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Shivering in Postpartum Women:

Development of a Perioperative Protocol for Women Undergoing Cesarean Section

Lindsay Dawson, BSN, SRNA & Kara Peters, BSN, SRNA

Introduction of the Problem

According to the census data by the United States Department of Health and Human Services (US DHHS), in 2021, 1,175,545 births occurred via cesarean section; of those, 41,203 were in Illinois (US DHHS, 2023). Neuraxial analgesia or anesthesia, including epidurals, spinals, or combined spinal epidurals (CSE), are utilized to improve the birthing experience among women throughout the United States. Spinal anesthesia, however, is the most employed anesthetic technique for cesarean deliveries due to the dense and rapid onset of neural blockade (Hannallah, 2016). Spinal anesthesia is not without risk though. Postpartum shivering is a potential risk with any neuraxial procedure carrying an overall estimated incidence ranging between 40-80% following a spinal anesthetic (Feng et al., 2021). Postpartum shivering has been reported as anywhere from mild to debilitating and may have detrimental physical and emotional effects on the mother and newborn. Due to the unknown pathophysiology and multiple theories postulated, the treatment for postoperative shivering has yet to be standardized. Thus, the development of a perioperative protocol targeting preventative and corrective treatment strategies was initiated to improve patient outcomes and standardize obstetric patient care.

Literature Review

The exact pathophysiology of shivering following neuraxial anesthesia remains unclear. However, three main theories are presented in the current literature contributing to postoperative shivering: perioperative hypothermia, a neurohormonal response to delivery, and medications
administered in the perioperative setting (Lopez, 2018). The effects of postpartum shivering can range from mild to detrimental. Shivering increases oxygen consumption by up to 500% and, subsequently, the risk of myocardial ischemia, pain intensity, surgical site infections, coagulopathy, and additional adverse effects (Feng et al., 2021; Lopez, 2018; Nnacheta et al., 2020; Qi et al., 2022). Not only does shivering result in decreased patient comfort and satisfaction, but it also impairs maternal-newborn bonding (Jayaraj et al., 2019).

Two types of shivering exist, thermoregulatory and non-thermoregulatory (Lopez, 2018). Thermoregulatory shivering is most common and is associated with cutaneous vasoconstriction due to hypothermia. In contrast, non-thermoregulatory shivering is related to cutaneous vasodilation and pain (Lopez, 2018). Therefore, the risk of postpartum shivering following spinal anesthesia may be reduced by a combination of nonpharmacological and pharmacological treatment modalities targeting the two separate mechanisms. Nonpharmacological treatment options are largely preventative, while pharmacological treatment options are both preventative and corrective in nature.

Nonpharmacological interventions include warmed intravenous fluids, radiant heating, forced-air warming, and warmed cotton blankets (Lopez, 2018). Nonpharmacological interventions should be applied in the preoperative setting and continued throughout the perioperative experience. Applying warming methods 15 minutes prior to spinal blockade reduced the temperature gradient between the core and periphery. This gradient occurs from redistribution hypothermia following the sympathectomy associated with spinal anesthesia. Specifically, the simultaneous use of warmed intravenous fluids and forced-air warming yield the greatest efficacy in reducing postpartum shivering without adverse effects (Chung et al., 2012; Jun et al., 2019; Ni et al., 2020). With that, colloids are the superior fluid of choice in
reducing maternal and fetal hypothermia (Guzey & Turkyilmaz, 2022; Kinsella et al., 2018). When urgency negates the preemptive nonpharmacological interventions to be instituted, medications can be administered to prevent and treat the incidence of perioperative shivering.

Pharmacologic interventions include opioid agonists, serotonin antagonists, NMDA antagonists, and alpha receptor agonists (Abdel-Ghaffar & Moeen, 2019; Botros et al., 2018; Lopez, 2018; Sachidananda et al., 2018). Evidence-based research demonstrate prophylactic administration of intravenous phenylephrine at doses of 25-100 mcg/min (15-60 mL/hr) can lower the incidence of shivering without adverse effects (Palanisamy et al., 2022). Ondansetron, 8 mg IVP has proven effective at preventing shivering when administered prior to initiating spinal anesthesia (Nallam et al., 2017). Intramuscular administration of meperidine is another medication with proven efficacy to reduce shivering but should only be used as a last resort due to the untoward side effect profile (Khezri et al., 2018; Jayaraj et al., 2019; Subramani et al., 2020; de Witte & Sessler, 2002). Intrathecal administration of dexmedetomidine (5 mcg IVP) is an off-label use of the medication found to effectively reduce shivering in perioperative patients. Current evidence provides safe application of multiple pharmacological interventions available to help prevent and treat shivering in post-partum women after a cesarean section. Caution and additional larger studies are needed to better evaluate maternal and fetal risks with any off-label medication administration.

**Project Methods**

The development of this perioperative protocol for postpartum shivering utilized a nonexperimental, single group, posttest design for an evidence-based quality improvement initiative. Objectives included reviewing current evidence-based literature on the prevention and treatment of postpartum shivering, creating a facility specific perioperative algorithm, and
presenting the customized protocol to the obstetric staff. A PowerPoint presentation served as an educational module to increase knowledge and encourage protocol buy-in.

This project's setting was a tertiary regional medical center in central Illinois. A nonexperimental single group pre-and post-test was utilized to assess voluntary participants' content and treatment knowledge. Participants in the study included twenty-two obstetric nurses and seven certified registered nurse anesthesiologists.

This project was deemed exempt by Southern Illinois University Edwardsville’s Institutional Review Board (IRB). The project was a quality improvement design and did not include patient information or involve human subjects. Once exempt, the host facility approved the project.

**Evaluation**

Twenty-nine obstetric nurses and certified registered nurse anesthesiologists participated in the educational presentation. The years of professional experience ranged from zero to greater than twenty. The pre- and post-survey evaluations measured obstetric nurses and anesthesia providers’ knowledge of various interventions to prevent and/or treat postpartum shivering. The evaluation survey consisted of demographic information, multiple choice, select all that apply, true or false, and fill in the blank questions. The post-evaluation was collected following the educational PowerPoint presentation to assess the knowledge gained. Overall, participants improved their rates of correct responses. According to the analysis of survey responses, the educational PowerPoint presentation was an effective teaching instrument used to improve provider knowledge.

**Impact on Practice**
This project's purpose was to introduce a standardized evidence-based treatment protocol to decrease shivering and optimize the perioperative experience for obstetric patients. Prior to implementation, the host facility lacked a standardized approach to prevent and treat postpartum shivering in women receiving spinal anesthesia for cesarean sections. Numerous provider-specific techniques and non-standardized treatment options yielded various patient outcomes. According to the post-education results, participants supported the implementation of the perioperative protocol. Thus, a standardized, evidence-based protocol will provide obstetric staff with a pathway of preventive techniques, an algorithm for symptom management, and treatment options should the complication arise.

**Conclusion**

This project provided a standardized, accessible perioperative protocol with a myriad of preventive and corrective treatment modalities to help prevent the onset and severity of shivering. The project educated obstetric nursing staff and anesthesia providers on current practice guidelines and evidence-based treatment options for women undergoing cesarean sections with spinal anesthesia. With the creation of an evidence-based protocol, there will be a standardized treatment approach to patients at risk of postpartum shivering. The inclusion of this protocol can have a significant impact on positive patient outcomes, satisfaction rates, and overall care in the obstetric department at this facility.

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