

**An Educational Intervention to Increase Nurse's Knowledge of Side Effects and
Medication Interactions of Sugammadex**

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DNP Project Final Approval

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DNP Scholarly Project Final Approvals

The DNP student Dustin Heath and the Scholarly

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meet all the requirements for the degree of Doctor of Nursing Practice at University of Saint Francis-Fort Wayne, IN.

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Copies to: Student File, Graduate office and attached to the Final Project Manuscript.

Abstract

Problem Statement - The decision to administer sugammadex to a patient during surgery is based on a variety of factors throughout the surgery and is often not determined during the preoperative evaluation by the anesthesia provider. Side effects and medication interactions, including reduced efficacy of progesterone containing hormonal replacement medications and an increased post-operative bleeding risk, are not discussed with the patients during discharge teaching due to the discharging nurse's lack of knowledge on the side effects and medication interactions of sugammadex (Iwasaki et al., 2017; Keating, 2016; Lee & Jung, 2020; Lee, 2019; O'Driscoll & Parrott, 2019).

Purpose - This project aims to determine if an educational presentation to perioperative nurses will increase the nurses' knowledge of the side effects and medication interactions of sugammadex, which will translate to more effective discharge teaching for the patient.

Methods - This DNP project is a Quality Improvement (QI) project focused on increasing knowledge and improving outcomes utilizing an educational intervention. The educational intervention consists of a PowerPoint presentation to the perioperative registered nurses (RNs) at Marion Health (MH). The PowerPoint presentation addresses the use, mechanism of action, side effects and medication interactions of sugammadex; as well as which patient populations would benefit from direct teaching about the medication interactions and side effects of sugammadex.

Results - The post-intervention data showed a marked increase in the self-reported discharge teaching on the side effects and medication interactions of sugammadex with a 171% and 111% increase respectively. The post-intervention data also shows a 200% increase in scores related to the medication interactions and medication interactions of sugammadex. The increases in not

only knowledge, but in self-reported discharge teaching, on the side effects and medication interactions of sugammadex indicate that the project interventions were effective.

Implications - This DNP project overwhelmingly demonstrates that an educational intervention for perioperative RNs yielded an increase in knowledge on the side effects and medication interactions of sugammadex.

Table of Contents

<i>DNP Project Final Approval</i>	2
<i>Abstract</i>	3
<i>Table of Contents</i>	5
<i>Chapter 1: Introduction</i>	7
Problem	7
Background of the Problem	8
Practice/Knowledge Gap and Needs Assessment	9
DNP Project Overview	9
Scope of Project	9
Budget and Resources	10
Cost	10
Description of Resources	10
General Timeline	11
Setting and Target Population	11
Expected Outcomes	11
Risk Analysis	12
Risk Analysis	12
<i>Chapter 2: Synthesis of Supporting Evidence and Project Framework</i>	12
Relevant Theory and Concepts	12
Frameworks/Models/Theories	12
Literature Review	16
<i>Chapter 3: Project Design</i>	22
Methodology	22
Project Design	22
Ethical Considerations	22
Project Schedule	23
Implementation Methods	24
Measures/Tools/Instruments	24
Evaluation Plan	25
Dissemination Plan	27
<i>Chapter 4: Results and Outcomes Analysis</i>	27
Data Collection Techniques	27
Data Analysis Inferences	29
Gaps	30
Unanticipated Consequences	31
Expenditures	31
<i>Chapter 5: Leadership and Management</i>	31
Organizational Culture	31
Change Strategy	36
Leadership Style	37

Interprofessional Collaboration	38
Conflict Management	38
Chapter 6: Discussion	39
Impact of Project	39
Decisions and Recommendations	39
Limitations of the Project	39
Application to Other Settings	40
Strategies for Maintaining and Sustaining	40
Lessons Learned	40
Chapter 7: Conclusion	41
Potential Project Impact on Health Outcomes Beyond Implementation Site	41
Health Policy Implications of Project	42
Proposed Future Direction for Practice	42
References	43
Appendix A	54
Appendix B	61
Appendix C	63
Appendix D	66
Appendix E	71
Appendix F	72
Appendix G	73
Appendix H	74
Appendix I	76
Appendix J	84
Appendix K	85
Appendix L	87
Appendix M	88

Chapter 1: Introduction

Problem

Sugammadex is a novel reversal agent for non-depolarizing neuromuscular relaxing medications (NDNMR) that has an excellent safety profile; however, it does have some medication interactions of which many anesthetists and perioperative nurses are not aware (Dalton & Van Hasslet, 2015; Hristovska et al., 2017; O'Driscoll & Parrott, 2019). Utilizing the Iowa Model of Evidence-Based-Practice to Promote Quality Care, this project takes an identified gap in knowledge and translates the existing literature into an educational intervention. This educational intervention seeks to increase the participants' knowledge on the side effects and medication interactions of a medication that is often administered during the course of an anesthetic, which will enable more effective discharge teaching to be performed by the perioperative nurses.

Problem Statement

The decision to administer sugammadex to a patient during surgery is based on a variety of factors throughout the surgery and is often not determined during the preoperative evaluation by the anesthesia provider. The anesthesia provider does not routinely inform the post-anesthesia care unit (PACU) nurse about the administration of specific reversal of neuromuscular blocking medications during a standard hand-off report in the PACU (American Association of Nurse Anesthetists, 2019). Side effects and medication interactions, including reduced efficacy of progesterone containing hormonal replacement medications and an increased post-operative bleeding risk, are not discussed with the patients during discharge teaching due to the discharging nurse's lack of knowledge on the side effects and medication interactions of

sugammadex (Iwasaki et al., 2017; Keating, 2016; Lee & Jung, 2020; Lee, 2019; O'Driscoll & Parrott, 2019). An elderly patient may not be aware of an increased risk of post-operative bleeding, from the effect of sugammadex on coagulation, and fail to accurately assess their surgical wound for excess bleeding. Additionally, a woman of childbearing age who takes a progesterone containing hormonal replacement medication may experience an unintended pregnancy as a result of inadequate discharge teaching on the medication interactions of sugammadex. This project aims to determine if an educational presentation to perioperative nurses will increase their knowledge of the side effects and medication interactions of sugammadex in patients who received sugammadex during an anesthetic for surgery which will translate to more effective discharge teaching for the patient.

