

## OBSTETRICS

# Guidelines for postoperative care in cesarean delivery: Enhanced Recovery After Surgery (ERAS) Society recommendations (part 3)



George A. Macones, MD; Aaron B. Caughey, MD, PhD; Stephen L. Wood, MD; Ian J. Wrench, MB, ChB, PhD; Jeffrey Huang, MD; Mikael Norman, MD, PhD; Karin Pettersson, MD, PhD; William J. Fawcett, MBBS, FRCA, FFPMRCA; Medhat M. Shalabi, MD; Amy Metcalfe, PhD; Leah Gramlich, MD; Gregg Nelson, MD, PhD; R. Douglas Wilson, MD, MSc

**BACKGROUND:** This Enhanced Recovery After Surgery Guideline for postoperative care in cesarean delivery will provide best practice, evidenced-based recommendations for postoperative care with primarily a maternal focus.

**OBJECTIVE:** The pathway process for scheduled and unscheduled cesarean delivery for this Enhanced Recovery After Surgery cesarean delivery guideline will consider time from completion of cesarean delivery until maternal hospital discharge.

**STUDY DESIGN:** The literature search (1966–2017) used Embase and PubMed to search medical subject headings that included “Cesarean Section,” “Cesarean Delivery,” “Cesarean Section Delivery,” and all postoperative Enhanced Recovery After Surgery items. Study selection allowed titles and abstracts to be screened by individual reviewers to identify potentially relevant articles. Metaanalyses, systematic reviews, randomized controlled studies, nonrandomized controlled studies, reviews, and case series were considered for each individual topic. Quality assessment and data analyses evaluated the quality of evidence, and

recommendations were evaluated according to the Grading of Recommendations, Assessment, Development and Evaluation system as used and described in previous Enhanced Recovery After Surgery Guidelines.

**RESULTS:** The Enhanced Recovery After Surgery cesarean delivery guideline/pathway has created a pathway for postoperative care. Specifics include sham feeding, nausea and vomiting prevention, postoperative analgesia, nutritional care, glucose control, thromboembolism prophylaxis, early mobilization, urinary drainage, and discharge counseling. A number of elements of postoperative care of women who undergo cesarean delivery are recommended, based on the evidence.

**CONCLUSION:** As the Enhanced Recovery After Surgery cesarean delivery pathway (elements/processes) are studied, implemented, audited, evaluated, and optimized by the maternity care teams, there will be an opportunity for focused and optimized areas of care and recommendations to be further enhanced.

**Key words:** cesarean delivery, enhanced recovery

Enhanced recovery after surgery (ERAS) is a standardized, perioperative care program that is embedded firmly within multiple surgical disciplines that include colorectal, urologic, gynecologic, and hepatobiliary surgery. ERAS has been shown to result in both clinical benefits (reductions in length of stay, complications, and readmissions) and health system benefits (reduction in cost).<sup>1,2</sup>

ERAS is a tool for process management, with the creation of a focused care process. The use of audit and feedback, whereby clinicians are provided with comparative data to educate, change,

and decrease the “harmful” clinical variances that are identified in certain high-volume clinical care processes and procedures that will increase quality of care, patient safety, and health outcomes.

This serialized ERAS guideline for perioperative care in cesarean delivery will provide best practice recommendations for part 1 (antenatal/preoperative),<sup>3</sup> part 2 (intraoperative),<sup>4</sup> and part 3 (postoperative phases) that are the focus of this document. Although certain ERAS principles have been established for other abdominal/pelvic surgeries, this present ERAS cesarean delivery pathway will provide evidenced-based recommendations for the surgical pathway that is related to cesarean delivery with, primarily, a maternal focus.

## Methods

### Literature search

The author group was selected and vetted by the ERAS Society Guideline Committee in 2017 based on expertise in the area, and a consensus topic list was

determined. After the topics were agreed on, they were allocated among the group according to expertise. The literature search (1966–2017) used Embase and PubMed to search medical subject headings that included “Cesarean Section,” “Cesarean Delivery,” “Cesarean Section Delivery,” and all postoperative ERAS items. Reference lists of all eligible articles were cross-checked for other relevant studies.

