

Better late than never: why obstetricians must implement enhanced recovery after cesarean



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Enhanced recovery after surgery (ERAS) has become the standard for perioperative care in numerous surgical specialties.⁴ ERAS is a comprehensive, interdisciplinary, protocol-based approach to the patient's entire surgical journey, beginning at the preoperative visit and extending into the postoperative period. ERAS has been reviewed extensively in the literature.^{4–9} Briefly, the goal of ERAS is to help patients return to physiological functioning as quickly as possible through a series of evidence-based interventions combined into a single protocol (see [Table](#) for key components of ERAS).

ERAS began in colorectal surgery and has gradually been incorporated into numerous other surgical specialties including general surgery, breast surgery, urology, and more recently gynecological oncology and general gynecology.^{5–8} Across many specialties, ERAS has been shown to address the so-called triple aim: improving quality of care while decreasing costs and increasing patient satisfaction.⁹

The most common major abdominal surgery in the world, cesarean delivery, has been late to join the ranks of ERAS

THE PROBLEM: Amid the outcry over high cesarean delivery rates, there has been less attention on improving perioperative outcomes for these women.^{1,2} The international cesarean delivery rate reached an unprecedented high of 21% in 2015; even higher rates were observed in the United States (32%) and United Kingdom (26%).³ Women who undergo cesarean delivery face unique challenges in the postpartum period as they recover from major abdominal surgery while also caring for an infant.

A SOLUTION: Enhanced Recovery After Surgery (ERAS) is a standardized, evidence-based, interdisciplinary protocol that has been successfully used in other surgical specialties to improve quality of perioperative care and patient satisfaction while reducing overall health care costs. ERAS for cesarean delivery and other standardized care protocols have the potential to reduce disproportionately high rates of maternal morbidity and mortality in the United States and limit the negative impact of postpartum opioid prescribing by ensuring all patients, regardless of demographics or location, receive the same level of high-quality peripartum care.

specialties. ERAS society guidelines for cesarean delivery were not introduced until 2018, and to date, there are no completed randomized controlled trials of ERAS for cesarean delivery protocols in the literature.^{10,11}

A handful of European trials have been conducted in recent years, predominantly in France and the United Kingdom, with demonstrable improvement in length of stay, ambulation, time to oral intake, and patient autonomy.^{12–16} Studies have shown no increase in readmission rates in spite of decreased hospital stay, with urinary retention (resolved with simple straight catheterization) the only noted complication.^{12,13} Surveys of maternity care providers and anesthesiologist in the United Kingdom, France, and Serbia suggest ERAS protocols are feasible and acceptable for providers, although they are not universally implemented at this time.^{16–20}

With the recent publication of the ERAS Society guidelines, hospitals now have scientific supportive data for improving the perioperative experience for patients undergoing cesarean delivery in addition to providing more standardized care for these women.^{12,13} Many existing ERAS principles are endorsed in

these new guidelines, with the addition of pregnancy and postpartum-specific elements: to improve protocol implementation and foster success, it is crucial to address the unique aspects of simultaneously recovery from surgery and caring for a newborn ([Table](#)).

ERAS for cesarean delivery may afford unique advantages in the postpartum period during which women face not only the burden of surgery but also new motherhood. ERAS is even more crucial now with 3 main trends in peripartum care: the persistently high cesarean delivery rate; the emphasis on high-quality bundled care to reduce maternal morbidity and mortality; and an increased focus on preventing harms of unrestricted opioid prescribing. In this paper we will review the principal arguments for adopting ERAS for cesarean delivery.