Background of the Problem

There are current case reports of unintended pregnancy after receiving sugammadex during surgery while taking progesterone containing hormonal replacement medications (Hormonal-contraceptives/sugammadex interaction, 2020). A survey in England found that only 2% of anesthesia providers were aware of the interaction between sugammadex and progesterone containing hormonal replacement medications (Dalton & Van Hasselt, 2015). O'Driscoll and Parrott report half of perioperative nurses were unaware of the interaction between sugammadex and progesterone containing hormonal replacement medications (2019). Sugammadex also increases coagulation times; however, the clinical relevancy is controversial (Lee, 2019). Tas et al. demonstrated a statistically significant increase in the volume of blood loss after sugammadex administration during septoplasty (2015). The AANA practice considerations do not list

neuromuscular blocking reversal medications on the standard transfer of care hand-off form (Postanesthesia Care Practice Considerations, 2019).

PICOT Question

Do perioperative nurses with education on the side effects and medication interactions of sugammadex compared to no education on the side effects and medication interactions of sugammadex demonstrate increased knowledge on the side effects and medication interactions of sugammadex?

Practice/Knowledge Gap and Needs Assessment

While on previous residency rotations at Marion Health (MH), the project manager administered sugammadex for approximately 50% of NDNMR reversals. This medication choice was not relayed to the PACU nurse by the preceptors or resident, as the medication for reversal of neuromuscular block is not included on the standard hand-off form adopted by the American Association of Nurse Anesthetists (AANA) for PACU transfer of care (Postanesthesia Care Practice Considerations, 2019).

DNP Project Overview

Scope of Project

This project aims to increase the knowledge of perioperative nurses regarding the side effects and medication interactions of sugammadex. This was accomplished through an educational intervention via a short PowerPoint presentation by the project manager during a regularly scheduled unit meeting. The accompanying pre and post intervention surveys are located in Appendices A, B, and C, which were distributed to the participants digitally via the Microsoft Forms platform. Printed surveys were also available as a backup for any technological

problems. The pre and post intervention surveys were imported to IBM SPSS in aggregate to analyze the results.

Stakeholders

The stakeholders for this project include the project manager (Dustin Heath, SRNA, University of Saint Francis) the operating room manager at Marion Health (Brandon Scott, RN), the project advisor (Dr. Carla Mueller, University of Saint Francis), and the perioperative registered nurses (RN) at MH.

Budget and Resources

Cost

Direct costs for this project include printing of handout materials and printed backup surveys at a cost of \$10. IBM SPSS statistical analysis software was also purchased by the project manager at a cost of \$64. In-kind costs including the salary of participants of approximately \$800 was provided by MH.

Description of Resources

Many of the resources needed for this project are provided by the University of Saint Francis as part of tuition such as Microsoft Word, Microsoft PowerPoint, and Microsoft Forms. IBM SPSS software for statistical analysis was purchased by the project manager at a cost of \$64. MH provided the necessary room for the educational presentation during a regularly scheduled unit meeting.

Process and Outcomes

General Timeline

A literature review was started in January of 2021 along with site selection and initial communication with stakeholders. The Collaborative Institutional Training Initiative (CITI) training program was completed in February 2021 with completion certificates provided in Appendix D. A stakeholder agreement was signed in April of 2021 and is provided in Appendix E. In August of 2021, a letter of support was received from MH indicating permission to implement this project without the need for facility IRB approval and is provided in Appendix F. IRB application to the University of Saint Francis was made in the Fall of 2021. Approval from the University of Saint Francis IRB was received in November 2021 and is provided in Appendix G. Implementation was February 2022 with data collection occurring immediately after the presentation and again at 4 weeks post-presentation. Data analysis occurred in the spring of 2022. Final dissemination and presentation of findings occurred in June of 2022.

Setting and Target Population

MH is a 99-bed, not-for-profit hospital located in Marion Indiana (Marion Health, n.d.). The surgery department of MH includes nine operating rooms and three endoscopic suites and performs an average of 20,000 procedures yearly (Marion Health, n.d.). MH is designated as a Qualified Health Center outside of Urbanized Areas (Rural Health Information Hub, 2020).

Expected Outcomes

The expected aims of this DNP project are to increase perioperative nurses' knowledge of pharmacology, side effects, and medication interactions of sugammadex as well as to increase perioperative nurses' self-reported use of discharge teaching on the side effects and medication

interactions of sugammadex. The expected outcomes of this DNP project consist of an increase in the scores of related questions between the pre and post intervention surveys.

Risk Analysis

Risk Analysis

There are no identifiable immediate or long-term risks to participants of this project. Participation in this project is voluntary and participants may withdraw at any time. There is no personally identifiable information collected at any time during participation in this project. The pre-intervention survey on Microsoft Forms includes the informed consent as the first question. If participants agree to the informed consent, the survey will proceed to the next question, however the survey will end if the participant does not agree to the informed consent. The informed consent is provided in Appendix H. The participants may benefit from increased knowledge and ability to provide a more thorough teaching for patients that have received sugammadex. There is no compensation from this project for the participants, however the educational intervention took place during a scheduled unit meeting for which the participants were paid from the hospital. There is no intended deception in the presentation or surveys given to the participants. There was no audio or video recording of the participants.

Chapter 2: Synthesis of Supporting Evidence and Project Framework

Relevant Theory and Concepts

Frameworks/Models/Theories

The Iowa Model of Evidence-Based-Practice to Promote Quality Care (Iowa Model) was designed for nurses to take existing research and synthesize it to improve patient care and is the

intended framework for this project (Buckwalter et al., 2017; Titler et al., 1994, 2001). The Iowa Model was originally developed in the early 1990s at the University of Iowa Hospitals and Clinics to help nurses and other healthcare professionals to translate the growing body of original research into practice changes that improved patient care (Buckwalter et al., 2017; Titler et al., 1994, 2001). The Iowa Model has gone through two revisions, in 2001 and 2015, based upon feedback that was solicited by the original authors (Buckwalter et al., 2017; Titler et al., 2001). The most current revision to the Iowa Model is represented in Figure 1. Permission was granted through the Iowa Model Collaborative to use and reprint the model in this project (K. Jordan, personal communication, February 9, 2021). The steps of the Iowa Model are listed below in Figure 1:

