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Introduction of Enhanced Recovery After Cesarean Section (ERAC) Protocol

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Executive Summary

Introduction of the Problem

Cesarean section is one of the most performed in-patient surgeries worldwide (Wilson et al., 2018; Liu et al., 2020). Global births by cesarean section increased by 85.6 % between 2000 and 2015 (UNICEF, 2019). In the United States, cesarean section has remained high, above 31%, while the birth rate has consistently decreased 2% per year (Martin et al., 2019). Cesarean section rates remained high, above 30% in Illinois as well (Hamilton et al., 2021). With the increasing rate of cesarean section procedures performed, there is a need for improved surgical and anesthesia care to mitigate the physiological stressors of surgery and to promote maternal and neonate wellbeing (Gramlich et al., 2017).

The Enhanced Recovery After Surgery (ERAS) program is an evidence-based, multidisciplinary care pathway to optimize patient care through the perioperative period by reducing surgical stress and expediting recovery (Elisa, 2017). ERAS provides a platform for all providers involved with the patient to develop a collaborative plan of care, addressing every aspect for maximum optimization (Ljungqvist, 2014). Dr. Kehlet Henrick, a colorectal surgeon, postulated ERAS in 1997 (Liu et al., 2020). The ERAS program has since gained popularity across various medical specialties as a cost-effective means of maximizing patients' safety and satisfaction (Ljungqvist, 2014; Mullman et al., 2020).

The Society of Obstetric Anesthesia and Perinatology (SOAP) adopted Enhanced Recovery After Cesarean Section (ERAC), the cesarean version of ERAS, in 2019 to provide all expecting women a standardized, evidence-based, multidisciplinary care pathway promoting swift recovery while improving maternal and neonatal outcomes (SOAP, 2019). A community hospital in central Illinois routinely performs cesarean deliveries without ERAC protocol. The

hospital seeks recommendations for the best anesthesia care for cesarean patients. This project aims to introduce the ERAC protocol to this hospital.

Literature Review

The literature review presented ERAC/ERAS protocols divided into three perioperative care phases – preoperative, intraoperative, and postoperative. Anesthesia care is a continuum across all three phases of care (Lukyanova & Reede, 2015).

The preoperative phase focused on patient education, prophylaxis for aspiration, antibiotic administration, and management of hypotensive-bradycardic episodes (SOAP, 2019). Patient education decreases fear, anxiety, improves patients' compliance, and promotes early discharge (Nelson et al., 2015; SOAP, 2019). Aspiration of gastric contents is an important concern with obstetric anesthesia (Hunie et al., 2021). Complications of gastric aspiration are reduced by preoperative administration of nonparticulate antacids and histamine H2 antagonists (Hunie et al., 2021; Wilson et al., 2018). Multiple studies have demonstrated decreased postoperative insulin resistance, hypoglycemia, gastric fluid volume, vomiting, and increased gastric pH when the patient consumed an oral carbohydrate drink and was allowed clear liquids two hours before, and solid low-fat food six hours before scheduled cesarean section procedures (Itou et al., 2012; Li et al., 2019; Nelson et al., 2015; Wilson et al., 2018; and SOAP, 2019). Also, a systematic review and meta-analysis of six randomized controlled trials (RCTs) showed a reduction in early Post Operative Nausea and Vomiting (PONV) with metoclopramide administration (Mishriky & Habib, 2012). Spinal anesthesia has roughly an 80% incidence of hypotension and bradycardia in obstetric patients (Sahoo et al., 2012). The Bezold-Jarisch Reflex (BJR) elicited by stimulating the 5-hydroxytryptamine type 3 (5-HT3) serotonin receptors causes bradycardia, while decreased vascular resistance causes spinal induced hypotension (SIH)

(Sahoo et al., 2012). Ondansetron administered before spinal anesthesia attenuates SIH and bradycardia by blocking the serotonin-induced BJR (Sahoo et al., 2012; Tubog et al., 2017). Cesarean surgical procedures carry approximately a 20-fold greater risk for maternal postpartum infection than vaginal birth (Smaill & Grivell, 2014). Studies have demonstrated the administration of prophylactic antibiotics prior to surgical incision reduces infection (Jyothirmayi et al., 2017; Smaill and Grivell, 2014; and Bollig et al., 2018). Cefazolin (Ancef) is the first-line prophylactic antibiotic to reduce surgical site infection. If the patient has a significant beta-lactam allergy, the recommendation is to administer the combination of clindamycin along with an aminoglycoside (AGOG, 2011).

