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# Dexmedetomidine as an Adjunct Therapy to Neuraxial Anesthesia in Labor and Delivery

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**Title**

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**Introduction to the Problem**

In 2011 the Center for Disease Control (CDC) declared opioid abuse an epidemic. In 2017 it was declared a public health emergency. The practice of anesthesia and many other medical specialties have placed a priority on limiting the administration of opioids to help combat this crisis. In the practice of anesthesia, techniques such as opioid-sparing, opioid-free, peripheral nerve blocks, and neuraxial blocks have become the preferred choice to limit the exposure of patients to opioids when it is appropriate.

In labor and delivery, neuraxial anesthesia has been used for over a hundred years to provide pain relief for parturients. Although many alternatives have been studied, opioids are the most frequently used local anesthetic adjuvants and their use in neuraxial blocks has evolved over the last 50 years (Swain et al., 2017). While neuraxial opioids have proven to be an effective adjunct for pain relief, they are associated with undesirable side effects as well as the exposure of the patient to the opioid itself. With the push for opioid-free techniques, researchers searched for non-narcotic alternatives that can provide the same benefits as their narcotic counterparts. Dexmedetomidine (DEX) is an opioid-free, selective alpha-2 agonist that has been shown to be equal to, and in most cases, superior to opioid additives in neuraxial blockade (Qi et al., 2016).

## Literature Review

Neuraxial opioids are associated with side effects that can cause a great deal of discomfort to parturients, and in some cases these side effects can be lethal. While many other side effects have been described, the four classic side effects are pruritus, nausea and vomiting, urinary retention, and respiratory depression. DEX is not associated with any of these side effects. The relatively small side effect profile of neuraxial DEX makes it a desirable non-narcotic alternative to opioids. The most common adverse reactions associated with neuraxial DEX are prolonged sensory and motor block, dose-dependent transient hypotension, and bradycardia.

Multiple studies have produced similar conclusions regarding the use of DEX as an adjunct to epidural anesthesia. In a meta-analysis conducted by Qian et al. (2020) that included nine randomized control studies (RCT) and 672 patients, it was concluded that "DEX is better than fentanyl as an adjuvant to ropivacaine for epidural anesthesia with better effects and less adverse events." Another meta-analysis conducted by Li et al. (2021), which included nine studies and 1403 patients, reached similar conclusions stating: "DEX as an adjuvant to epidural local anesthetics has the potential to offer a better analgesic effect than placebo, similar labor pain control to opioids, and has no definite adverse effects on the parturient or fetus." Compared to neuraxial opioids, DEX shows a reduction in adverse reactions without the loss of analgesic effects when used for labor epidurals. Similar results have been reached regarding intrathecal DEX. A study by Qi et al. (2016) surmised, "Intrathecal DEX supplementation produced prolonged sensory and motor blockade and similar analgesic effects compared with supplementation using 100 μg of morphine. Furthermore, intrathecal DEX additive produced

fewer side effects compared with morphine." Additionally, post-operative time to first analgesics was longer and total opioid consumption at 24 and 48-hour intervals were lower in the DEX group.

Neuraxial dosing for DEX as an adjuvant therapy has a somewhat wide range of dosing guidelines. Intrathecal dosing for DEX in most studies recommends 5 μg. However, a more recent study by Bi et al. (2020) concluded that: " 3 μg intrathecal DEX as an adjuvant to ropivacaine improved intraoperative somato-visceral sensory block characteristics and postoperative analgesia, alleviated shivering in parturients, and did not prolong the time of motor block or produce any side effects, which makes this dose appropriate for cesarean delivery." For epidural dosing, the consensus of most studies falls in the range of 0.5-1.5 mcg/kg (Yousef et al. 2015; Zhao et al. 2017; Selim et al. 2012; Soni 2016). Alfandy et al. (2021), states: "The dose of DEX as an epidural adjuvant ranged between 0.5 μg/kg and 1.5 μg/kg. It is known to cause dose–dependent bradycardia and hypotension; a relatively low fixed-dose (50 μg) was given to all the patients as their weights were within a narrow range to avoid exacerbation of maternal hypotension or bradycardia."

**Methods**

The goal of this project was to educate and institute a protocol for the licensed anesthesia providers in the Obstetric department about the use of neuraxial Dexmedetomidine as an opioid-free replacement for patients during the entire labor process. The sample group was given a pre-test to assess their knowledge and experience with neuraxial DEX and initial feelings on implementing DEX into their practice. Upon completing the pre-test, the group was given a PowerPoint presentation and all questions were answered satisfactorily. In addition, all

participants were given a copy of the PowerPoint presentation and a “fast Facts” handout with dosing guidelines and adverse reactions. Approximately two weeks after training, the sample group was given a post-test to assess knowledge retention and willingness to implement DEX into their current practice.