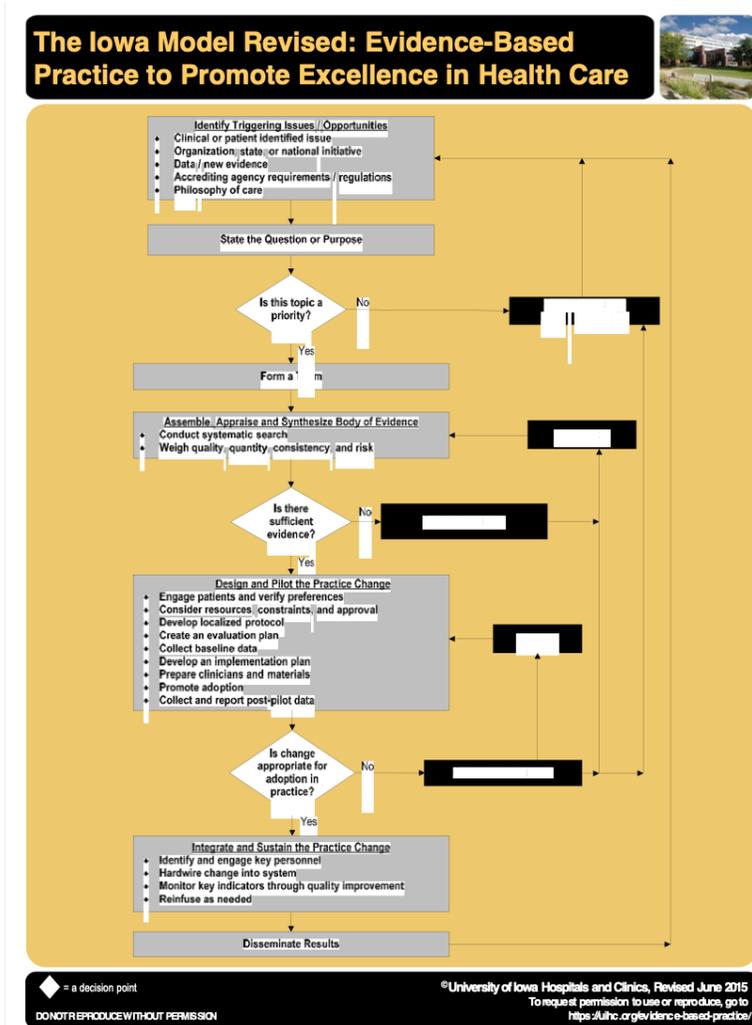


Figure 1: The Iowa Model-Revised. *Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 2015. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at 319-384-9098.*

Utilizing the Iowa Model, a knowledge trigger was identified that many perioperative nurses and anesthesia providers were unaware of certain medication interactions and side effects of sugammadex. The question or purpose determined from the knowledge gap is: Do perioperative nurses with education on the side effects and medication interactions of sugammadex compared to no education on the side effects and medication interactions of sugammadex demonstrate

increased knowledge on the side effects and medication interactions of sugammadex? This question was determined to be a priority after consulting with members of the project team, including stakeholders from the implementation site and faculty from the University of Saint Francis. A comprehensive literature review was completed and is detailed later in this chapter. There was sufficient evidence gathered and synthesized to support an educational intervention. An educational intervention was developed and implemented as detailed in Chapter 3.

An additional and additive theory utilized in this project is Malcolm Knowles' Theory on Andragogy. Malcolm Knowles defined the term *andragogy* as the theory of adult learning (Knowles, 1977). There are six assumptions of adult learners made by Knowles as listed below:

1. The need to know – The intended learner must be shown why they need to know the information to be presented (Knowles, 1984; Ota et al., 2016).
2. The learner's concept of self – Adults need to be seen as self-directed learners as opposed to children who are generally dependent on the teacher (Knowles, 1984; Ota et al., 2016).
3. The role of the learner's experience – Use the learner's life experiences to enhance the teaching (Knowles, 1984; Ota et al., 2016).
4. Readiness to learn – Demonstrate what changes the learner can make immediately to increase the readiness to learn (Knowles, 1984; Ota et al., 2016).
5. Orientation to learning – Adult learners prefer to learn things that can solve problems they face daily (Knowles, 1984; Ota et al., 2016).
6. Motivation to learn – Internal motivation such as increasing knowledge or confidence are more effective than external motivation (Knowles, 1984; Ota et al., 2016).

The educational intervention will ensure that the professional adult learner demonstrates an increase in knowledge by utilizing the six assumptions of andragogy. During the educational intervention, the uninformed perioperative nursing staff will be shown why they need to know the information regarding the side effects and medication interactions of sugammadex. As perioperative nursing professionals, the learners will be able to take the new information, along with their professional experience and immediately incorporate the educational intervention into their daily practice. This immediacy of incorporating the education will help to provide internal motivation to increase the perioperative nurse's knowledge and confidence.

Literature Review

An exhaustive literature review was performed yielding approximately 1200 articles for initial review. Several databases were utilized including: Cochrane Library, CINAHL, Emcare, Proquest Nursing and Allied Health, PubMed Medline, Proquest, Google Scholar, and NCBI. The following search terms were used in each of the databases: sugammadex pharmacology, sugammadex side effects, sugammadex medication interactions, sugammadex and bleeding, sugammadex and anticoagulant, sugammadex and coagulation, sugammadex and birth control, sugammadex and contraception, sugammadex and contraceptive. Criteria for inclusion included: published in English from 2009-2021 from a peer-reviewed journal or national organization; 61 articles ultimately met the criteria for inclusion in this review and synthesis.

Anesthesia

Sugammadex is routinely used by anesthesia providers at the end of a surgical procedure to reverse the neuromuscular relaxation produced by a non-depolarizing neuromuscular relaxant medication (Golembiewski, 2016; Hristovska et al., 2017; Keating, 2016; Lee & Jung, 2020;

Murphy, 2016; Nguyen-Lee et al., 2017; Sokol-Kobielska, 2013). Neuromuscular relaxation is often required for optimized surgical conditions or to establish an airway via endotracheal intubation (Jain et al., 2020).

Anesthesia for surgery can safely be accomplished in many ways depending on the surgery being performed and the needs of both the patient and surgeon. One common method of providing anesthesia is called General Anesthesia which the American Society of Anesthesiologists (ASA) define general anesthesia as “a drug induced loss of consciousness during which patients are not arousable, even by painful stimulation” (American Society of Anesthesiologists, 2019, para 5). Additional characteristics of general anesthesia according to the ASA are inadequate spontaneous ventilations, with airway intervention required (American Society of Anesthesiologists, 2019). An induction of general anesthesia refers to the steps and medications administered to the patient to safely transition into a state of general anesthesia. Many surgeries require that an endotracheal (ET) tube is inserted into the patient’s trachea to establish a secure airway, which protects the patient from aspiration and allows for mechanical ventilation of the patient’s lungs throughout the surgery. A muscle relaxant medication is given to facilitate the insertion of the ET tube into the patient’s trachea, improve compliance with mechanical ventilation and to relax skeletal muscles to allow surgical access (D’Souza et al., 2020; Goetz et al., 2018; Golembiewski, 2016; Hristovska et al., 2017; Jain et al., 2020; Keating, 2016; Sokol-Kobielska, 2013).

