAP recommendations
  - Exclusive breastfeeding for 6 months
  - Continued breastfeeding alongside solid food for 1 year or longer as desired by both mother and infant

Lactation/Breastfeeding Preparation and Education

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- Breastfeeding is a public health priority
  - Risk protective for downstream adverse health outcomes
    - CA breast
    - Hypertension
    - etc.
- Every woman should be supported in her informed decision on infant feeding

การให้ลูกกินนมแม่อย่างเดียวหลังคลอด 6 เดือน มีประโยชน์

แม่	ลูก
• ประหยัดเงิน	• ช่วยการเจริญเติบโตของสมองและการมองเห็น
• น้ำหนักลดลงเร็ว	• สร้างภูมิคุ้มกัน ลดการป่วยง่าย
• ผ่อนคลาย ลดความตึงเครียด	• ลูกฉลาดมี IQ EQ สูง พัฒนาการดี
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• ลดการเกิดมะเร็งรังไข่ และมะเร็งเต้านม	• ลดการเกิดโรคเบาหวานสำหรับเด็กชนิดที่ 1
• ลดการเกิดโรคกระดูกพรุน	• ป้องกันการเกิดภูมิแพ้

คุณประโยชน์ดังกล่าวถือเป็นตัวอย่างส่วนน้อยที่คุณแม่และลูกจะได้รับจากการเลี้ยงลูกด้วยนมแม่ ดังนั้นเพื่อส่งเสริมให้สังคมไทยเป็นสังคมที่ให้ความสำคัญกับการให้ลูกกินนมแม่อย่างเดียว เรามาสร้างวัฒนธรรมชื้อของฝากให้คุณแม่หลังคลอด เพื่อเอื้อต่อการเลี้ยงลูกด้วยนมแม่อย่างเดียว ตลอด 6 เดือนหลังคลอด ซึ่งปัจจุบันเราจะพบว่าของฝากสำหรับคุณแม่หลังคลอดจะเต็มไปด้วยชุดผ้าอ้อม เปล ซึ่งจะได้ซ้ำๆ กัน เรามาซื้อของฝากที่ไม่ซ้ำใครและมีประโยชน์กับลูกหลานกันนะคะ ตัวอย่างของฝาก เช่น ผ้าคลุมให้นมบุตร เครื่องปั๊มน้ำนม ถุงเก็บน้ำนม และกระติกแช่น้ำนม

: สื่อสารสุขภาพ ศูนย์อนามัยที่สองพิพฒุโลก
: ศูนย์อนามัยที่ 2 พิษณุโลก
: hpc2.anamai.moph.go.th
: hpc2.anamai.moph.go.th/infocenter
@xji0083b
0 5599 3000

https://multimedia.anamai.moph.go.th/infographics/miracle-of-breastfeeding/

Hemoglobin Optimization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- Work with obstetric provider team during prenatal visits
  - To engage patient in understanding the importance of hemoglobin optimization
  - Treat prenatal anemia appropriately

Hemoglobin Optimization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- Antepartum anemia
  - Significant predictor of postpartum anemia
    - Depression and fatigue
  - Iron-deficiency anemia
    - Increased risk for low birth weight, preterm delivery, and perinatal mortality

Hemoglobin Optimization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- Perinatal anemia prevention and treatment
  - Improved cognition and mood
  - Quicker postpartum recovery
  - Transfusion avoidance

Hemoglobin Optimization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- Preoperative anemia optimization for C/S is particularly important
  - Pregnancy is associated with increased blood volume and dilutional anemia
  - C/S is associated with blood loss that is higher than most abdominal surgeries
  - Prenatal anemia is a strong predictor of severe postpartum anemia
  - ACOG and CDC recommend screening, prevention, and treatment of anemia in pregnancy

Hemoglobin Optimization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

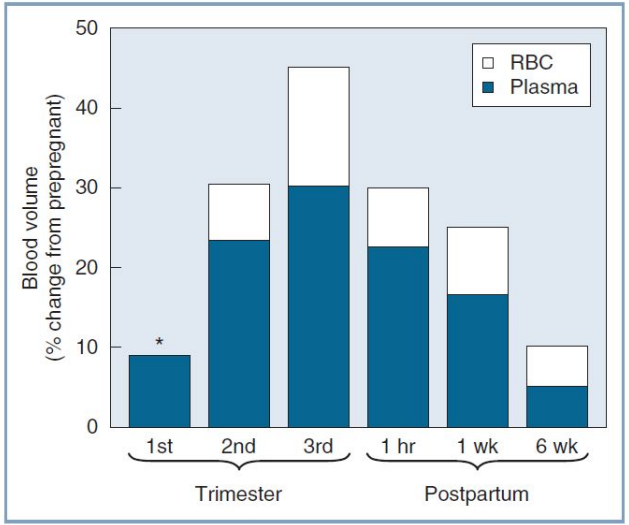

Fig. 2.7 Blood Volume during Pregnancy and the Puerperium. Values during pregnancy measured at the end of the first, second, and third trimesters. Postpartum values measured after a vaginal delivery. The values for red blood cell volume *(RBC)* and plasma volume *(Plasma)* do not represent the actual percentage of change in these parameters but rather reflect the relative contribution of each to the change in blood volume. The asterisk indicates that RBC volume is below the prepregnancy volume at the end of the first trimester.