### Study selection

Titles and abstracts were screened by individual reviewers to identify potentially relevant articles. Metaanalyses, systematic reviews, randomized controlled studies, nonrandomized controlled studies, reviews, and case series were considered for each individual topic.

### Quality assessment and data analyses

The quality of evidence and recommendations were evaluated according to

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## AJOG at a Glance

**Why was this study conducted?**

This Enhanced Recovery After Surgery Society guideline was created to support the most common surgical procedure in the industrialized healthcare world, the cesarean delivery. It has the goal to enhance the quality and safety of the cesarean delivery for improved maternal and fetal/neonatal outcomes through evaluation and audit.

**Key findings**

The broad Enhanced Recovery After Surgery Society cesarean delivery elements and recommendations (Parts 1–3) break down the surgical delivery process into a pathway that starts at 30–60 minutes before skin incision, for both scheduled and unscheduled cesarean deliveries, until hospital discharge and presents a longer pathway that manages antenatal education, maternal comorbidities, and immediate neonatal needs at delivery. This postoperative section (Part 3) focuses on the time from the completion of cesarean delivery until maternal discharge.

**What does this add to what is known?**

This Enhanced Recovery After Surgery Society cesarean delivery guideline has taken the evidenced-based knowledge that was created from the cesarean delivery research and has critically and with consensus published the information in a 3-part guideline that uses the Enhanced Recovery After Surgery Society principles and process for improved surgical quality and safety for obstetric surgical deliveries.

traditional feeding trials. This was a 7-hour improvement in time to flatus compared with those who did not chew gum. Only 4 studies reported postoperative ileus that was reduced with gum chewing (odds ratio, 0.39; 95% confidence interval, 0.19–0.80). Hospital stay was not changed:  $-0.36$  days (95% confidence interval,  $-0.53$  to  $0.18$ ). Quality of evidence was rated “low” mainly because of lack of blinding. Applicability to all settings is limited because a high proportion of subjects had general anesthesia in many of the trials.

**Summary and recommendation**

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.<sup>8</sup> The overall incidence of nausea and vomiting during regional anesthesia for cesarean delivery is variable (21–79%).<sup>8–17</sup> 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.<sup>18</sup> Nausea and vomiting reduced patient satisfaction and delayed discharge from hospital.

There are multiple causes of nausea and vomiting during cesarean delivery. Maternal hypotension from regional anesthesia is a common cause. Several approaches are used currently to minimize or prevent hypotension and likely to decrease the incidence of nausea and vomiting. A Cochrane review study (75 studies and 4624 women who received spinal anesthesia for cesarean delivery) showed that colloid or crystalloid preloading, the intravenous administration

the Grading of Recommendations, Assessment, Development and Evaluation system, as used and described in previous ERAS guidelines (Table 1).<sup>3,4</sup> Briefly, recommendations are given in the following manner: “Strong” recommendations indicate that the panel is confident that the desirable effects of adherence to a recommendation outweigh the undesirable effects. “Weak” recommendations indicate that the desirable effects of adherence to a recommendation probably outweigh the undesirable effects, but the panel is less confident. Recommendations are based not only on the quality of evidence (high, moderate, low, and very low) but also on the balance between desirable and undesirable effects. In some cases, strong recommendations may be reached from low-quality data and vice versa. The core ERAS cesarean delivery team (A.B.C., G.A.M., S.L.W., G.N., and R.D.W) reviewed the evidence in detail for each section and assigned both the recommendation and evidence level (Table 2). Discrepancies were resolved by the lead and senior authors.