A high percentage of anesthesia care is provided in the intraoperative phase, focusing on anesthetic techniques, stabilizing hemodynamics, multimodal perioperative analgesia, preventing IONV/PONV, and maintaining normothermia (SOAP, 2019). Spinal anesthesia is recommended for fast onset of sensory and motor blockade, and decreased intraoperative pain, risk of tracheal intubation, aspiration, lung infection, and fetal exposure to anesthetic drugs (Caughey et al., 2018; Li et al., 2020). Dexmedetomidine (DEX) is not approved by the Food and Drug Administration (FDA) for intrathecal purposes, yet has been demonstrated to provide fast onset and prolonged sensory and motor block (Li et al., 2020, Qi et al., 2016; Wu et al., 2014). Qi et al. (2016) demonstrated that IT DEX was equally as effective as ITM (Intrathecal morphine) without the adverse effects of opioids. ERAC protocols promote opioid-sparing analgesia. Combining analgesics from different drug classes provides better analgesia through synergistic effects (Ong et al., 2010). Though acetaminophen or NSAIDs (Nonsteroidal Anti-Inflammatory Drugs) alone are effective postoperative analgesics and reduce opioid consumption, yet scheduled administration of both provides better analgesia than either medication alone (Altenau

et al., 2017; Martinez et al., 2016; Ong et al., 2010; Ozmete et al., 2016; Singla et al., 2010).

Transversus Abdominis Plane Block (TAPb) and wound infiltration effectively control postoperative pain for patients with ITM allergy, chronic pain, and opioid use disorder (Adesope et al., 2016; Fusco et al., 2016; Nasir et al., 2019; Tan et al., 2012). According to Riemma et al. (2021), TAPb and wound infiltration are equally effective for managing postoperative pain.

PONV among cesarean patients under neuraxial anesthesia is about 80% (Tan & Habib, 2020). PONV risk predictors include the female gender, which by default applies to all cesarean patients, history of PONV, motion sickness, nonsmokers, and younger age (Apfel et al., 2012; Gan et al., 2014). Prophylactic treatment for PONV is initiated in the intraoperative phase.

Maternal hypotension is frequently associated with spinal anesthesia due to decreased systemic vascular resistance (SVR) (Mitra et al., 2013; Tawfik et al., 2014). The combination of administering intravascular fluids and vasopressors effectively treat SIH. Studies have demonstrated coloaded with crystalloids or preloading with colloids are equally effective in providing intravascular fluid volume expansion to prevent SIH (Fichter & Nelson, 2019). Studies by Chooi et al. (2020) and Lin et al. (2012) revealed phenylephrine and ephedrine are equally effective in managing SIH. Maternal heart rate is the critical factor in choosing between the two vasopressors. Neuraxial anesthesia has been shown to decrease maternal core temperature by 0.5 °C (32.9°F) to 1.0 °C (33.8°F) within one hour of spinal administration (Allen & Habib, 2018; Dendis & Hooven, 2020). Hypothermia negatively affects coagulation, surgical site infections, respiratory distress syndrome, hypoglycemia, shivering, oxygen consumption, pain, drug metabolism, and patient satisfaction (Allen & Habib, 2018; Dendis & Hooven, 2020). The literature review revealed by maintaining, an ambient room temperature of 23°C (72°F),

preoperative and intraoperative active body warming, IV and irrigation fluid warming all help to maintain normothermia throughout the perioperative period (SOAP, 2017; Bollag et al., 2020).

The postoperative interventions aim to reduce surgical stress and promote the return to the preoperative physiological state. Anesthesia care in this phase is the continuation of interventions initiated in the intraoperative phase. Long-acting IT opioids or IT DEX, NSAIDs, acetaminophen, TAPb, and wound infiltration provide postoperative multimodal analgesia (Macones et al., 2019). Opioids, oral and parenteral, are reserved for breakthrough and persistent pain (AGOA, 2018). Patients who experience ITM-induced pruritus are treated with IV nalbuphine or ondansetron, which are equally effective (Moustafa et al., 2016).