TABLE 2.6 Hematologic Parameters at Term Gestation

Parameter	Change[a] or Actual Measurement
Blood volume	+45%[a]
Plasma volume	+55%[a]
Red blood cell volume	+30%[a]
Hemoglobin concentration (g/dL)	11.6
Hematocrit	35.5%

[a]Relative to nonpregnant state.

Modified from Conklin KA. Maternal physiological adaptations during gestation, labor, and puerperium. *Semin Anesth.* 1991;10:221–234.

Chestnut's Obstetric Anesthesia Principles, 6th Edition

Hemoglobin Optimization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: B-R

- All pregnant women should be screened for anemia per ACOG guidelines
  - Iron-deficiency anemia
    - Treated with supplemental orally iron in addition to prenatal vitamins
    - If refractory anemia with IV
  - Anemia other than iron-deficiency
    - Further evaluated

ACOG PRACTICE BULLETIN

CLINICAL MANAGEMENT GUIDELINES FOR OBSTETRICIAN–GYNECOLOGISTS

NUMBER 95, JULY 2008

Anemia in Pregnancy

Classification

The definition of *anemia* recommended by the Centers for Disease Control and Prevention is a hemoglobin (Hgb) or hematocrit (Hct) value less than the fifth percentile of the distribution of Hgb or Hct in a healthy reference population based on the stage of pregnancy. Classification derived from an iron-supplemented population lists the following levels as anemic: Hgb (g/dL) and Hct (percentage) levels below 11 g/dL and 33%, respectively, in the first trimester; 10.5 g/dL and 32%, respectively, in the second trimester; and 11 g/dL and 33%, respectively, in the third trimester (1).

https://www.acog.org/clinical/clinical-guidance/practice-bulletin/articles/2008/07/anemia-in-pregnancy

2.

Intraoperative

ERAC Recommendations

Intraoperative ERAC Recommendations

Intraoperative ERAC elements (cont.)

- Prevention of spinal-induced hypotension
- Maintenance of normothermia
- Optimized uterotonic administration
- Antibiotic prophylaxis
- IONV and PONV prophylaxis
- Multimodal analgesia initiation
- Promotion of breastfeeding and maternal-infant bonding
- Intravenous fluid optimization
- Delayed umbilical cord clamping

Spinal Anesthesia–Induced Hypotension Prevention

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Spinal anesthesia–associated hypotension is primarily an afterload-driven problem
- Goal:
  - To prevent intraoperative N/V after spinal anesthesia
  - Maintain uteroplacental perfusion
- Vasopressor regimen may need to be modified in women with preeclampsia
  - May be less than that in nonpreeclamptics

Spinal Anesthesia–Induced Hypotension Prevention

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Maintain blood pressure at baseline
- Optimally managed with prophylactic vasopressor infusion
  - Phenylephrine (or norepinephrine) infusion

Anaesthesia 2018, 73, 71–92 doi:10.1111/anae.14080

Guidelines

International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia

S. M. Kinsella,[1] B. Carvalho,[2] R. A. Dyer,[3] R. Fernando,[4] N. McDonnell,[5] F. J. Mercier,[6] A. Palanisamy,[7] A. T. H. Sia,[8] M. Van de Velde[9,10] and A. Vercueil[11]

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Optimum dose

Allen et al. studied four prophylactic fixed-rate phenylephrine infusions. The groups having 25 $\mu g.min^{-1}$ and 50 $\mu g.min^{-1}$ had fewer physician interventions to maintain SAP > 80% baseline, compared with the group having 100 $\mu g.min^{-1}$. In addition, the 75 $\mu g.min^{-1}$ and 100 $\mu g.min^{-1}$ groups had higher incidences of reactive hypertension [108]. It seems preferable to start an infusion at a rate of 25–50 $\mu g.min^{-1}$, and titrate to response. Physician-controlled variable rate infusions are preferable to fixed rate, in order to limit the total dose of phenylephrine infused.