**Postoperative Cesarean Delivery Pathway (Focused Elements)****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.<sup>6</sup> In a separate review of gum chewing after cesarean delivery, 15 clinical trials were identified.<sup>7</sup> 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. In 10 of these studies, the comparator group was traditional delayed feeding until return of intestinal function (bowel sounds or flatus). In 2 studies, the comparator group had an early feeding policy. With gum chewing (using a variety of gum types and duration of chewing), the time to first report of flatus was 5.9 hours in early feeding trials and 7.8 hours in the

of ephedrine or phenylephrine, and lower limb compression (by bandages, stockings, or inflatable boots) reduced the incidence of spinal anesthesia-related hypotension.<sup>19</sup>

Antiemetic agents that have been used prophylactically during cesarean delivery under regional anesthesia are effective for the prevention of nausea and vomiting.<sup>20</sup> A multimodal approach to nausea and vomiting prevention is quickly becoming a standard of care. A Cochrane review study (41 studies and 5046 patients) demonstrated that 5-HT<sub>3</sub> antagonists (eg, ondansetron, granisetron), dopamine antagonists (eg, metoclopramide, droperidol), and sedatives (eg, midazolam, propofol) were effective in the reduction of intraoperative nausea and vomiting.<sup>19</sup> Corticosteroids (such as dexamethasone) were found to reduce only intraoperative nausea and vomiting.<sup>8</sup> Anticholinergic agents (eg, scopolamine) were effective at the reduction of postoperative nausea and vomiting.<sup>19</sup> Other interventions (opioids, supplemental oxygen, supplemental intravenous fluid, acupressure/acupuncture) did not reduce intraoperative nausea or postoperative nausea and vomiting.<sup>8</sup>

A metaanalysis (33 trials with data from 3447 patients) reported that combination regimens (5-HT<sub>3</sub> is combined with either droperidol or dexamethasone) are significantly more effective than 5-HT<sub>3</sub> alone.<sup>21</sup> The efficacy of combination antiemetic agents to prevent nausea and vomiting in patients who underwent cesarean delivery was demonstrated in a randomized prospective study.<sup>22</sup> Tropisetron 2 mg and metoclopramide 20 mg are highly effective in the prevention of 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

**TABLE 1**  
**Grading of Recommendations, Assessment, Development and Evaluation system<sup>5</sup>**

Variable	Definition
Rating quality of evidence: evidence level	
High quality	Further research is unlikely to change confidence in estimate of effect.
Moderate quality	Further research is likely to have important impact on confidence in estimate of effect and may change the estimate.
Low quality	Further research is very likely to have important impact on confidence in estimate of effect and likely to change the estimate.
Very low quality	Any estimate of effect is very uncertain.
Rating strength of recommendations: recommendation strength	
Strong	When desirable effects of intervention clearly outweigh the undesirable effects, or clearly do not.
Weak	When trade-offs are less certain: either because of low quality evidence or because evidence suggests desirable and undesirable effects are closely balanced.

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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.)

### Postoperative analgesia

Poor postoperative pain control may be detrimental to recovery for surgery of any kind. Pain may prolong recovery and delay discharge<sup>23</sup> and has a negative impact on rehabilitation.<sup>24</sup> For cesarean delivery, high pain scores have the potential to prevent early mobilization and the mother's efforts to be independent and to care for her newborn baby. Multimodal analgesia is a key component in the management of postoperative pain as part of an enhanced recovery protocol,<sup>25</sup> which results in fewer side-effects and faster postoperative recovery.

Postcesarean delivery analgesia may be enhanced by a number of intraoperative interventions. Long-acting intrathecal opioids, such as morphine,

provide analgesia for several hours after cesarean delivery, although at the expense of a number of side-effects that include nausea, vomiting, and pruritus.<sup>26,27</sup> In the absence of long-acting intrathecal opioids, the transversus abdominis plane field block provides excellent postoperative pain control.<sup>28</sup> A Cochrane review of local analgesia infiltration and abdominal nerve blocks found that they improved postoperative analgesia for cesarean delivery.<sup>29</sup>

A review of oral analgesia for postcesarean delivery pain relief concluded that there was insufficient evidence to make recommendations regarding the safest and most effective form.<sup>30</sup> Nevertheless, the perioperative administration of nonsteroidal anti-inflammatory drugs (NSAIDs) is known to diminish postoperative pain for cesarean delivery.<sup>31</sup> Evidence in the obstetric population is less clear for paracetamol, although a systematic review of studies that included studies in which patients underwent cesarean delivery found that the combination of NSAIDs and paracetamol was