Improving quality of care for cesarean deliveries

Likely persistence of high cesarean delivery rates. The international cesarean delivery rate is high and does not show signs of decreasing³; thus, it is even more important now that we provide the highest level of perioperative care to ensure improved recovery.²² The

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TABLE
Components of an ERAS for cesarean protocol

Protocol component ^a	Focused pathway ^b	Optimal pathway ^c
Antepartum		
Preoperative education for all women, regardless of anticipated mode of delivery		X
Optimization of comorbidities		X
Preoperative		
Recommendation against cesarean delivery for nonmedical indications	X	X
Informed consent for cesarean delivery	X	X
Decreased fasting		X
Light meal up to 6 h preoperatively		
Clear fluids up to 2 h preoperatively		
Oral carbohydrate drink		X
2 h preoperatively, nondiabetic patients		
Omission of bowel preparation		X
Shower using antimicrobial soap prior to admission		X
Administration of antacid and H2 blocker	X	X
Avoidance of preoperative sedation	X	X
Preoperative analgesia		X
Prophylactic antibiotics 30–60 min before skin incision	X	X
All women: first-generation cephalosporin		
Women with labor/ruptured membranes: add azithromycin		
Chlorhexidine-alcohol scrub on abdomen	X	X
Vaginal preparation with povidone-iodine solution	X	X
Intraoperative		
Perioperative normovolemia	X	X
Multimodal anesthesia	X	X
Regional anesthesia (intrathecal morphine)		
Limited opioids		
Limited use of NG tubes/drains	X	X
Temperature monitoring	X	X
Active warming	X	X

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(continued)

unreasonably high patient expectations, the medicolegal environment, and failures of technology to accurately predict successful vaginal delivery or fetal risk during labor. They conclude that cesarean delivery will remain the perceived safer delivery option for labor so long as these forces persist.

While we believe continued focus on decreasing the cesarean delivery rate is crucial, it is also apparent that cesarean delivery will continue to be a common abdominal surgery internationally and a necessary tool for obstetrician gynecologists. For this reason, we believe efforts to improve perioperative cesarean care are crucial for obstetric patients.

Improved maternal outcomes and experience

Obstetrics differs from other surgical specialties in two key ways: the surgery is often unplanned and women who deliver face the challenges of new motherhood in addition to postoperative recovery. Because cesarean deliveries are often not expected, preoperative planning is difficult. Despite the high cesarean rate, many women find themselves unexpectedly postoperative rather than simply postpartum.

The new ERAS Society guidelines provide two pathways to address this common but sometimes unanticipated and sometimes planned operation: (1) the focused pathway for all cesarean deliveries starting from the decision to operate and (2) an optimized pathway for planned cesarean deliveries, beginning in the antepartum period. The focused ERAS pathway can be easily implemented for all cesarean deliveries, including those that are unplanned or emergent, making the intraoperative and postoperative components universally accessible to all women, regardless of when the decision for cesarean delivery is made.

Unexpected surgery may come with additional physical and emotional burdens. Women who undergo unplanned cesarean delivery may experience an additional set of physical demands and exhaustion in addition to concerns about the health of their newborn child. Unplanned cesarean delivery has also

cesarean delivery rate began to climb significantly in 1996 and has plateaued at nearly one fifth of delivering women internationally in spite of numerous attempts by key stakeholders including the American College of Obstetricians and Gynecologists, Society for Maternal-

Fetal Medicine, American College of Nurse-Midwives, World Health Organization, and others to lower cesarean delivery rates.^{10,22–24}

In fact, Clark et al¹ suggest that 3 forces in addition to physician control are largely responsible for these high rates:

TABLE
Components of an ERAS for cesarean protocol (continued)

Protocol component ^a	Focused pathway ^b	Optimal pathway ^c
Operative technique	X	X
Pfannenstiel incision		
Blunt expansion of the hysterotomy		
Two-layer hysterotomy closure		
No closure of peritoneum		
Reapproximate subcutaneous tissue if >2 cm		
Subcuticular suture closure of skin		
Neonate pathway		
Delayed cord clamping	X	X
Term: at least 1 min		
Preterm: at least 30 s		
Skin to skin/breast-feeding in OR	X	X
Measure and maintain infant body temperature	X	X
Avoid neonatal airway suctioning	X	X
Avoid supplementation with oxygen	X	X
Capacity for immediate neonatal resuscitation	X	X
Postoperative		
Postoperative nausea/vomiting prophylaxis	X	X
Early oral intake	X	X
Early mobilization	X	X
Early removal of intravenous lines	X	X
Early removal of urinary catheter	X	X
Multimodal opioid-sparing analgesia	X	X
Postoperative education	X	X
Postpartum specific		
Lactation consult	X	X
Contraceptive counseling	X	X
Postpartum depression screening, education, and referral	X	X

NG, nasogastric; OR, operating room.