If a vasopressor infusion is commenced at a fixed rate after spinal insertion, there will be a delay in achieving effective blood levels, whereas adding a bolus dose of vasopressor immediately after the spinal will allow more rapid effect. Kuhn et al. demonstrated that an initial phenylephrine bolus of 0.25 $\mu g.kg^{-1}$, followed by an infusion at 0.25 $\mu g.kg.min^{-1}$, maintained SAP without any adverse effects [45]. Further work is required to identify an optimum dose for a prophylactic bolus, and ensure that there is not a risk of reactive hypertension and bradycardia.

https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/10.1111/anae.14080

Maintain Normothermia

Low-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: C

- Consider active warming starting preoperatively
  - In-line IV fluid warmer
  - Forced air warming
  - Keep OR temperature ideally >72°F or >23.0°C (Joint Commission guidance)

Optimal Uterotonic Administration

High-Grade Level of Evidence

Strength of Recommendation: Class II
Level of Evidence: A

- Use lowest effective dose of uterotonic necessary
  - Achieve adequate uterine tone
  - Minimize side effects

TABLE 37.3 Drug Therapy for Uterine Atony

Agent	Dose and Route	Relative Contraindications	Side Effects	Notes
Oxytocin	0.3–0.9 IU/min IV infusion	None	Tachycardia Hypotension Myocardial ischemia Free water retention	Short duration of effect
Ergonovine or methylergonovine	0.2 mg IM	Hypertension Preeclampsia Coronary artery disease	Nausea and vomiting Arteriolar constriction Hypertension	Long duration of action May be repeated once after 30 minutes
15-Methylprostaglandin $F_{2\alpha}$	0.25 mg IM	Reactive airway disease Pulmonary hypertension Hypoxemia	Fever Chills Nausea and vomiting Diarrhea Bronchoconstriction	May be repeated every 15 minutes up to 2 mg
Misoprostol[a]	600–1000 μg PR, sublingual, or buccal	None	Fever Chills Nausea and vomiting Diarrhea	Off-label use

IM, Intramuscular; *IV,* intravenous; *PR,* per rectum.

[a]Meta-analysis indicates that misoprostol does not provide benefit and increases adverse effects when administered to women with postpartum hemorrhage who are already being treated with high-dose oxytocin.[111]

Optimal Uterotonic Administration

High-Grade Level of Evidence

Strength of Recommendation: Class II
Level of Evidence: A

- Use lowest effective dose of uterotonic necessary e.g.
  - Elective C/S
    - Bolus 1 IU oxytocin;
      start oxytocin infusion at 2.5–7.5 IU/hr (0.04–0.125 IU/min)
  - Intrapartum cesarean delivery
    - 3 IU oxytocin over ≥30 s;
      start oxytocin infusion at 7.5–15 IU/hr (0.125–0.25 IU/min)

Antibiotic Prophylaxis


The American College of Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

ACOG PRACTICE BULLETIN

Clinical Management Guidelines for Obstetrician–Gynecologists

NUMBER 199

(Replaces Practice Bulletin Number 120, June 2011)

Committee on Practice Bulletins—Obstetrics. This Practice Bulletin was developed by the ACOG Committee on Practice Bulletins—Obstetrics with the assistance of Jenell Coleman, MD, MPH; Amy Murtha, MD; and Neil S. Silverman, MD.

Use of Prophylactic Antibiotics in Labor and Delivery

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Follow ACOG guidelines
  - Antibiotic prophylaxis dosed before skin incision
    - Cefazolin 2 g as a first-line antibiotic
    - Addition of azithromycin in appropriate C/S
      - e.g. presence of ruptured membranes
  - Do not wait until after cord clamping

IONV/PONV Prophylaxis

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B

- IONV/PONV
  - Major stressor for mother and should be avoided
  - Bearing in mind the different etiologies
- Prophylactic vasopressor infusion to decrease hypotension-associated IONV

IONV/PONV Prophylaxis

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B

- Combination of at least 2 prophylactic IV antiemetics with different mechanisms of action
  - $5HT_3$ antagonist (e.g. Ondansetron 4 mg)
  - Glucocorticoid (e.g. Dexamethasone 4 mg)
    - Dexamethasone is effective for PONV
      but not IONV due to delayed onset of action
  - D2 receptors antagonist (e.g. Metoclopramide 10 mg)
    - Metoclopramide is effective for IONV
      but not PONV

Multimodal Analgesia

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Neuraxial long-acting opioid
  - IT morphine 50 – 150 µg
  - Epidural morphine 1 – 3 mg

Table 1. Suggested Clinical Decision Tool for Risk Stratification Using Neuraxial Morphine