Types of Muscle Relaxants

There are two types of muscle relaxant medications: depolarizing and non-depolarizing. Depolarizing muscle relaxants bind to the post-junctional acetylcholine receptors on the motor

end plate and create an action potential which causes the muscles to fasciculate and not repolarize (Gulenay & Mathai, 2020). Succinylcholine is the only depolarizing muscle relaxant medication approved for use in the United States. Succinylcholine has an extremely short duration of action of approximately 6 minutes due to metabolism by pseudocholinesterases (Gulenay & Mathai, 2020). There are two classes of non-depolarizing neuromuscular relaxant medications: aminosteroid and benzyliisoquinolinium. Aminosteroid NDNMR examples include rocuronium, vecuronium, and pancuronium, while benzyliisoquinolinium NDNMR examples include atracurium, cisatracurium, and mivacurium (D'Souza et al., 2020). NDNMR medications exert their action by binding to post-junctional nicotinic acetylcholine receptors, blocking acetylcholine's ability to bind and depolarize the receptor (Jain et al., 2020).

Reversal of NDNMR

At the end of the surgical procedure a reversal agent must be administered to terminate the effects of the NDNMR and prevent a residual neuromuscular block (Sokol-Kobielska, 2013). There are two classes of medications that allow for reversal of NDNMR: anticholinesterases and cyclodextrins (Hristovska et al., 2017; Jain et al., 2020). Benzyliisoquinolinium NDNMR medications can only be reversed with anticholinesterases as cyclodextrins are not able to bind to the benzyliisoquinolinium structure. Sugammadex is a novel cyclodextrin designed to bind to steroidal NDNMR medications including rocuronium, vecuronium and pancuronium (Golembiewski, 2016; Hristovska et al., 2017; Keating, 2016; Lee & Jung, 2020; Murphy, 2016; Nguyen-Lee et al., 2017; Sokol-Kobielska, 2013). A cyclodextrin is a rigid, circular molecule made from sugar units designed to encapsulate steroidal molecules and create a water-soluble

compound that is easily eliminated (Murphy, 2016). One molecule of sugammadex can bind to one molecule of steroidal NDNMR with the highest affinity to rocuronium (Murphy, 2016).

Sugammadex

Sugammadex was first approved for use in Europe in 2008 after extensive clinical trials (Murphy, 2016). Sugammadex was approved for use in the United States in 2015 after several additional clinical trials (Murphy, 2016). It is currently estimated that sugammadex and neostigmine are used equally in anesthesia practice in the United States (Kheterpal et al., 2020). O'Reilly-Shah and colleagues conducted a worldwide survey of anesthesia providers and found that approximately 40% of anesthesia providers limit their use of sugammadex due to cost, while 7.8% of anesthesia providers limit their use due to concerns about adverse events such as increased risk of bleeding and allergic reaction (2017).

Side Effects and Medication Interactions

Sugammadex has been found to have a unique side effect and medication interaction of interest for this project, specifically an increase in bleeding times and a sequestration of steroidal progesterone containing hormonal replacement medications (Iwasaki et al., 2017; Keating, 2016; Lee & Jung, 2020; Lee, 2019; O'Driscoll & Parrott, 2019). Multiple studies show that sugammadex prolongs the prothrombin time (PT) and activated partial thromboplastin time (aPTT) after administration for approximately 1 hour (Awad et al., 2020; Bosch et al., 2016; Carron, 2015; Carron et al., 2018; De Kam et al., 2013; De Kam et al., 2014; Dirkmann et al., 2016; Kang, E. et al., 2020; Kruithof et al., 2020; Lee, 2019; Moon et al., 2018; Raft et al., 2015; Rahe-Meyer et al., 2015; Tas et al., 2015). The clinical significance of the prolongation of bleeding times is still being investigated; however, current recommendations are to use higher

doses of sugammadex with caution, especially in patients with an increased bleeding risk (Kang, E. et al., 2020). As previously described, sugammadex is designed to sequester steroidal NDNMR medications, but has also been shown, in vitro, to sequester steroidal progesterone containing hormonal replacement medications, which could displace steroidal NDNMR and lead to residual neuromuscular blockade, as well as decrease levels of steroidal progesterone containing hormonal replacement medications leading to unintended pregnancy (Corda & Robards, 2018; Dalton & Van Hasselt, 2015; Et et al., 2015; Gunduz et al., 2016; Hormonal-contraceptives/sugammadex interaction, 2020; Lazorwitz et al, 2019; O'Driscoll & Parrott, 2019; Richardson & Raymond, 2020; Shu et al., 2007; Webber & Kreso, 2018; Williams & Bryant, 2017; Zwiars et al, 2010).

Contraceptives and Unintended Pregnancy

According to data from the National Center for Health Statistics, a division of the United States Department of Health and Human Services, 65.3% of women aged 15-49 use some form of contraception (Daniels & Abna, 2020). Of the users of contraception in the United States 27.5% use some form of hormonal birth control such as the oral contraceptive pill or a long-acting reversible contraceptive (Daniels & Ana, 2020). Dalton and Van Hasselt (2015) report only 6% of patients recall a direct question about hormonal contraceptives during their pre-operative interview by the anesthesia provider. Weber and Kreso (2018) recommend utilizing neostigmine for women of childbearing age regardless of contraceptive reporting unless a specific reason to use sugammadex is apparent, as it is possible that a patient may not be forthcoming on contraceptive use depending on the support person with the patient. Current data approximates that 51% of pregnancies in the United States are unintended and of which

approximately 40% are terminated (Barton et al., 2017; Crowley et al., 2017; Heitmann et al., 2014; Herd et al., 2016; Wollum et al., 2020).

Outcomes

The mitigation of the risk of unintended pregnancy and vigilance for post-operative bleeding and residual neuromuscular blockade are outcomes that the perioperative nurse can directly impact through discharge teaching (Kang, W.S. et al., 2020; Naqib et al., 2018; O'Driscoll & Parrott, 2019).