The sample group consisted of the 25 licensed anesthesia providers that provide care to the labor and delivery unit of a 300-bed suburban hospital in Bradenton, Fl. Additionally, four Nurse Anesthesia Residents were included in the training. All 25 participants completed the pre-test, post-test, and training along with the four students. This project was submitted to Southern Illinois University’s IRB committee for approval and was granted an exemption. The project is a quality improvement project and does not include human subject experimentation. The research evaluated for this project is based on randomized studies with no identifiable patient information.

Evaluation

This non-experimental project was aimed to educate anesthesia practitioners on current practices of using the opioid-free neuraxial adjunct DEX for parturients in labor and delivery. One hundred percent of the study group, including the four students, indicated that they had no prior experience using DEX in this manner. The primary knowledge instruments deployed in this project were a pre-test and a post-test, done approximately two weeks apart. The pre-test consisted of thirteen questions, of which five were demographic questions, seven were knowledge-based questions, and one used a Likert scale to determine the likelihood of use of the adjunct. The post-test consisted of fourteen questions including five demographic, seven knowledge-based, one Likert scale, and one assessing the teaching aids employed.

The licensed practitioners in the sample group had a mean experience of 17.84 years. This represents an experienced group of practitioners learning about a new adjunct to their

practice. As expected, the baseline knowledge of dosing and adverse reactions to neuraxial DEX was low. Overall, the presentation and instruction increased the scores of the study group from the pre-test to the post-test. Specifically, the licensed providers saw an average of a 73% increase in their score on the neuraxial dosing questions. The licensed providers also saw a 56% increase in scores on the questions regarding adverse reactions of neuraxial DEX. The students experienced an increase of 100% on the neuraxial dosing questions and 75% on the adverse reaction questions. After presentation and instruction, 32% of licensed providers responded that they were more likely to incorporate neuraxial DEX into their regular practice in labor and delivery.

One of the limitations of this project was the small sample size. This sample group was a sample of convenience. A larger sample size, possibly including different institutions, could gain a better idea of the effectiveness of the teaching, presentation, and handouts. Another limitation of this project was the relatively small sample sizes in the studies that describe the use of DEX as an adjunct to neuraxial anesthesia. Larger, multi-institutional studies can strengthen current research findings on this topic.

**Impact to Practice**

With the opioid epidemic still raging, the practice of anesthesia is changing and evolving to help combat the public health emergency. Many different techniques to limit the use of opioids are being researched, including opioid-free anesthesia, Enhanced Recovery After Surgery (ERAS), peripheral nerve blocks, and neuraxial anesthesia. Parturients experience intense visceral pain during labor. Neuraxial anesthesia is the preferred method of anesthesia for Cesarian Sections due to the maternal physiologic changes that pregnancy causes. Opioids have

been the chosen adjuncts to neuraxial anesthesia for this population due to their enhanced pain control during and after delivery. However, this can come with undesirable and potentially lethal side effects. Neuraxial DEX can eliminate these adverse reactions while providing equal or superior pain relief during and after labor and delivery.

**Sustainability**

The information and training aids will be reviewed and update regularly as new studies and information are made available. The required post-operative order sets will be made available to the anesthesia providers within the CERNER system for use by all providers. The pharmacy department will stock the appropriate vials of DEX in the Pyxis for use by the providers. All employees will have access to the teaching information in the anesthesia office. Additionally, all new employees will be given the teaching information. This information and training will be provided to the staff at no cost.

**Conclusion/Recommendations**

DEX, as an adjunct to neuraxial anesthesia, has the potential to offer anesthesia providers and patients an opioid-free option for pain control and relief. The presentation, hand-outs, and instruction given to the anesthesia providers in the sample group were successful in educating them on the use, dosing, and adverse reactions of this medication. This offered the knowledge and confidence for successfully implementing this opioid-free option in their practice to improve the outcomes for their patients.

For some parturients, DEX alone during the labor process could offer pain relief without loss of sensation in their lower extremities. This could be studied to see if it is a viable option. Further studies and uses of this medication to extend past labor and delivery could be beneficial. This could include using the adjunct for lower extremity surgeries that currently use neuraxial blocks.

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