Risk Factors	Neuraxial Morphine Dose		Postoperative Respiratory Monitoring Recommendation
	Intrathecal	Epidural	
None (healthy, normal BMI)	≤0.05 mg	≤1 mg	No further respiratory monitoring needed in addition to institutional guidelines for postoperative monitoring in this patient population
	>0.05 and ≤0.15 mg	>1 and ≤3 mg	Q 2 h for 12 h RR and sedation checks
	>0.15 mg	>3 mg	Follow ASA/ASRA guidelines[3]: 1. RR and sedation assessments for Q 1 h for first 12 h; Q 2 h for 12–24 h 2. Consider additional monitoring modalities (eg, pulse oximetry, capnography); continuous versus continual intermittent monitoring as indicated
Patient risk factors examples Cardiopulmonary/neurological comorbidity Class III obesity (BMI ≥40 kg/m^2) Known or suspected OSA[a] Chronic opioid use Hypertension Peri/postoperative risk factors examples General anesthesia Supplemental IV opioid Concomitant sedating medications[b] Magnesium administration Desaturation event in the PACU	≤0.05 mg	≤1 mg	No further respiratory monitoring needed in addition to institutional guidelines for postoperative monitoring in this patient population
	>0.05 mg	>1 mg	Follow ASA/ASRA guidelines[3]: 1. RR and sedation assessments for Q 1 h for first 12 h; Q 2 h for 12–24 h 2. Consider additional monitoring modalities (eg, pulse oximetry, capnography); continuous versus continual intermittent monitoring as indicated

Abbreviations: ASA, American Society of Anesthesiologists; ASRA, American Society of Regional Anesthesia and Pain Medicine; BMI, body mass index; OSA, obstructive sleep apnea; PACU, postanesthesia care unit; Q, every; RR, respiratory rate; EPI, epidural; IV, intravenous.

[a]All patients with risk factors for OSA (ie, obesity > 30 kg/m^2, hypertension, etc) should be screened using any or a combination of STOP, STOP-BANG, the ASA checklist, Flemons Index Berlin, or the Epworth Sleepiness Scale.[7–12] Additionally consider these OSA screening questions: BMI > 35 kg/m^2, falling asleep while talking with someone, and history of treatment for hypertension.[13,14]

[b]Examples include general anesthetics, benzodiazepines, and sedating antiemetics.

Society for Obstetric Anesthesia and Perinatology Consensus Statement: Monitoring Recommendations for Prevention and Detection of Respiratory Depression Associated With Administration of Neuraxial Morphine for Cesarean Delivery Analgesia

Multimodal Analgesia

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Nonopioid analgesia started in OR unless contraindicated
  Ideally started before the onset of pain
  - Ketorolac 15 – 30 mg IV after peritoneum closed
  - Acetaminophen IV after delivery or orally before or after delivery
    - Rectal Acetaminophen may be an alternative but has lower bioavailability
- Neuraxial morphine is not administered
  or Patients at risk for severe pain
  - Local anesthetic wound infiltration
  - Regional blocks such as TAP or QLB

Promote Breastfeeding and Maternal-infant Bonding

Low-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: C

- Skin-to-skin contact should occur as soon as possible in OR
  - Based on maternal/neonatal condition
- “Golden hour” of breastfeeding initiation within 1 hr of birth
- Supports a safe transition of the infant from intrauterine life to extrauterine life
- Facilitates mother-infant bonding

Promote Breastfeeding and Maternal-infant Bonding

Low-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: C

- Ideally responsibility of nonanesthesia care team member
  - May require additional nurse support intraoperatively (follow hospital guideline for safe positioning for newborn during skin-to-skin contact)

Promote Breastfeeding and Maternal-infant Bonding

Low-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: C

- Ways to facilitate skin-to-skin contact intraoperatively
  - Moving electrocardiogram leads and electrodes to patients back to clear space on the chest
  - Moving equipment to allow nursing personnel space to safely accomplish skin-to-skin contact
  - Maintain efforts to keep maternal/neonatal temperature
    - Forced air warmer
    - Warmed blankets

Intravenous Fluid Optimization

Low-Grade Level of Evidence

Strength of Recommendation: Class IIa
Level of Evidence: C

- Limit IV fluids to <3 L* for routine cases
  - Spinal anesthesia–associated hypotension in C/S
    - Primarily managed with vasopressors
    - Instead of fluids
  - In the case of hemorrhage
    - Institutional hemorrhage resuscitation protocol

*Ideal intravenous fluid parameters/goals in cesarean delivery are not well established

The American College of Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

ACOG PRACTICE BULLETIN

Clinical Management Guidelines for Obstetrician–Gynecologists

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Committee on Practice Bulletins—Obstetrics. This Practice Bulletin was developed by the American College of Obstetricians and Gynecologists' Committee on Practice Bulletins–Obstetrics in collaboration with Laurence E. Shields, MD; Dena Goffman, MD; and Aaron B. Caughey, MD, PhD.

