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# Development of a Guideline to Reduce Spinal-Induced Hypotension and Related Nausea and Vomiting In Patients Undergoing Scheduled Cesarean Section

Peter Gillen, BSN, RN

## **Introduction to the Problem**

Scheduled cesarean sections are most often conducted under spinal anesthesia. This method is advantageous due to excellent analgesia for the parturient and limited amounts of medications crossing the placenta to the fetus, however, there is also maternal hypotension and subsequent nausea and vomiting associated with this technique. Nausea and vomiting places the parturient at risk for aspiration and also decreases satisfaction of the childbirth experience. Research has indicated prophylactic interventions can reduce the incidence of spinal-induced hypotension, and therefore, nausea and vomiting that often follows. By developing a guideline incorporating this research for a tertiary care center in Illinois, anesthesia providers will be educated on the most recent evidence-based practice to attenuate spinal-induced hypotension and apply these interventions to their practice to reduce the amount of both spinal-induced hypotension and the effect of nausea and vomiting during scheduled cesarean sections.

## **Literature Review**

A review of the literature was conducted to discover the most recent evidence-based practice regarding spinal-induced hypotension and methods to attenuate it. During the initial exploration of the problem, research showed that vomiting is a strong indicator of satisfaction in the perioperative period with patients ranking vomiting as the number one dissatisfying event ahead of both pain and awareness during anesthesia (Macario, Weinger, Carney, & Kim, 1999).

Research to combat the issue of spinal-induced hypotension has focused on the blockade of the Bezold-Jarisch reflex. The Bezold-Jarisch reflex is a cardiac inhibitory reflex that is

stimulated when there is a decrease in venous return to the heart. The decrease in venous return to the heart results in bradycardia and further hypotension in the patient. It is mediated by the vagus nerve which has 5-HT<sub>3</sub> receptors primarily; these receptors are also a key receptor in the chemoreceptor zone of the brain affecting nausea and vomiting (Campagna & Carter, 2003). Inhibition of the Bezold-Jarisch reflex can be accomplished by maintaining venous return to the heart leading to a preserved cardiac output, normotension, and less nausea and vomiting (Campagna & Carter, 2003).

Three interventions have been identified to support venous return and inhibit the Bezold-Jarisch reflex. These include sequential devices on the lower extremities, co-loading of crystalloid fluids, and prophylactic ondansetron (Tubog, Kane, & Pugh, 2017). Upon receiving a spinal anesthetic, the parturient has a drastic decrease in muscle tone in the lower extremities. The use of sequential devices simulates muscle contraction and facilitates blood pumping back to the heart (Cyna, Andrew, Emmett, Middleton, & Simmons, 2006). Co-loading of fluids involves the administration of 500 ml of crystalloid just before administration of the spinal and 500 ml immediately after administration of the spinal. This method of fluid administration is in contrast to preloading 1000 ml before administration of the spinal anesthetic. Research by Ni, Liu, Zhang Peng, and Ji (2017) showed a significant decrease in episodes of hypotension using the co-loading method compared to the pre-loading method. Finally, prophylactic intravenous ondansetron is administered to patients before administration of the spinal anesthetic. The ondansetron helps block the Bezold-Jarisch reflex through blockade of 5-HT<sub>3</sub> receptors on the vagus nerve (Tubog, Kane, & Pugh, 2017). It also blocks the 5-HT<sub>3</sub> receptors in the chemoreceptor zone which inhibits nausea and vomiting (Watcha & White, 1992). With the implementation of these three interventions, research has shown a decreased requirement of

vasopressors, decreased episodes of hypotension, and a decrease in the amount of nausea and vomiting (Tubog, Kane, & Pugh, 2017).

### **Project Methods**

This project utilized a non-experimental design to measure the implementation of a guideline to reduce spinal-induced hypotension and associated nausea and vomiting at a tertiary care facility in Illinois. The purpose was to educate anesthesia providers on the problem and offer solutions to the problem through the use of the guideline with the overall goal that providers would report fewer episodes of nausea and vomiting due to spinal-induced hypotension. A pre-test and post-test were administered to the anesthesia providers before and after the presentation of the guideline. After a one-month implementation period, the providers were asked to complete a brief survey. The survey used a six-point Likert scale and measured the effectiveness of the guideline.

The project was exempt from IRB approval through Southern Illinois University Edwardsville because it was a quality improvement project and was evaluating the providers and guideline without direct patient interaction. There was no identifying information collected from the providers. The research council approved the project at the tertiary care facility. Completion of the evaluation tools was voluntary and risks, such as loss of confidentiality, were minimal.

### **Evaluation**

The goal of the project was to reduce the episodes of hypotension and subsequent nausea and vomiting in patients undergoing cesarean section under spinal anesthesia. The literature review yielded data that supported the use of pre-operative ondansetron, co-loading of crystalloid fluids, and application of lower extremity sequential devices to minimize hypotension. Evaluation of the process was completed through the use of the pre-test, post-test, and post-

implementation survey. The pre-test confirmed providers were aware of the problem but there was a gap in knowledge regarding the most recent interventions to address the problem. The post-test scores indicated the providers were educated effectively and understood how and why the interventions improved patient care. The post-implementation surveys indicated that the anesthesia providers who used the guideline had improved patient results. These results included providers reporting a decrease in hypotensive episodes among patients, a decrease in the use of vasopressors for patients, and a decrease in nausea and vomiting for patients undergoing cesarean sections.

The most significant limitations to the project were lack of experimental data and sample size. The project lacked experimental and control groups and the guideline was developed through an extensive review of the literature. The small sample size can be attributed to the use of convenience sampling and the reliance on both subject availability and interest in completing the evaluation documents. With only eight participants in the pre-implementation period and three in the post-implementation period, the sample size does not allow for generalizability of the data.

### **Impact on Practice**

Through the pre and post-test results, it was clear the anesthesia providers were aware of the problem of spinal-induced hypotension but needed further education on how to reduce its incidence. This project succeeded in offering a solution to this problem. The participants indicated they were able to utilize the protocol for patients resulting in more favorable outcomes. The patients experienced less episodes of hypotension, and therefore less nausea and vomiting in the intraoperative period. This is advantageous for both the provider and patient as the provider does not have to treat hypotension and nausea, and the patient is more comfortable. The

surveys also indicated providers would continue to utilize the interventions suggested in future cesarean sections.

Moving forward, the participants may continue to use these interventions while also educating other anesthesia providers on ways to limit spinal-induced hypotension during cesarean sections. There is also the potential application of the interventions to other patients undergoing procedures under spinal anesthesia to reduce the incidence of spinal-induced hypotension. Unlike cesarean sections, other procedures often use sedation in addition to spinal anesthesia. These patients may not be able to verbalize the feeling of nausea, but a reduction in spinal-induced hypotension may be observed by the anesthesia provider. The overall results from this project are encouraging and the project could be replicated at other institutions with the hope of similar results and larger sample size.

### **Conclusion**

Anesthesia providers have identified spinal-induced hypotension with subsequent nausea and vomiting to be a problem for cesarean section patients. Although recent evidence supports prophylactic ondansetron, co-loading of fluids, and the use of lower extremity sequential devices, there is still a knowledge gap among providers and implementing these interventions. While the results of the surveys showed positive outcomes, the small sample size does not permit for generalizability of the data and further research should be conducted to confirm the results from the project.

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