TABLE 2

## Guidelines for postoperative care in cesarean delivery: Enhanced Recovery After Surgery Society recommendations

Variable	Item	Recommendation	
		Evidence level	Recommendation grade
Postoperative pathway			
Chewing gum after cesarean section (focused element)	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.	Low	Weak
Nausea and vomiting prevention (focused element)	(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.	Moderate (multiple interventions)	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.	Moderate	Strong
Postoperative analgesia (focused element)	Multimodal analgesia that include regular nonsteroidal antiinflammatory drugs and paracetamol is recommended for enhanced recovery for cesarean delivery.	Moderate	Strong
Perioperative nutritional care (focused element)	A regular diet within the 2 hours after cesarean delivery is recommended.	High	Strong
Perioperative glucose control (focused element)	Tight control of capillary blood glucose is recommended.	Low	Strong
Prophylaxis against thromboembolism (focused element)	(1) Pneumatic compression stockings should be used to prevent thromboembolic disease in patients who undergo cesarean delivery.	Low	Strong
	(2) Heparin should not be used routinely for venous thromboembolism prophylaxis in patients after cesarean delivery.	Low	Weak
Early post—cesarean delivery mobilization (focused element)	Early mobilization after cesarean delivery is recommended.	Very low	Weak
Post—cesarean delivery urinary drainage (focused element)	Urinary catheter should be removed immediately after cesarean delivery, if placed during surgery.	Low	Strong
Postoperative/postpartum mother pathway			
Discharge counselling (focused element)	Standardized written discharge instructions should be used to facilitate discharge counselling.	Low	Weak

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synergistic for postoperative pain.<sup>32</sup> A survey of practice surrounding cesarean delivery in the United Kingdom found that almost all units were using postoperative paracetamol

and NSAIDs.<sup>33</sup> This combination is cheap, effective, easy to administer, and opioid-sparing, which leads to fewer opioid-related side-effects,<sup>25</sup> and is compatible with ERAS regimens.

### Summary and recommendation

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

There are multiple randomized controlled trials on the subject of early feeding from countries across the world with differing cultural norms dating back >15 years.<sup>34–41</sup> Early feeding is defined variably as feeding as early as 30 minutes<sup>34</sup> and up to 8 hours after cesarean delivery.<sup>35</sup> The largest trial to study early feeding randomized 1154 patients to conventional feeding within 18 hours or early feeding within 2 hours and demonstrated a reduction in thirst and hunger and improved maternal satisfaction, ambulation, and length of stay, with no impact on readmissions or gastrointestinal symptoms or infections.<sup>38</sup> The findings of this trial are similar to those in other trials that have demonstrated similar or enhanced satisfaction, earlier resumption of solid food, accelerated return of bowel activity, and reduced length of stay with no evidence of higher complication rates related to wound healing or infection.<sup>34–41</sup> A systematic review and metaanalysis of 17 studies also supported these findings.<sup>41</sup> One study did document increased nausea with early resumption of diet, but this was self-limited.<sup>34</sup> 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.

### Summary and recommendation

A regular diet within the 2 hours after cesarean delivery is recommended. (Evidence level: high; recommendation grade: strong.)

### Perioperative glucose control

Insulin resistance is a common physiologic change in pregnancy. There are various controversies about the peripartum treatment of diabetic patients.<sup>42</sup>

Diabetes mellitus in pregnancy is associated with adverse outcomes that include an increase in morbidity and mortality rates for both the mother and

fetus.<sup>43,44</sup> Patients with diabetes mellitus who undergo surgery have increased complications (particularly wound infections), length of hospital stay, and death.<sup>45</sup> Patients with undiagnosed diabetes mellitus are at greater risk, with a dose-response relationship between the level of capillary blood glucose (CBG) and composite adverse events.<sup>46</sup> Conversely, strict control of hyperglycemia can help to reduce surgical site infections.<sup>47</sup>