Postpartum Hemorrhage

Table 3. Acute Medical Management of Postpartum Hemorrhage

Drug*	Dose and Route	Frequency	Contraindications	Adverse Effects
Oxytocin	IV: 10–40 units per 500–1,000 mL as continuous infusion or IM: 10 units	Continuous	Rare, hypersensitivity to medication	Usually none. Nausea, vomiting, hyponatremia with prolonged dosing. Hypotension can result from IV push, which is not recommended.
Methylergonovine	IM: 0.2 mg	Every 2–4 h	Hypertension, preeclampsia, cardiovascular disease, hypersensitivity to drug	Nausea, vomiting, severe hypertension particularly when given IV, which is not recommended
15-methyl $PGF_{2\alpha}$	IM: 0.25 mg Intramyometrial: 0.25 mg	Every 15–90 min, eight doses maximum	Asthma. Relative contraindication for hypertension, active hepatic, pulmonary, or cardiac disease	Nausea, vomiting, diarrhea, fever (transient), headache, chills, shivering hypertension, bronchospasm
Misoprostol	600–1,000 micrograms oral, sublingual, or rectal	One time	Rare, hypersensitivity to medication or to prostaglandins	Nausea, vomiting, diarrhea shivering, fever (transient), headache

Abbreviations: IV, intravenously; IM, intramuscularly; PG, prostaglandin.

*All agents can cause nausea and vomiting.

Modified from Lyndon A, Lagrew D, Shields L, Main E, Cape V, editors. Improving health care response to obstetric hemorrhage version 2.0. A California quality improvement toolkit. Stamford (CA): California Maternal Quality Care Collaborative; Sacramento (CA): California Department of Public Health; 2015.

https://www.acog.org/clinical/clinical-guidance/practice-bulletin/articles/2017/10/postpartum-hemorrhage

Delayed Umbilical Cord Clamping

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- ACOG recommends delay in umbilical cord clamping in vigorous term and preterm infants for at least 30 – 60 sec after birth
- Does not increase maternal risk for blood loss or transfusion
- Should be deferred in certain situations
  - Maternal instability
  - Fetal/neonatal need for immediate resuscitation
  - etc.

Delayed Umbilical Cord Clamping

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Benefits:
  - Term:
    - Improved iron stores
    - Developmental benefits
  - Preterm:
    - Improved transitional circulation
    - Reduced need for transfusion
    - Lower risk of necrotizing enterocolitis and intraventricular hemorrhage

3.

Postoperative

ERAC Recommendations

Postoperative ERAC Recommendations

Preoperative ERAC elements

- Early oral intake
- Early mobilization
- Resting periods promotion
- Early urinary catheter removal
- Venous thromboembolism (VTE) prophylaxis
- Early discharge facilitation

Postoperative ERAC Recommendations

Preoperative ERAC elements (cont.)

- Anemia remediation
- Breastfeeding support
- Multimodal analgesia
- Glycemic control
- Return of bowel function promotion

Early Oral Intake

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Accelerated return of bowel function
- Reduced hospital length of stay
- No increased rates of complication
- No increased risk of PONV
- Reduced postoperative catabolism
- Improved insulin sensitivity
- Reduced surgical stress response

Early Oral Intake

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Ice chips and/or water within 60 min postcesarean admission to PACU
- Heparin/saline lock IV early once oxytocin infusion complete, tolerating fluids, and urine output adequate
- Advance to regular diet ideally within 4 hr postcesarean, as tolerated

Early Mobilization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B-NR

Early mobilization decreases:

- Insulin resistance
- Muscle atrophy
- Hypoxia
- Venous thromboembolism
- Length of stay

Early Mobilization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B-NR

- Remove barriers to early mobilization:
  - IV poles
  - Urinary catheters
  - Poor pain control
  - Sedation
  - PONV
  - Dizziness
  - Slow block regression

Early Mobilization

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B-NR

- Ambulate only after adequate return of motor function
  - 0 – 8 hr postoperatively:
    - Sit on edge of bed
    - Out of bed to chair
    - Ambulation as tolerated
  - 8 – 24 hr postoperatively:
    - Ambulation as tolerated
    - Walk: 1 – 2 times (or more) in hall
  - 24 – 48 hr postoperatively:
    - Walk: 3 – 4 times (or more) in hall
    - Out of bed for 8 hr

Promotion of Resting Periods

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Fatigue potentially impacts cognitive function, depression, pain, maternal-infant bonding, and risk of respiratory depression
- Optimize sleep and rest
  - Encourage clustered interventions
    - e.g. V/S assessments in coordination with analgesic administration; timing of oral analgesics contemporaneously

