Spring 5-2019

Improving Acute Pain Management: Development of an Adult Dexmedetomidine Infusion Protocol

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Introduction of the Problem

Studies have revealed over 80% of surgical patients experience acute postoperative pain: 75% of patients describe pain levels as moderate, severe, or extreme (Chou et al., 2016). Unfortunately, for the 25 million inpatient surgical procedures performed each year throughout the United States, opioids continue to be the mainstay of most postoperative analgesia regimens (Tan, Law, & Gan, 2015). While effective for the treatment of severe pain, opioid use also prolongs length of hospital stay and places patients at greater risk for higher adjusted mean costs due to dose-related side effects, such as respiratory depression, excessive sedation, postoperative nausea and vomiting, urinary retention, and ileus (Tan et al., 2015). Moreover, opioid consumption subsequently leads to rapid development of tolerance and a reduction in pain threshold (i.e. opioid-induced hyperalgesia), which makes effective pain management during the perioperative period difficult to achieve (Tan et al., 2015). Multimodal analgesia is a concept that continues to gain momentum to improve perioperative analgesia while reducing the incidence of opioid-related adverse events (Buvanendran & Kroin, 2009). Therefore, the purpose of this project was to improve acute pain management, particularly for opioid-tolerant patients, in the perioperative setting through the development of an adult dexmedetomidine infusion protocol for a tertiary care center in central Illinois. Dexmedetomidine was being under-utilized at the tertiary care center,

and an adult dexmedetomidine infusion protocol was not in place, thus, providing clinical relevance for this project.

Literature Review

Evidence-based research has indicated the use of dexmedetomidine in the perioperative setting as a successful adjunct to a multimodal pain management regimen (Chou et al., 2016; Tan et al., 2015). Research confirmed the ability of dexmedetomidine to minimize total opioid consumption and opioid-related adverse effects while maintaining appropriate pain scores (Blaudszun et al., 2012; Le Bot et al., 2015; Lundorf et al., 2016; Peng, et al., 2015; Schnabel et al., 2013; Shenhui et al., 2017). Literature suggested the value of dexmedetomidine as part of a multimodal pain management regimen for opioid tolerant patients and to help prevent the development of OIH (Chu et al., 2008). As demonstrated in the multitude of research studies, dexmedetomidine can be administered as a bolus, a continuous low-dose infusion, alongside an opioid-based PCA, or a combination of these methods at various times throughout the perioperative period. Research also presented a wide range of dosing regimens for dexmedetomidine (Blaudszun et al., 2012; Le Bot et al., 2015; Lundorf et al., 2016; Peng, et al., 2015; Schnabel et al., 2013; Shenhui et al., 2017). Bolus doses ranged from 0.1-2 mcg/kg, with the most common bolus dose being 0.5 mcg/kg or 1 mcg/kg. Continuous low-dose infusion rates ranged from 0.1-1 mcg/kg/hr, with the most common infusion range being approximately 0.2-0.7 mcg/kg/hr. Further research is needed for determination of the optimal dosing regimen of dexmedetomidine and the timing of administration within the perioperative period.

Project Methods

This project utilized a non-experimental design to assist in the creation and introduction of an evidence-based adult dexmedetomidine infusion protocol for a tertiary care center in central Illinois. The purpose of this project was to increase awareness and knowledge among the key stakeholders concerning the use of dexmedetomidine as part of a multimodal approach to treat pain in the perioperative setting, particularly for opioid-tolerant patients. Using the evidence within the extensive literature review, the proposed protocol provided anesthesia providers with research-based practice for employing multimodal analgesia to treat perioperative pain, particularly in opioid-tolerant patients.

The project was implemented at a tertiary care center in central Illinois. A large group of staff members attended the educational presentation, and staff members electing to participate in the project completed a post-presentation survey. The survey included demographic information, true/false questions related to information provided during the educational presentation, a Likert scale to assess staff support for the implementation of an adult perioperative dexmedetomidine infusion protocol, and a section for open-ended comments.