Project Methods

This quality improvement project had two goals. The first goal was to review medical literature for best practices concerning the components of existing ERAC programs, emphasizing anesthesia components. The second was to develop an ERAC protocol based on the outcome of the literature reviewed. Anesthesia providers of the community hospital were educated on the ERAC protocol.

The pre-presentation survey was analyzed to determine participants' basic knowledge of ERAC and prophylactic interventions for hypotension, hypothermia, and cesarean patient care. The post-presentation survey was used to evaluate participants' understanding of the goals, benefits, and components of the developed ERAC protocol.

On November 15, 2021, the Southern Illinois University Edwardsville's (SIUE) Institutional Review Board (IRB) per the Code of Federal Regulations (CFR) Section 46.102. considered this project a Quality Improvement Project (QIP). The community hospital approved the implementation of the project in the hospital. There was no threat to participants, and consent

was validated by completing the pre-presentation questionnaire. No personally identifiable information was captured in the questionnaire, and further measures were taken to provide participants anonymity.

Evaluation

Over half of the participants had less than five years of anesthesia care experience. New providers are building on their knowledge and gaining experience along the way, therefore, they are more likely to accept new protocols. This provided a fertile ground for disseminating new knowledge for improved care. Forty-four percent of the participants did not know about ERAC before the presentation. However, 100% of the participants indicated they would provide interventions recommended by the ERAC protocol after the presentation. Regarding analgesia, 100% of participants indicated opioid-sparing analgesia as the preferred method of perioperative pain control post-presentation compared to 67% before the presentation. Prior to the educational presentation, only 11% of providers administered ondansetron prior to administering the spinal to reduce hypotensive-bradycardic episodes. After the presentation, all participants indicated their readiness to administer ondansetron at least five minutes before spinal placement as prophylactic management of hypotensive-bradycardic episodes. Analyzing the questions that evaluated opioid-sparing analgesia, only 22% of participants administered Tylenol before surgery, 56% administered Toradol intraoperative, 22% administered ibuprofen, and 67% administered Toradol postoperatively before the presentation. However, after the presentation, 100% of participants would administer scheduled Tylenol, Toradol, and ibuprofen as opioid-sparing analgesia. None of the participants had ever administered IT DEX before the presentation. However, 100% of the participants indicated they would administer IT DEX after the presentation. It should be noted that the FDA has not approved DEX for intrathecal use. On

the question of administering LA (Local Anesthetic) analgesia through TAP block, none of the participants had experience in placing TAB blocks. However, after the presentation, all participants indicated their willingness to consider TAP block for postoperative pain management in selected patients. After the presentation, 100% of participants indicated they would administer at least four medical interventions compared to 67% pre-presentation for IONV/PONV. All participants accurately indicated ITM as the long-acting opioid for maximal postoperative pain control.

The most significant limitation of this project is the lack of time to assess the effects of the ERAC implementation on patient outcomes. The author would have wished to assess the effects of the ERAC protocol three months after implementation. Another limitation of this project is the lack of resources in the community hospital. During the presentation, it was revealed that IV acetaminophen (Ofirmev) is unavailable in the hospital. Also, peripheral blocks are not a routine standard of care within the scope of the CRNAs (Certified Registered Nurse Anesthetists) in the hospital.

Impact on Practice

This project aimed to create a standardized, evidence-based, multidisciplinary care pathway emphasizing anesthesia care to improve maternal and neonatal outcomes. The post-presentation survey analysis revealed an increase in anesthesia providers' knowledge of ERAC and readiness to adopt the developed ERAC protocol. Therefore, this project is seen as the first step in implementing standardized care that would be applied to all prospective patients.

Conclusion

The practice protocol met the goals of this quality improvement project. The first goal was to review the literature on the various components of the existing ERAC/ERAS protocol,

emphasizing anesthesia components. The second goal was to develop an ERAC protocol for the community hospital. The survey participants understood that adoption and compliance to the ERAC protocol would improve maternal and neonatal wellbeing and safety.

This project can be the basis for developing ERAS protocols for other surgical specialties of the community hospital to improve patient care and safety. This is especially important since it is one of only two hospitals that serve the area.