^a Adapted from Caughey et al.¹⁰ Wilson et al.¹¹ and Ituk 2018²¹; ^b The focused pathway begins with the decision to operate (30–60 min before incision) and continues through hospital discharge; ^c The optimized pathway begins at 10–20 wks and includes multidisciplinary care and education throughout the pregnancy and delivery episode through hospital discharge. Patients not planning cesarean delivery may be included in the optimized pathway if they are medically complex and at high risk should they need a cesarean delivery.

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been associated with emotional consequences including negative birth experience, depression, and in the event of emergent delivery, posttraumatic stress disorder.^{25–27}

Prior studies in other specialties have demonstrated that patients who

prepare for surgery through education and psychological counseling have better experience with their procedures.^{17,28,29} By definition, women undergoing unplanned surgeries are not afforded this luxury of preparation. Standardized protocols have the

potential to improve patient experience by defining expectations in an uncertain time.

Even when cesarean deliveries are planned, patients must face the challenges of the postoperative period with the responsibilities of parenthood, caring not only for themselves but also their new infant while recovering from major abdominal surgery. In addition to routine activities like ambulating and voiding that all postoperative patients have to address, additional postpartum activities like diaper changes and breast-feeding require mobility and position changes that can be uncomfortable and also cause sleep disruption.

Efforts to improve postoperative recovery have the potential to improve mother-infant bonding, breast-feeding, and even postpartum depression, which have been shown to be adversely affected by poor control of postoperative pain.^{26,30,31} These additional demands make enhanced recovery even more relevant in the population.

Women who undergo cesarean delivery experience challenges beyond pain management. Cesarean delivery has been linked with maternal postpartum depression and mood disorders, which are associated with poorer maternal functioning after delivery.^{26,30} Potential long-term effects on the infant include impaired cognition, neurological functioning, and social-emotional growth.²⁶

European studies of ERAS have demonstrated that these protocols improve perioperative experiences, maternal satisfaction, and maternal-infant bonding, suggesting some aspects of the protocol may mitigate the negative impact of the surgical episode.³² Skin-to-skin contact in the operating room and faster return to physiological function are potential contributors, although more work is needed to understand this relationship.^{31,32}

Promise of incorporating ERAS into new bundled care options to decrease maternal morbidity and mortality, reduce disparities, and decrease costs

Rates of maternal mortality have continued to climb in the United States,

with greater than half of these deaths occurring in the postpartum period and a disproportionate number affecting black women.^{33,34} Leading experts report greater than half of maternal deaths are preventable and suggest variations in practice as potential sources of disparate outcomes.³⁴ These variations and outcomes demonstrate the need for the standardization of practice to ensure every woman receives high quality of care, no matter her demographics or geographic location.

The Alliance for Innovation in Maternal Health has developed 10 evidence-based patient safety bundles to guide perioperative care.³⁵ Notably, however, these guidelines do not include recommendations for standardized perioperative care following cesarean delivery. Perioperative care pathways have been used in other surgical specialties to ensure all patients receive high-quality services. Implementation of ERAS for cesarean delivery would fill a current gap in standardizing practices with an expectation of reduced postoperative surgical morbidity and potentially maternal mortality.

One contributor to maternal morbidity and mortality is postcesarean infection, which occurs following 3–15% of cesarean deliveries.^{36,37} ERAS protocols have demonstrated significant improvements in postoperative infections, including surgical site infections (SSI): a meta-analysis of 36 studies evaluating ERAS in diverse surgical specialties reported an overall decrease in hospital-acquired infections.³⁸ Specifically, improvements were seen in lung infection (relative risk [RR], 0.38, confidence interval [CI], 0.23–0.61, $P < .001$), urinary tract infection (RR, 0.42, CI, 0.23–0.76, $P = .004$), and SSI (RR, 0.75, CI, 0.58–0.98, $P = .04$) following protocol implementation.