Summary

Sugammadex is a novel cyclodextrin designed to bind to steroidal NDNMR medications including rocuronium, vecuronium and pancuronium (Golembiewski, 2016; Hristovska et al., 2017; Keating, 2016; Lee & Jung, 2020; Murphy, 2016; Nguyen-Lee et al., 2017; Sokol-Kobielska, 2013). Multiple studies show that sugammadex prolongs the prothrombin time (PT) and activated partial thromboplastin time (aPTT) after administration for approximately 1 hour (Awad et al., 2020; Bosch et al., 2016; Carron, 2015; Carron et al., 2018; De Kam et al., 2013; De Kam et al., 2014; Dirkmann et al., 2016; Kang, E. et al., 2020; Kruithof et al., 2020; Lee, 2019; Moon et al., 2018; Raft et al., 2015; Rahe-Meyer et al., 2015; Tas et al., 2015).

Sugammadex is designed to sequester steroidal NDNMR medications, but has also been shown, in vitro, to sequester steroidal hormonal contraceptive medications, which could displace steroidal NDNMR and lead to residual neuromuscular blockade, as well as decrease levels of steroidal hormonal contraceptive medications leading to unintended pregnancy (Corda & Robards, 2018; Dalton & Van Hasselt, 2015; Et et al., 2015; Gunduz et al., 2016; Hormonal-contraceptives/sugammadex interaction, 2020; Lazorwitz et al, 2019; O'Driscoll & Parrott, 2019;

Richardson & Raymond, 2020; Shu et al., 2007; Webber & Kreso, 2018; Williams & Bryant, 2017; Zwiers et al, 2010).

Chapter 3: Project Design

Methodology

Project Design

This DNP project is a Quality Improvement (QI) project focused on increasing knowledge and improving outcomes utilizing an educational intervention. The educational intervention consists of a PowerPoint presentation to the perioperative RNs at MH during a regularly scheduled unit meeting. The PowerPoint presentation, located in Appendix I, addresses the use, mechanism of action, side effects and medication interactions of sugammadex; as well as which patient populations would benefit from direct teaching about the medication interactions and side effects of sugammadex. The pre-intervention survey is designed to establish the baseline knowledge on the side effects and medication interactions of sugammadex of the perioperative RNs as well as collect demographic information. The immediate post-intervention survey is designed to demonstrate an increase in knowledge on the side effects and medication interactions of sugammadex. The four-week follow-up survey is designed to demonstrate an increase in self-reported discharge teaching on the side effects and medication interactions of sugammadex.

Ethical Considerations

The Collaborative Institutional Training Initiative (CITI) training program was completed by the project manager with completion certificates provided in Appendix D. There are no identifiable immediate or long-term risks to participants of this project. Participation in this

project is voluntary and participants may withdraw at any time. The pre-intervention survey on Microsoft Forms includes the informed consent as the first question. If participants agree to the informed consent, the survey will proceed to the next question; however, the survey will end if the participant does not agree to the informed consent. The informed consent is provided in Appendix H. The participants may benefit from increased knowledge and ability to provide a more thorough teaching for patients that have received sugammadex. There is no compensation from this project for the participants, however the educational intervention took place during a scheduled unit meeting for which the participants were paid from the hospital. There is no intended deception in the presentation or surveys given to the participants. There was no audio or video recording of the participants.

Project Schedule

A literature review was started in January of 2021 along with site selection and initial communication with stakeholders. The Collaborative Institutional Training Initiative (CITI) training program was completed in February 2021 with completion certificates provided in Appendix D. A stakeholder agreement was signed in April of 2021 and is provided in Appendix E. In August of 2021, a letter of support was received from MH indicating permission to implement this project without the need for facility IRB approval and is provided in Appendix F. IRB application to the University of Saint Francis was made in the Fall of 2021. Approval from the University of Saint Francis IRB was received in November 2021 and is provided in Appendix G. Implementation was February 2022 with data collection occurring immediately after the presentation and again at 4 weeks post-presentation. Data analysis occurred in the spring of 2022. Final dissemination and presentation of findings occurred in June of 2022.

Implementation Methods

The educational intervention consists of a PowerPoint presentation to the perioperative RNs at MH during a regularly scheduled unit meeting. The PowerPoint presentation addresses the use, mechanism of action, side effects and medication interactions of sugammadex, as well as which patient populations would benefit from direct teaching about the medication interactions and side effects of sugammadex. Due to the number of temporary and Locum Tenens anesthesia providers at MH, it was difficult to establish a routine process for reporting the use of sugammadex to the perioperative RN's during the hand-off by the anesthesia providers. The perioperative RNs at MH are permanent full-time employees; for this reason, the perioperative RNs were educated to determine from the anesthesia provider if sugammadex was administered. The pre-intervention survey is designed to establish the baseline knowledge on the side effects and medication interactions of sugammadex of the perioperative RNs as well as collect demographic information. The immediate post-intervention survey is designed to evaluate for an increase in knowledge on the side effects and medication interactions of sugammadex. The four-week follow-up survey is designed to demonstrate an increase in self-reported discharge teaching on the side effects and medication interactions of sugammadex.

Measures/Tools/Instruments

The pre-intervention survey, immediate post-intervention survey and four-week follow-up survey are all included in Appendices A, B, and C. Two published instruments were adapted for use in this project. The author of each instrument was contacted, and permission was granted to the project manager for adaptation. See Appendix J for communication with the authors. The

first instrument was published by O'Driscoll and Parrott and is titled *Performance-improvement project: Increasing nursing knowledge of the impact of sugammadex in female patients taking steroidal contraceptives* (2019). The second instrument was published by Dwan, Raymond and Richardson and is titled *Unanticipated consequences of switching to sugammadex: Anesthesia provider survey on the hormone contraceptive drug interaction* (2021).

The pre/post intervention surveys used in this project are anonymous with no identifiable data collected. The survey data was collected via Microsoft Forms and was transferred to a password-protected folder on Microsoft OneDrive with only the project manager having access to the folder. Paper copies of the Microsoft Forms surveys were available in the event of technological issues. Completed paper surveys were scanned to a password-protected folder on the project manager's Microsoft OneDrive, and original papers were shredded prior to leaving MH.

Evaluation Plan

The pre-intervention, post-intervention and four-week follow-up surveys were created on the Microsoft Forms platform. Face validity was confirmed by two doctorly prepared Certified Registered Nurse Anesthetists (CRNAs) and one RN with a Bachelor of Science in Nursing (BSN) degree. A Quick Response (QR) code was generated by the Microsoft Forms platform that links directly to the pre-intervention survey and was distributed immediately before the educational intervention. A QR code was generated by the Microsoft Forms platform that links directly to the post-intervention survey and was distributed immediately after the educational intervention. A QR code was generated by the Microsoft Forms platform that links directly to a

follow-up survey and was distributed 4 weeks after the educational intervention by a flyer that was distributed to the perioperative RNs at MH by the project manager. Any participant that is unable or unwilling to utilize the Microsoft Forms platform was offered a paper copy of the surveys.