The level of control of CBG is a complex area; for nonobstetric patients, the ideal range is probably 6–10 mmol/L.<sup>48</sup> Lower limits of 4–7 mmol/L are recommended at the time of delivery to reduce fetal hypoglycemia<sup>49</sup> that often will require variable rate insulin infusions, formerly known as a sliding scale. As a result, these standards have been challenged, and a higher upper limit of 8 mmol/L is suggested by Modi et al,<sup>50</sup> because there is little further risk of fetal hypoglycemia. Moreover, CBG meters have been shown to have, at least, a 15% error that is permitted by the US Food and Drug Administration, with a measured CBG of 4 mmol/L that could be as low as 3.4 mmol/L, thereby putting mothers at risk of severe maternal hypoglycemia (<2.8 mmol/L).<sup>48</sup>

For patients who take insulin for type I diabetes mellitus, the major issue is to never stop all insulin because ketoacidosis may develop rapidly. The manipulation of perioperative insulin is complex, with a small evidence base for patients who undergo cesarean delivery.

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. The aim is to return the patient to normal insulin with food as soon as possible after surgery. The use of continuous subcutaneous insulin pumps are increasing in usage and will often be advised to reduce the basal infusion by 10–20% and to omit the bolus dose before meals.<sup>51</sup> The use of the variable rate insulin infusions is still popular for patients who take insulin or with significant hyperglycemia (>12 mmol/L), but it is associated with a

number of serious side-effects that include hyperglycemia and hypoglycemia, hyponatremia, and hypokalemia. It requires appropriate fluids to run along aside the insulin with 5% dextrose and 0.45% saline solution with additional potassium chloride. Hourly CBG monitoring is required; 20% glucose (50–100 mL) is available to treat hypoglycemia.<sup>52,53</sup>

Cesarean deliveries are best carried out under a regional technique where possible. Not only does it avoid the risk of general anesthesia, but in addition regional anesthesia will considerably blunt the ‘stress’ response (including the hyperglycemic response) to surgery. CBG is optimally measured every 30 min from induction of general anesthesia until the mother is fully conscious.<sup>49</sup>

Oral carbohydrate preloading is an area of controversy for patients with impaired glucose control. Although the patient may benefit from the advantages of preloading (such as reduced length of stay and reduced complications for some surgeries) and, in particular, a reduction in insulin resistance, there are no large trials to support or refute its use in women with diabetes mellitus. The majority of diabetic care providers would not support its use in diabetic patients because of the fear of worsening of glucose control. Patients, nevertheless, should be scheduled early in the day (particularly those who require insulin) with minimal fasting to reduce the risk of dehydration, acidosis, and ketosis

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 breast feeding 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.<sup>49</sup> The neonate is at risk of severe hypoglycemia after delivery; there must be assessment by a pediatrician regarding whether admission to a neonatal unit is appropriate.

Finally these patients require counseling, advice (diet, weight control, and exercise), and follow-up evaluation to minimize the impact of poor glucose

control on their future health, such as worsening of glucose control and cardiovascular disease.

### Summary and recommendations

Tight control of CBG postoperatively is recommended. (Evidence level: low; recommendation grade: strong.)

### 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).

A recent Cochrane review assessed the efficacy of some strategies for post-cesarean delivery thromboprophylaxis. In the comparison of heparin (either low molecular weight heparin or unfractionated heparin) with placebo/no treatment, there were no differences in symptomatic thromboembolic events (relative risk, 1.30; 95% confidence interval [CI], 39.0–4.27), symptomatic pulmonary embolism (relative risk, 1.10; 95% CI, 0.25–4.87), or symptomatic deep vein thrombosis (relative risk, 1.74; 95% CI, 0.23–13.31). Importantly, in this metaanalysis, there were few studies that enrolled a relatively small number of patients who were generally not of high methodologic quality. In addition, there were no included studies that compared mechanical with pharmacologic thromboprophylaxis or mechanical methods with placebo/no treatment.<sup>54</sup>