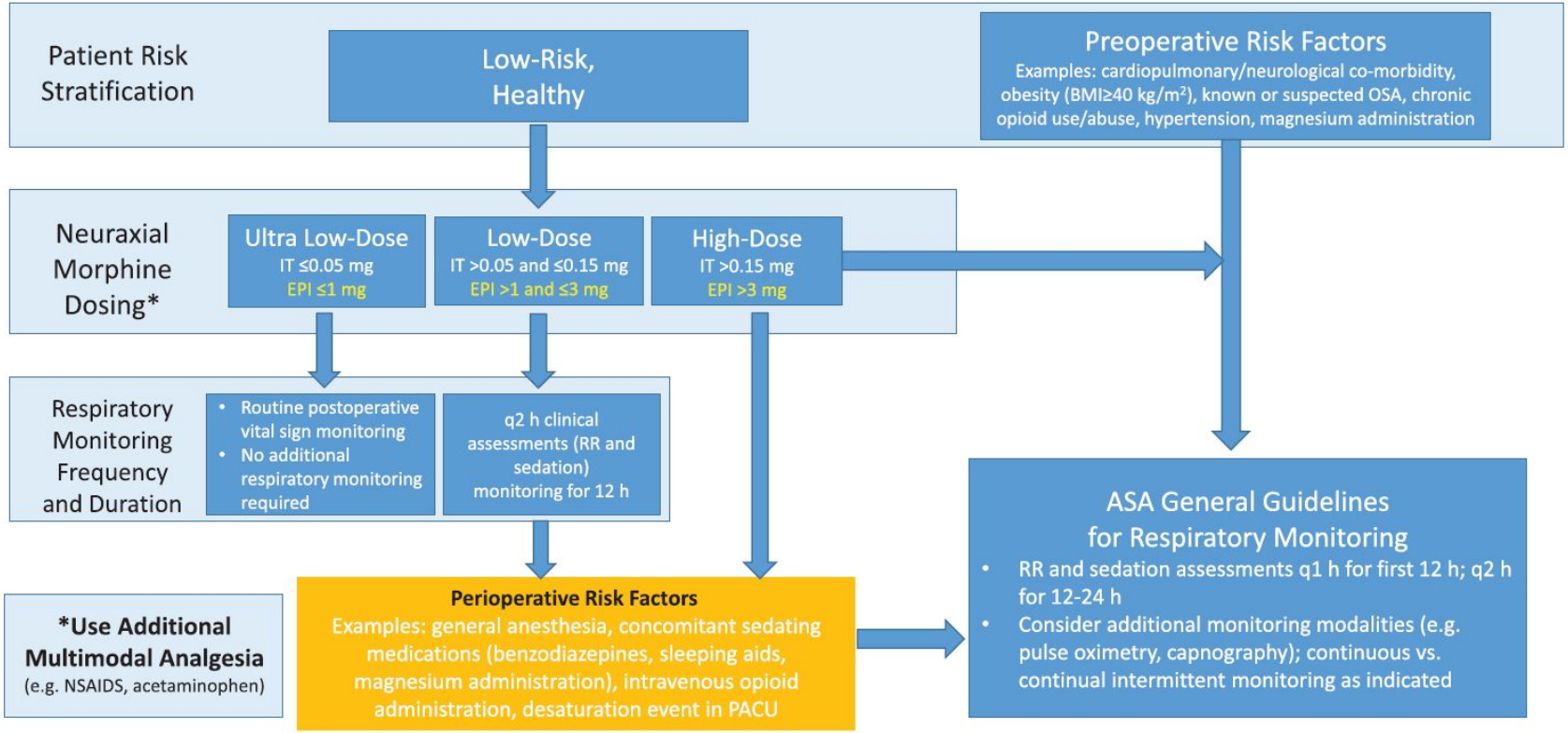


Figure. Respiratory monitoring algorithm following neuraxial morphine administration for postcesarean delivery analgesia. BMI indicates body mass index; EPI, epidural; IT, intrathecal; Mg, magnesium; NSAIDs, nonsteroidal anti-inflammatory drugs; OSA, obstructive sleep apnea; PACU, postoperative anesthesia care unit; Q, every; RR, respiratory rate.

Box 2. Examples of Patient and Postoperative Risk Factors for Respiratory Depression in the Obstetric Population

Perioperative	General anesthesia
	Desaturation event in PACU
	Coadministration of intravenous opioid
	Coadministration of sedatives (intra/postoperative)
	Coadministration of magnesium
Patient	Cardiopulmonary or neurological comorbidities
	Class III obesity (BMI $\geq$ 40 kg/m^2)
	Obstructive sleep apnea
	Chronic opioid use
	Hypertension

Abbreviations: BMI, body mass index; PACU, postanesthesia care unit.