Methods for collection of data

Data collection occurred immediately after the distribution and completion of the surveys. Demographic data is non-identifiable and was collected on the pre-intervention survey and consists of number of years practicing as an RN, years practicing as an RN in the perioperative area, and education level as an RN. The use, mechanism of action, side effects and medication interactions of sugammadex was collected in the pre-intervention and post-intervention surveys. Self-reported discharge teaching on side effects and medication interactions of sugammadex was collected in the pre-intervention and four-week follow-up surveys. All data was stored on the project manager's password-protected Microsoft OneDrive with only the project manager having access. After dissemination in June of 2022, all data was permanently erased from the project manager's Microsoft OneDrive using software intended for complete and permanent deletion.

Data Analysis Plan

Using IBM SPSS, the change in mean from the pre-intervention survey to the post-intervention survey was calculated. The change in mean will show if there is a statistically significant increase in participant knowledge or self-reported use of discharge teaching on the side effects and medication interactions of sugammadex.

Dissemination Plan

After project completion, the findings were presented to the University of Saint Francis DNP faculty and students. The findings were reported to the stakeholders at Marion Health by email. The complete manuscript is also listed in the University of Saint Francis DNP Project Repository.

Chapter 4: Results and Outcomes Analysis

Data Collection Techniques

Data collection was completed via the Microsoft Forms platform and consisted of primary data gathered at three intervals: pre-intervention, post-intervention, and finally at four weeks post-intervention. Nine participants completed the pre-intervention and post-intervention surveys on February 11, 2022. The four-week follow-up survey had 9 participants and was completed on March 21, 2022. The data was imported into IBM SPSS for analysis.

Measures/Indicators

After the data was entered into IBM SPSS, the demographic data was separated from the remainder of the survey questions. The survey questions were grouped with the correlating project aims and outcomes.

Demographic Questions

Three demographic questions were included on the pre-intervention survey. The majority (6 out of 9) of the participants had greater than 20 years of experience as a RN, with 1 participant having 16-20 years of experience, and 2 participants having 1-5 years of experience. The majority (6 out of 9) of the participants had less than 10 years of experience in the perioperative

area, with 3 participants having greater than 20 years of experience in the perioperative area. The majority (5 out of 9) of the participants had a Bachelor of Science in Nursing degree, while the remaining (4 out of 9) participants had an Associate's of Science in Nursing degree.

Aim 1

The first aim of this project was to Increase perioperative nurses' knowledge of pharmacology, side effects, and medication interactions of sugammadex.

Outcome 1a

Pre to post-intervention surveys will demonstrate an increase in perioperative nurses' knowledge of the pharmacology of sugammadex by a 40% increase in the mean scores of related questions.

Outcome 1a was not met with a 13% increase in the mean scores of related questions; due to a pre-intervention mean score of 89% and a post-intervention mean score of 100%.

Outcome 1b

Pre to post-intervention surveys will demonstrate an increase in perioperative nurses' knowledge of the side effects of sugammadex by a 40% increase in the mean scores of related questions.

Outcome 1b was met with a 200% increase in the mean scores of related questions; due to a pre-intervention mean score of 33% and a post-intervention mean score of 100%.

Outcome 1c

Pre to post-intervention surveys will demonstrate an increase in perioperative nurses' knowledge of the medication interactions of sugammadex by a 40% increase in the mean scores of related questions.

Outcome 1c was met with a 200% increase in the mean scores of related questions; due to a pre-intervention mean score of 33% and a post-intervention mean score of 100%.

Aim 2

Increase perioperative nurses' self-reported use of discharge teaching on the side effects and medication interactions of sugammadex.

Outcome 2a

Pre to post-intervention surveys will demonstrate an increase in perioperative nurses' self-reported use of discharge teaching on the side effects of sugammadex by a 20% increase in the mean scores of related questions.

Outcome 2a was met with a 171% increase in self-reported use of discharge teaching on the side effects of sugammadex; due to a pre-intervention mean of "never" or 1 on a Likert scale to a post-intervention mean of "often" or 4 on a Likert scale.

Outcome 2b

Pre to post-intervention surveys will demonstrate an increase in perioperative nurses' self-reported use of discharge teaching on the medication interactions of sugammadex by a 20% increase in the mean scores of related questions

Outcome 2b was met with a 111% increase in self-reported use of discharge teaching on the medication interactions of sugammadex; due to a pre-intervention mean of "rarely" or 2 on a Likert scale to a post-intervention mean of "sometimes" or 3 on a Likert scale.

Data Analysis Inferences

The pre-intervention data showed an unanticipated high level of knowledge on the use of sugammadex, translating to an unmet objective 1a as there was only 1 participant that missed the

related question. The pre-intervention data showed a knowledge deficit on the side effects and medication interactions of sugammadex.

The post-intervention data showed a marked increase in the self-reported discharge teaching on the side effects and medication interactions of sugammadex with a 171% and 111% increase respectively. The post-intervention data also shows a 200% increase in scores related to the medication interactions and side effects of sugammadex. The increases in not only knowledge, but in self-reported discharge teaching, on the side effects and medication interactions of sugammadex indicate that the project interventions were effective. The following table summarizes the findings on this educational intervention to increase nurses' knowledge of the side effects and medication interactions of sugammadex.

	Pre-Intervention	Post-Intervention	% increase
Pharmacology	89%	100%	13%
Side Effects	33%	100%	200%
Medication Interactions	33%	100%	200%
Discharge Teaching on Side Effects	1 - "never"	4 - "often"	171%
Discharge teaching on Medication Interactions	2 - "rarely"	3 - "sometimes"	111%

Gaps

The four-week follow-up survey had a 67% return rate compared to a 100% return rate on the day of intervention. The number of participants was lower than anticipated, at the beginning of project planning, due to the ongoing Coronavirus pandemic along with concurrent emergency surgeries during the implementation of this project.

Unanticipated Consequences

No negative consequences were discovered during the project or implementation. During implementation it was noted that sugammadex was moved from a single central location to each anesthesia workstation leading to a possible increase in sugammadex use. This project could have increased utility alongside the possible increase in sugammadex use as there are more opportunities for the nursing staff to utilize the increase in knowledge gained.

Expenditures

The project manager spent \$64 on IBM SPSS software for data entry and analysis. Refreshments were also purchased by the project manager for the participants at a cost of \$42.07.