One recent study from a large health system compared rates of post-cesarean delivery pulmonary embolism deaths in the time period before a universal policy for pneumatic compression stockings to the time period after implementation. There was a significant reduction in death from post-cesarean delivery pulmonary embolism between these 2 time periods (7/458,097 cesarean births before implementation vs 1/456,880 cesarean births after implementation;  $P=0.38$ ).<sup>55</sup>

### Summary and recommendation

(1) Pneumatic compression stockings should be used to prevent thromboembolic disease in patients who undergo cesarean delivery. (Evidence level: low; recommendation grade: strong.) (2) Heparin should not be used routinely for venous thromboembolism prophylaxis in patients after cesarean delivery. (Evidence level: low; recommendation grade: weak.)

### 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. There are no available data to judge whether early mobilization improves outcomes after cesarean delivery.<sup>56</sup>

Early mobilization is often part of a surgical bundle “fast track” or “enhanced recovery after surgery” (ie, ERAS). These bundles include extensive preoperative counseling, improved preoperative nutrition, improved pain relief along with rapid postoperative diet resumption, and early mobilization. This bundle of care has not been evaluated in patients after cesarean delivery. Additionally, there are no randomized controlled trials of this process in gynecologic patients. A recent Cochrane review of this bundled approach in colorectal surgery patients included 4 small randomized trials of low quality. Complications were reduced with the ERAS process, although not because of a reduction in major complications. The review concluded that quantity and quality of the data in this population are low and that ERAS should not be adopted universally based on these data. It is important to note that, in addition to these studies being done on patients very different from obstetrics patients, the effects of the individual components of the bundle cannot be separated analytically.<sup>56</sup>

### Summary and recommendation

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.<sup>57</sup> However, urinary tract infection is 1 of the most common complications after cesarean delivery.<sup>58–61</sup> Indwelling urinary catheters can increase the incidence of urinary tract infection, urethral pain, and difficult voiding. These complications result in delayed ambulation, prolonged hospital stay, and increased costs.

In 2003, Ghoreishi<sup>57</sup> conducted a prospective study with 270 patients who underwent cesarean delivery. The results indicated that placement of a urinary catheter during cesarean delivery did not improve surgical exposure of the lower uterine segment or reduce injury to the urinary tract. Patients without indwelling urinary catheters had a shorter mean ambulation time and length of hospital stay. In a non-randomized clinical trial with 344 patients, Senanayake<sup>62</sup> demonstrated that there was low incidence of postoperative urinary retention after cesarean delivery in patients without an indwelling urinary catheter.

In a prospective study, 420 patients who underwent elective cesarean delivery were assigned randomly into a noncatheterized group or a catheterized group (the catheter was removed 12 hours postoperatively).<sup>63</sup> The study reported that mean time to patient ambulation, first postoperative voiding, oral rehydration, bowel movement, and length of hospital stay were significantly less in the noncatheterized group ( $P<0.001$ ). Even though the urinary catheter was removed 12 hours after surgery, the incidence of urinary tract infection was significantly higher (5.7% vs 0.5%;  $P<0.001$ ). A systemic review (2 randomized controlled trials and 1 nonrandomized controlled trial) concluded that urinary catheter usage is associated with higher rates of urinary tract infections.<sup>64</sup> Urinary catheter does

not reduce postoperative urinary retention or decrease intraoperative surgical difficulties.<sup>64</sup>

In another prospective randomized clinical trial of immediate (n=150) vs 12-hour (n=150) removal of the urinary catheter in women who undergo elective cesarean delivery, the incidence of postoperative bacteriuria, dysuria, burning on the micturition, urinary frequency and urgency, the time till the first voiding, mean postoperative ambulation time, and length of hospital stay were significantly lower in the immediate urinary catheter removal group.<sup>65</sup>

A Cochrane review (5 randomized controlled trials with 1065 patients) showed that the use of urinary catheters in patients who underwent cesarean delivery was associated with increased time to first voiding, higher incidence of discomfort because of catheterization, delayed postoperative ambulation, and prolonged stay in hospital.<sup>66</sup>

### Summary and recommendation

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.)