Society for Obstetric Anesthesia and Perinatology Consensus Statement: Monitoring Recommendations for Prevention and Detection of Respiratory Depression Associated With Administration of Neuraxial Morphine for Cesarean Delivery Analgesia

Early Urinary Catheter Removal

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Benefits:
  - Improved ambulation
  - Reduced length of stay
  - Lower rates of symptomatic UTI

Early Urinary Catheter Removal

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Urinary catheter removed by 6 – 12 hr postpartum
  - Dose of neuraxial local anesthetic and opioid can impact catheter removal time
  - Earlier catheter removal may be associated with higher rates of urinary retention and need for recatheterization
    - Construct protocols to establish criteria for appropriate removal and to manage postcatheter removal urinary retention

Venous Thromboembolism Prophylaxis

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Follow institutional practices as per ACOG and ACCP guidelines
  - ACOG recommends mechanical thromboembolism prophylaxis for all women not already receiving pharmacologic thromboprophylaxis
    - C/S approximately doubles risk of VTE compared to vaginal delivery
    - Healthy patients the absolute risk is low

Facilitate Early Discharge

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Standardized discharge planning and coordinate care starting preoperatively
  - Establish patient-oriented goals early
  - Personalize/patient-centered opioid prescribing at discharge
  - Use metrics to monitor patient progress in meeting early discharge criteria
- Discharge planning on POD 1 should ideally include pediatric, lactation, and contraceptive planning

Anemia Remediation

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Screen and treat anemia
  - Hb check on POD 1 or 2 should be considered in patients with severe intraoperative bleeding

Breastfeeding Support

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Robust lactation support per institutional guideline
- Start immediately after birth by offering skin-to-skin care and continued throughout hospitalization
- “Golden hour” to help women initiate breastfeeding within 1 hr of birth
- Initial skin-to-skin contact should continue uninterrupted until the completion of the first breastfeeding
- In the case of formula fed infants, initial skin-to-skin contact should continue as uninterrupted as possible for at least 1 hr

Breastfeeding Support

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- After initial period of skin-to-skin contact, mothers should be encouraged to continue this type of care as much as possible during the hospital stay
- Provide lactation consulting and educational material
  - 10 steps to successful breastfeeding as documented in the Joint Statement by UNICEF and WHO: Baby Friendly Hospital Initiative

https://www.who.int/activities/promoting-baby-friendly-hospitals/ten-steps-to-successful-breastfeeding

บันได 10 ขั้น เพื่อการเลี้ยงลูกด้วยนมแม่

สำหรับลูกแรกเกิดน้ำหนักตัวน้อยและเด็กป่วย

บันไดขั้นที่ 1 การให้ข้อมูลเรื่องคุณค่านมแม่กับลูกป่วย (Informed Decision)

การให้ข้อมูลที่ห้องฝากครรภ์ | การให้ข้อมูลที่ห้องคลอดที่ยับยั้งการคลอด | การให้ข้อมูลที่หลังคลอด

บันไดขั้นที่ 2 การช่วยกระตุ้นการหลั่งน้ำนมให้มาเร็วและต่อเนื่อง (Establishment and Maintenance of Milk Supply)

บีบด้วยมือ | ให้ได้กินสิ่งที่เรียกว่าน้ำนม (Colostrum) | ให้เครื่องปั๊มดูดน้ำนม | ให้การบอกเนื่องยาเกี่ยวกับน้ำนม | แบบบันทึกการเก็บน้ำนม

บันไดขั้นที่ 3 การบริหารจัดการน้ำนมแม่ (Human Milk Management)

นมแม่เก็บในการตักน้ำแข็ง | นมแม่เก็บช่องแช่แข็ง ตู้เย็น 1 ประตู | นมแม่เก็บช่องแช่แข็ง ตู้เย็น 2 ประตู | นมแม่เก็บตู้ช่องแช่แข็ง (ไอศครีม)

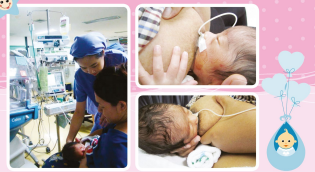
บันไดขั้นที่ 4 การเคลือบช่องปากด้วยนมแม่ และการให้นมแม่แก่ทารก (Feeding of Breast Milk: Oral Care and Initiation of Enteral Feedings)