Chapter 5: Leadership and Management

Organizational Culture

To effectively lead change in an organization, an organizational assessment must be completed to understand the mission, values, and vision of an organization. The Institutional and Organizational Assessment Model (IOA) was chosen as the framework to facilitate the organizational assessment of Marion Health for this project. As depicted below there are four main areas within the IOA framework including organizational performance, external environment, organizational motivation and organizational capacity (Lusthaus et al., 2002).

INSTITUTIONAL AND ORGANIZATIONAL PERFORMANCE ASSESSMENT



Figure 2. Institutional and Organizational Assessment Model *Used/reprinted with permission from Universalia.*

Institutional and Organizational Assessment Model

Within organizational performance there are four sections including effectiveness, efficiency, relevance and financial viability. Organizational effectiveness is the ability of an organization to meet its goals, such as outcomes, achievements, productivity, quality and

performance within a sustainable pattern (Universalia, n.d.). Organizational efficiency assesses expenses relative to outputs along with the productivity of staff. Organizational relevance looks at how well an organization adapts to the external environment, stakeholder needs, and its overall mission. Financial viability involves meeting financial targets as defined by the organization.

An external environment has many interconnected components both inside the organization and externally with the social and political environment (Universalia, n.d.). The administrative and legal departments impact the environment through policies and regulations. The social and cultural factors that impact the organization include the norms, values, beliefs, and attitudes within society. The political environment also impacts the organization through its access to resources, power, and influence in decision-making. The economic environment influences the organization through wages, pricing, and community economics. The technological and ecological environment influences include utilities, infrastructure, geography, and climate. Finally, the major stakeholders include the clients, beneficiaries, donors, and other institutions.

Organizational motivation is different in each organization and represents the personality of the organization (Universalia, n.d.). The history of the organization establishes the personality and direction of the organization. The mission of the organization starts with a mission statement that reflects the goals and values of the organization. The internal culture of the organization involves the shared beliefs, values, and attitudes about working. Each organization will have a different incentive and reward system that includes motivations, freedom, autonomy, peer recognition, and an opportunity for advancement that will serve to promote productivity.

Organizational Capacity refers to how well an organization utilizes its resources to accomplish its mission (Lusthaus et al., 2002). The strategic leadership of the organization directs strategic planning, business models, and setting the direction and culture. Financial management involves planning for operating expenses and financial accountability. Each organization has a unique organizational structure with different roles, responsibilities, decision-making processes, and coordination. Organizational infrastructure includes the physical facility as well as the technology such as the equipment, software, and systems utilized to perform the work of the organization. Finally, the human resources department is involved in recruitment, hiring, and training of new employees as well as maintaining the workforce.

Implementation Site

Marion Health (MH) is a 99-bed hospital located in Marion Indiana which is in Grant County (Marion Health, n.d.). MH is designated as a Qualified Health Center outside of Urbanized Areas and is one of 58 such facilities in the state of Indiana (Rural Health Information Hub, 2020). The surgery department contains nine operating rooms and three endoscopic suites (Marion Health, n.d.). MH is Grant County's largest employer with about 1300 employees (Marion Health, n.d., 2017). The Centers for Medicare & Medicaid Services (CMS) rates MH as five out of five stars, with ratings based on mortality, the safety of care, readmission, patient experience, and timely and effective care (Medicare.gov, 2021). According to its 2017 fiscal year annual report, MH has added several new service lines including cancer treatment and has recently renovated several patient care units (2017). The surgery department is developing a robotic bariatric surgery program after hiring an experienced general surgeon in the spring of 2021.

MH has a leadership structure with Stephanie Hilton-Siebert serving as President and chief executive officer (CEO), along with a 15-member board of directors consisting of members of the community (Marion Health, n.d.). The chief nursing officer (CNO) Cindy Futrell reports to the CEO. Reporting directly to the CNO is Brandon Scott, director of perioperative services. MH is positioned to positively impact health disparities within its community. In 2020 Grant County was ranked 91 out of 92 Indiana counties for health outcomes (Longevity and how healthy people feel) and 82 out of 92 for health factors (health behaviors, clinical care, social and economic factors, and physical environment factors), which shows there is room for MH to improve the health of the community it serves. (University of Wisconsin Population Health Institute, 2020). According to 2019 census data, there are 66,452 residents of Grant County (United States Census Bureau, 2021).

MH has received several awards and designations, including Magnet Status, Top 20 rural hospitals in the United States, and top 10 most wired hospitals in Indiana. The mission statement found on MH's website states "Marion Health exists to transform the health of our community through patient-centered, high quality, affordable care" (Marion Health, n.d. para 2.). Additionally, the values listed for MH are "quality, patient service excellence, effective communication, resource management, teamwork, and community driven" (Marion Health, n.d. para 2.). The employees at MH seem to be proud to be employed by MH.

MH has positioned itself as an integral part of the community, through the care it provides as well as the jobs it provides. MH is a not-for-profit hospital and according to its 2017 fiscal year annual report, more than 3.8 million dollars were invested in the community, along with 21 million dollars invested in the infrastructure of MH facilities (2017).

MH has developed a Unit Practice Council program for each nursing unit to focus on practice concerns and improving patient care through evidence-based practice. The unit practice council is made up of direct patient caregivers who are elected by their peers rather than assigned by a manager. MH also has several nursing alliances to further empower nursing staff, including leadership alliance, research alliance, professional development alliance, practice alliance, and quality & performance improvement alliance. The unit practice council can collaborate with any or all the nursing alliances to solve problems that have been identified by nursing staff that are providing direct patient care.

Change Strategy

Everett Rogers' Diffusion of Innovation Theory was chosen as the change theory for this project. There are five steps in Rogers' theory: Knowledge, Persuasion, Decision, Implementation, and Confirmation (White et al., 2021). New ideas can be considered innovation and progress through the steps of the Diffusion of Innovation Theory. Rogers noted there are five groups of adopters. The first are the innovators, the second are the early adopters, the third are the early majority, the fourth are the late majority, and finally the last group are the laggards (White et al., 2021). Each group requires a different approach for introduction to a change or innovation. This project aimed to introduce innovative knowledge (the side effects and medication interactions of sugammadex) to the perioperative nursing staff through an educational intervention, seeking to persuade the perioperative nursing staff that a change in practice was worth implementing. The decision to implement a change in practice based on new knowledge is individual and occurs in one of the five aforementioned groups of adopters. The educational intervention was targeted to capture the innovators, early adopters, and the early majority,

leaving the late majority and laggards with the benefit of increased knowledge. Through the positive influence of their early adopting peers a change in practice will occur.