## Postoperative/Postpartum Mother Pathway (Focused Element)

### Discharge counseling

There is limited research on specific optimal discharge counselling for women after cesarean delivery. However, active surveillance of complications after discharge after cesarean delivery suggests that surgical site infections occur in approximately 10% of patients, >80% of which develop after discharge,<sup>67</sup> which indicates a need for women to be provided with comprehensive information on the normal discharge course, signs and symptoms of infection, activity restrictions, and instructions on when to seek medical attention. The Perceived Readiness for Discharge After Birth Scale is a validated tool that may help clinicians to identify patients who are at increased risk of problems after discharge.<sup>68</sup> Web-based opportunities

have been explored, but there are not extensive support data at present.<sup>69</sup>

Looking at what can be learned from other areas, a systematic review of 30 randomized controlled trials that have evaluated discharge planning across multiple patient groups and medical specialties found that overall discharge planning may lead to a small reduction in length of stay, a reduced risk of readmission for some patient groups, and increased satisfaction for both patients and health professionals.<sup>70</sup> With a focus exclusively on surgical patients, 2 trials reported a nonsignificant reduction in length of stay (−0.06 days; 95% CI, −1.23 to 1.11); 1 trial reported a nonsignificant difference in readmission rates (+3%; 95% CI, −7 to 13%).<sup>70</sup> Additionally, a prospective before-and-after study of 1219 patients found that compliance with discharge instructions in the emergency department was increased from 26.2% to 36.2% (odds ratio, 1.59; 95% CI, 1.2–2.1) with the provision of standardized written information that included information on the diagnosis, medication dosage and length of treatment, potential medication side-effects, and suggested time and location of out-patient clinic follow up.<sup>71</sup>

### Summary and recommendations

Standardized written discharge instructions should be used to facilitate discharge counselling. (Evidence level: low; recommendation grade: weak)

### Comment

The ERAS cesarean delivery guideline/pathway has created a pathway (for scheduled and unscheduled surgery starting from 30–60 minutes before skin incision to maternal discharge) with 5 pre- elements (8 recommendations); 4 intraoperative elements (9 recommendations); 9 postoperative elements (11 recommendations, which are the focus of this document); and 1 neonatal element (6 recommendations).

The maternity clinical care area has complex pathways, but there are increasing risk management factors that are related to obstetric comorbid medical, genetic, surgical, and lifestyle factors. More prospective and quality

assessment/improvement research, evaluation, audit, and collaboration will be required for enhancement of the maternal and fetal health outcomes, quality, and safety. ■

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emergency department referral: the effect of computerized discharge instructions. *Ann Emerg Med* 1993;2:819–23.

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### Author and article information

From the Department of Obstetrics & Gynecology, Washington University in St Louis, St. Louis, MO (Dr Macones); the Department of Obstetrics & Gynecology, Oregon Health & Science University, Portland, OR (Drs Caughey, Metcalfe, Nelson, and Wilson); the Department of Obstetrics & Gynecology, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada (Dr Wood); the Sheffield Teaching Hospitals Trust, Royal Hallamshire Hospital, Glossop Road, Sheffield, United Kingdom (Dr Wrench); the Anesthesiologists of Greater Orlando, Orlando, FL (Dr Huang); the Division of Pediatrics, Department of Clinical Science, Intervention and Technology, Karolinska Institutet, Stockholm, Sweden (Dr Norman); the Division of Obstetrics, Department of Clinical Science, Intervention and Technology, Karolinska Institutet, Stockholm, Sweden (Dr Pettersson); the Department of Anaesthesia, Royal Surrey County Hospital, Egerton Road, Guildford, United Kingdom (Dr Fawcett); the Departments of Anesthesiology and Intensive Care, Alzahra Hospital, Dubai, United Arab Emirates (Dr Shalabi); the Department of Medicine, University of Alberta, Edmonton, Alberta, Canada (Dr Gramlich).

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Corresponding author: George A. Macones, MD. [maconesg@wudosis.wustl](mailto:maconesg@wudosis.wustl)