The theoretical mechanism of these decreased infection rates includes standardized care practices, routine use of perioperative antibiotic regimens, early mobilization, and removal of lines. Unlike strategies targeted at a single element of care, for example, improving antibiotic administration at the time of surgery, ERAS works through improving all

parts of the perioperative process. This process has been deemed the aggregation of marginal gains: improving each component of the perioperative process leads to additive benefits beyond the individual modifications.³⁹ While changes in infectious morbidity following ERAS for cesarean delivery are unknown at this time, it is reasonable to expect similar improvements based on current studies.

ERAS may also reduce disparities in perioperative care by limiting the potential for implicit bias through standardizing protocols.⁴⁰ In colorectal surgery, racial disparities in patients' length of stay were reduced following implementation of an ERAS protocol.^{41,42} These studies suggest that a focus on process improvements could be a tool in a much broader based effort to improve health care equity.⁴⁰

Standardized care protocols like ERAS also have the potential to address high costs in health care, predominantly by reducing length of stay.^{6,7} These cost savings have been demonstrated in multiple specialties including obstetrics, gynecology, and gynecological oncology through reducing recovery time leading to early discharge.^{6,7,10,43}

In obstetrics, ERAS protocols have facilitated next-day discharge without increase in readmissions rates, with up to 25% of patients leaving the hospital the day after cesarean delivery.^{43,44} Reduction in length of stay by just 1 day in the United States could represent significant cost reductions for the more than 1 million women who deliver by cesarean each year.³³

Potential of ERAS to prevent opioid persistence

The opioid epidemic remains a leading cause of death in reproductive-age individuals in the United States, and drug overdose deaths nearly tripled during 1999–2014. In 2014, there were 47,055 drug overdose deaths in the United States, and 28,647 (60.9%) involved an opioid.⁴⁵ It is estimated that between 14% and 21% of patients filled an opioid prescription during pregnancy.⁴⁶ Postoperative opioids are frequently prescribed following cesarean delivery, and

approximately 1 of 300 women will become persistent users after the postoperative period if an opioid is prescribed.⁴⁷

Several risk factors for opioid persistence are well documented in the literature, including receipt of a postoperative prescription, prescription size, concurrent pain diagnosis, other substance abuse disorder, and mood disorders.^{47,48} Because postoperative prescribing is a known risk factor for opioid persistence, the American College of Obstetricians and Gynecologists released recommendations for a stepwise approach to pain control based on the World Health Organization model.⁴⁹ ERAS, with its focus on opioid-sparing pain regimens and patient support, can begin to address opioid use, maximizing patient coping with supportive pharmacological strategies.

Other studies have demonstrated successful reductions in opioid use through patient-specific interventions. Notably, these protocols have focused on patient-level intervention through shared decision making or tailored prescribing, placing the onus on providers to reach every patient individually.^{32,33} In contrast, ERAS protocol implementation has allowed for similar results with significantly less burden to individual providers through standardized prescribing.^{48,50} The combination of preoperative pain management education with opioid-sparing postoperative pain protocols and standardized discharge prescriptions has been a successful strategy in other surgical specialties and could be adopted in obstetrics.^{48,51}

Of note, limited opioid prescribing following cesarean delivery has been usual practice in most European studies since before the recommendation for ERAS protocols.⁵² Increased pressure for achieving patient satisfaction as well as different perspectives on the management of acute pain have contributed to the United States being an international outlier in opioid prescribing following delivery.⁵³ Because differences are unlikely the result of pain requirements, standardized protocols for pain management like ERAS are one method of ensuring that all women have access to

adequate pain control while reducing the harms of opioid exposure.

Conclusion

Enhanced recovery after surgery for cesarean delivery is a promising intervention to address many pressing needs in obstetrics. ERAS provides a mechanism to standardize care for the over 2.1 million women who undergo cesarean delivery each year.² Widespread implementation of ERAS is an acknowledgment of the unique experience of women who face the challenges of being simultaneously postpartum and postoperative, balancing their personal and their infants' needs.