This project was declared exempt from the Southern Illinois University Edwardsville Institutional Review Board and was approved by the Research Review Committee at the tertiary care center. The project was a quality improvement design and did not include patient information or direct patient interaction. Also, this project posed minimal risks, such as time inconvenience, to those who completed the survey. Participation in the survey was voluntary.

Evaluation

Results from the implementation of the verbal educational presentation indicated increased knowledge for staff members related to the perioperative use of dexmedetomidine for acute pain management, particularly in opioid-tolerant patients. From all of the staff members attending the educational presentation, 15 participants completed the post-presentation survey used to analyze results. All survey participants recognized that 80% of surgical patients experience acute postoperative pain, and the proportion of opioid-tolerant patients requiring acute pain management has significantly increased. Furthermore, all participants were able to identify the goals of multimodal analgesia and demonstrated the understanding that multimodal analgesia is the preferred approach for the treatment of postoperative pain in children and adults. Nearly all participants (93%) correctly identified dexmedetomidine as a highly selective alpha-2 receptor agonist with sedative, anxiolytic, sympatholytic, and analgesic-sparing properties. All participants recognized the ability of dexmedetomidine to decrease total postoperative opioid consumption and opioid-related side effects while maintaining sufficient analgesia when added to a multimodal regimen. Less than a majority of the participants (40%) understood the inability of dexmedetomidine to provide an adequate level of analgesia when administered alone. Prior to the presentation, a small percentage of participants (13%) routinely administered dexmedetomidine as an adjunct to acute pain management in opioid tolerant patients.

A 5-point Likert Scale was included in the survey to assess support by the staff members regarding the implementation of an adult perioperative dexmedetomidine infusion protocol. The mean score was 4.29, which suggested strong staff member

support for the implementation of an adult perioperative dexmedetomidine infusion protocol.

The greatest limitation to this project was the nonexperimental design, because the dexmedetomidine infusion protocol was developed from an extensive literature review and not from experimental research on human subjects. Therefore, the success of this project greatly depends on the acceptance and implementation of the protocol into daily practice by the anesthesia and pharmacy departments at the tertiary care center in central Illinois. Other limitations to this project include sampling bias and a limited sample size. Due to time constraints and staff member availability, a convenience sample was used for this project. Only 15 staff members properly completed the post-presentation survey. Thus, the results from this project are not generalizable due to the small sample size.

Impact on Practice

The purpose of this doctoral project was to improve acute pain management, particularly for opioid-tolerant patients, in the perioperative setting through the development of an adult dexmedetomidine infusion protocol for a tertiary care center in central Illinois. Specific project objectives included an extensive literature review to determine the usefulness of dexmedetomidine for perioperative pain management and to develop an adult dexmedetomidine infusion protocol based on evidence reported in the literature that demonstrated best outcomes. According to survey results, a small number of anesthesia providers previously used dexmedetomidine as an adjunct to acute pain management in opioid tolerant patients. However, results indicated the educational presentation increased staff knowledge regarding the use of dexmedetomidine as part of a

multimodal pain management regimen in the perioperative setting. Furthermore, according to the 5-point Likert scale, staff members favored the implementation of an adult perioperative dexmedetomidine infusion protocol. The date of implementation for the dexmedetomidine infusion protocol at the tertiary care center remains undetermined.

Conclusion

Multimodal analgesia has proven to be an effective approach to improving perioperative analgesia. The primary benefits of such an approach is a reduction in total opioid consumption, which minimizes potential adverse side effects and expedites the recovery process. Evidence-based research has verified the ability of dexmedetomidine to decrease total opioid consumption and opioid-related adverse effects while maintaining appropriate pain scores when part of a multimodal regimen (Tan et al., 2015). Additionally, literature has supported the use of dexmedetomidine as a successful adjunct to a multimodal pain management regimen for opioid-tolerant patients. Therefore, this project aimed to provide education to the anesthesia and pharmacy departments at a tertiary care center in central Illinois concerning the use of a dexmedetomidine infusion protocol as part of a multimodal pain management regimen, particularly for opioid-tolerant patients. The results of the project suggested the anesthesia providers at the facility increased their knowledge pertaining to the use of the dexmedetomidine and supported the implementation of a dexmedetomidine infusion protocol.

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