ให้นมแม่เคลือบช่องปาก | พ่อกินนม! ให้ได้ทันสำหรับดูดน้ำนมแม่เคลือบช่องปาก

บันไดขั้นที่ 5 ให้แม่โอบกอดลูกเนื้อแนบเนื้อ (Skin-to-Skin Care)

การโอบกอดลูกเนื้อแนบเนื้อ (skin-to-skin care) หมายถึง การดูแลลูกแรกเกิดโดยให้ลูกอยู่ในอกแม่ ให้มีหนังแม่ลูกได้สัมผัสกันเสียระยะแรกเมื่อให้ลูกอยู่ภายนอกครรภ์ ลูกได้รับทั้งความอบอุ่น ความปลอดภัย และได้อาหาร คือ น้ำนมแม่

บันไดขั้นที่ 6 การดูดเต้าเปล่า (Non-Nutritive Sucking at the Breast: NNS)



บันไดขั้นที่ 7 การเปลี่ยนผ่านสู่การให้นมจากเต้า (Transition to Breast)

บันไดขั้นที่ 8 การวัดปริมาณน้ำนมที่ทารกได้รับ (Measuring Milk Transfer)

บันไดขั้นที่ 9 การเตรียมความพร้อมและสร้างความมั่นใจก่อนกลับบ้าน (Preparation for Discharge)

แม่ควรพักค้างอยู่กับลูกตลอดเวลาก่อนวันที่ลูกจะได้กลับบ้าน | แม่อยู่กับลูกเพื่อดูแลและให้นมลูกได้ตลอดเวลาที่ลูกต้องการ

บันไดขั้นที่ 10 มีระบบการติดตามดูแลแม่หลังจำหน่ายจากโรงพยาบาล (Appropriate Follow-up)

ที่บ้าน | คลินิกนมแม่ | Call center

Multimodal Analgesia

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B-NR

- Reduce pain
- Improve mobilization
- Limit IV opioids in PACU
- Limit opioids in hospital and at discharge
  - associated with N/V, sedation, fatigue, ileus, constipation, misuse/addiction risk
  - Multimodal analgesia (including NSAID + Acetaminophen) decrease opioid use/side effects by 30%

Multimodal Analgesia

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B-NR

- Multimodal analgesia protocols
  - Low-dose long-acting neuraxial opioid
    - Morphine (as mentioned before)
  - Scheduled NSAID
  - Scheduled APAP
  - Local anesthetic techniques as indicated

Multimodal Analgesia

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B-NR

- Peripheral nerve blocks
  (TAP, QLB, continuous wound infiltration)
  - Neuraxial morphine cannot be given
  - Rescue technique when severe breakthrough pain despite the use of neuraxial morphine
  - TAP block does not provide significant improvement when given in addition to neuraxial morphine and scheduled NSAID/APAP

Multimodal Analgesia

Moderate-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: B-NR

- Gabapentinoids
  - No significant benefit in routine C/S
  - Appropriate in select patients
    - Patients on methadone
    - Other QTc prolonging medications

Glycemic Control

High-Grade Level of Evidence

Strength of Recommendation: Class I
Level of Evidence: A

- Patient with diabetes ideally first case of day
- Maintain normoglycemia (<180 – 200 mg/dL)
  - Check maternal/neonatal glucose per hospital protocol
  - Hyperglycemia (>180 – 200 mg/dL) is associated with poor outcomes
    - Infection
    - Delayed wound healing

Promotion of Return of Bowel Function

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- Minimization of opioid consumption
- Consider chewing gum
- Encourage mobilization
- Remove barriers to recovery

Promotion of Return of Bowel Function

Low-Grade Level of Evidence

Strength of Recommendation: Class IIb
Level of Evidence: C-EO

- PRN bowel medications

Take Home Message

Preoperative ERAC element recommendations

- Patient education
- ***Minimizing preoperative fasting periods***
- ***Nonparticulate carbohydrate loading up to 2 hours before scheduled delivery***
- Lactation/breastfeeding education
- ***Hemoglobin optimization***

Take Home Message

Intraoperative ERAC element recommendations

- ***Prevention of spinal-induced hypotension***
- ***Maintenance of normothermia***
- ***Optimization of uterotonic administration***
- ***Antibiotic prophylaxis***
- ***IONV and PONV prophylaxis***
- ***Multimodal analgesia initiation***
- ***Promotion of breastfeeding and maternal-infant bonding***
- ***IV fluid optimization***
- Delayed cord clamping

Take Home Message

Intraoperative ERAC element recommendations

- Early oral intake
- Early mobilization
- Resting periods
- Early urinary catheter removal
- VTE prophylaxis
- Facilitation of early discharge
- Anemia remediation
- Breastfeeding support
- **Multimodal analgesia**
- Glycemic control
- Early return of bowel function

Thank You