It is also a recognition of the need for bundled to care to reduce maternal morbidity and mortality while addressing care disparities and costs. Perhaps most importantly, ERAS helps ensure that every woman, regardless of her demographics or location, can receive the same level of high-quality peripartum care.

ERAS for cesarean delivery is just one example of potential peripartum protocols for all women giving birth. Enhanced recovery after birth could be considered for women with postpartum complications like third- and fourth-degree lacerations or as part of routine practice for optimizing the postpartum period. In fact, ERAS is just one step toward developing effective care pathways across pregnancy.

Several barriers to ERAS implementation will need to be addressed to facilitate widespread protocol adoption. First, ERAS protocols depend on shifting some elements of care from the inpatient to the outpatient setting, such as patient preparation, education, and postoperative follow-up.^{8,11} Developing more robust connections between care settings may take time but will overall strengthen coordination across the system.

Second, ERAS is designed for planned surgeries; however, in obstetrics, even planned cesarean deliveries may not occur as scheduled if emergency cases lead to delays.⁵⁴ Adopting ERAS principles to the uncertain environment of labor and delivery requires flexibility from health care providers and patients

alike. Incorporating the two ERAS paths, focused and optimal, will allow for more rapid uptake of the protocol, and facilitate its dissemination through making the protocol more accessible even in less-than-perfect circumstances.¹¹

Finally, like any new initiative, implementation of ERAS requires champions who are passionate and knowledgeable about the protocol. We hope that this article will inspire key stakeholders to advocate for ERAS pathways in their own units. In turn, openly sharing protocols and patient education tools could lower the bar to entry for other groups hoping to implement ERAS for obstetrics without reinventing the wheel. For that reason, we have shared our own institution's protocol and encourage others to do the same (see [Appendix A](#)).

ERAS for cesarean delivery has been shown to be effective in observational studies, and a randomized controlled trial (NCT03552822) for ERAS following cesarean delivery is currently underway. While some might argue for delaying widespread implementation until randomized controlled trial data are available, we believe the abundance of evidence for each protocol element, as well as the robust evidence from other fields, give sufficient demonstration of protocol efficacy, effectiveness, and benefit. Close assessment of outcomes, including length of stay, readmission rates, and patient-centered measures like satisfaction, should be included in any new protocol implementation to monitor for unintended consequences. Still, ERAS implementation should not be delayed.

Childbirth should be a positive event in a woman's life, not the event that derails it. ERAS can help women return to physiological functioning and start a new chapter in their lives as unencumbered by medical burdens as possible. ■

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ABSTRACT

Better late than never: why obstetricians must implement enhanced recovery after cesarean

Despite persistent concerns about high cesarean delivery rates internationally, there has been less attention on improving perioperative outcomes for the millions of women who will experience a cesarean delivery each year. Enhanced recovery after surgery, a standardized, evidence-based, interdisciplinary protocol, has been successfully used in other surgical specialties including gynecology to improve quality of care and patient satisfaction while reducing overall health care costs through reduced length of stay. Enhanced recovery after surgery society guidelines for cesarean delivery were just released in August 2018. Obstetric patients, who face the dual challenge of being postpartum and postoperative, could benefit greatly from protocols that optimize their return to physiological function and reduce surgical morbidity. Although enhanced recovery after surgery has been widespread in other surgical specialties, uptake of this protocol in obstetrics has lagged behind. We believe enhanced recovery after surgery for

cesarean delivery can effectively address 3 challenges faced by obstetrician/gynecologists. These are: (1) improving care for the high number of women undergoing cesarean deliveries; (2) using evidence-based care bundles to prevent maternal morbidity and mortality, address disparities, and reduce costs; and (3) limiting postoperative opioid prescribing in response to the opioid crisis. Enhanced recovery after surgery for cesarean delivery and other standardized care protocols have the potential to reduce the disproportionately high rates of maternal morbidity and mortality in the United States, and ensure all patients, regardless of demographics or location, receive the same level of high-quality peripartum care.

Key words: cesarean delivery, enhanced recovery after surgery, maternal morbidity, recovery, surgical morbidity