Leadership Style

The leadership within the surgery department of MH consists of Tracy Livingston the OR Manager and Linda Simpkins the Pre-op/Post-op Manager who reports to Brandon Scott the Director of Perioperative Services. The surgery leadership report feeling supported by the administration for the implementation of evidence-based practice changes through not only this DNP project but also through the unit practice council. One of the challenges of the operating room is staffing for both scheduled cases and emergency or add-on cases. A supportive leadership style allows for the staff members to be flexible to accomplish the tasks that must be performed to adequately staff each operating room. A leadership style that micro-manages every aspect of each team member's work would not be effective in such a fluid environment as the operating room. The project manager's leadership style is consistent with the principles of crew resource management (CRM), including communication, situational awareness, problem-solving, decision making, and teamwork (Gaba et al., 2015). The project manager's CRM leadership style was developed through many years of practice through both the fire service and the aviation industry and lends itself to both anesthesia as well as managing a DNP project and its implementation. During the pre-implementation period there were obstacles related to the COVID-19 pandemic including redeployment of the perioperative staff to other areas of MH and stopping of elective surgeries by MH administration. The project manager, along with Brandon Scott were able to schedule an appropriate time for the project presentation to the perioperative

nursing staff. The project manager's CRM leadership background proved useful to navigate the problems encountered pre-implementation.

Interprofessional Collaboration

The team members identified for this DNP project include Brandon Scott the director of perioperative services, Dr. Carla Mueller project advisor, and Dr. Keith Cotrell academic advisor. This DNP project relied on the expertise of all team members within their respective roles. The project manager maintained professional communication with members of the project team through emails, phone calls, and in-person meetings. Collaboration with Brandon Scott was vital to enact a practice change at MH. Collaboration with Dr. Mueller and Dr. Cotrell ensured a thorough project and implementation. Meredith Frymier PharmD, a pharmacist at MH has assisted with gathering sugammadex usage data.

Conflict Management

CRM was designed to mitigate crisis through communication, situational awareness, problem-solving, decision making, and teamwork; this strategy can easily be adapted to any potential roadblocks or conflicts in the implementation of this DNP project (Gaba et al., 2015). During the pre-implementation period there were obstacles related to the COVID-19 pandemic including redeployment of the perioperative staff to other areas of MH and stopping of elective surgeries by MH administration. The project manager, along with Brandon Scott were able to schedule an appropriate time for the project presentation to the perioperative nursing staff.

Chapter 6: Discussion

Impact of Project

This project was designed to increase nurse's knowledge of the side effects and medication interactions of sugammadex through an educational intervention. An additional goal of this project was to increase the perioperative nursing staffs' self-reported use of discharge teaching on the side effects and medication interactions of sugammadex. This project failed to meet the outcomes related to the mechanism of action and use of sugammadex due to the perioperative nurses' knowledge of these items. However, this project met and exceeded the outcomes directly related to increasing knowledge of the side effects and medication interactions of sugammadex. This project also met and exceeded outcomes on the increase in self-reported discharge teaching on the side effects and medication interactions of sugammadex.

This project has the potential to impact a larger number of patients than anticipated due to the increased availability of sugammadex to the anesthesia providers at MH.

Decisions and Recommendations

This project demonstrated that an educational intervention is an effective method to change nursing practice in a positive manner. The educational intervention should be made available to all current perioperative nurses at MH as well as all future nursing staff as part of the orientation process.

Limitations of the Project

During the implementation phase of this project, MH paused elective surgeries and redeployed perioperative staff to other units in the hospital to assist with a surge in Coronavirus patients. This led to a smaller than anticipated sample size.

Application to Other Settings

A relevant educational intervention that is designed to drive practice change to improve patient outcomes could be used in every field and practice environment of nursing. The information included in the educational intervention of this project should be available for all perioperative nurses in facilities that use sugammadex.

Strategies for Maintaining and Sustaining

The PowerPoint presentation that was utilized by the project manager for the educational intervention was made available to Brandon Scott, the OR manager at MH for continued use to the perioperative nurses that were unable to attend the intervention as well as future staff. The information contained in the educational intervention could be utilized as part of the OR department's yearly continuing education requirements to ensure consistent discharge teaching for patients that have received sugammadex.

Lessons Learned

Implementing an evidence-based project taught the project manager the importance of flexibility and teamwork. The project manager worked with the project team to implement an educational intervention during a world-wide Coronavirus pandemic and still gain valuable data to support a change in practice. The insight provided to the project manager by members of the project team for of immense value, without which this project would not have been completed. The flexibility of the project team, especially at MH made navigating the Coronavirus pandemic manageable for the implementation of this project. The project manager worked with the project advisor on creating several contingent plans in the event the original plan failed; however, the

original plan succeeded. The practice of contingency planning was useful to the project manager on not only this DNP project but also to the clinical environment as an anesthesia provider.

The DNP Essentials served as a guide for this DNP project. Many hours of literature review and synthesis were involved in the completion of this DNP project (DNP Essential I). A comprehensive SWOT analysis was completed to determine the feasibility of implementing this DNP project at MH (DNP Essential II). An IRB proposal was constructed and submitted to the University of Saint Francis IRB prior to implementation of this DNP project (DNP Essential III). Several web-accessible surveys were created on the Microsoft Forms platform for use in the implementation of this DNP project (DNP Essential IV). The project manager spoke at multiple meetings of the Maconaquah School Board and participated in the committee to re-open the school during the Coronavirus pandemic, utilizing the knowledge acquired from the process of constructing this DNP project (DNP Essential V). The project manager met multiple times with the project advisor and the project team members regarding this DNP project (DNP Essential VI). A gap in knowledge was identified and this DNP project was implemented to address the gap (DNP Essential VII). Finally, the project manager disseminated the knowledge from this DNP project to healthcare providers including the perioperative RNs at MH (DNP Essential VIII).

Chapter 7: Conclusion

Potential Project Impact on Health Outcomes Beyond Implementation Site

This DNP project could be utilized by other healthcare organizations to similarly educate the perioperative staff on the side effects and medication interactions of sugammadex. Healthcare

organizations that utilize this DNP project as a template could increase the number of patients that receive proper teaching on the side effects and medication interactions of sugammadex.

Health Policy Implications of Project

Sugammadex has the potential for increased use, as the cost decreases and potential generic versions are approved and manufactured in the United States. Hospitals, such as MH, should take the results of this DNP project and institute a policy or procedure to encourage perioperative RNs to teach appropriate patients about the side effects and medication interactions of sugammadex.

Proposed Future Direction for Practice

This DNP project overwhelmingly demonstrates that an educational intervention for perioperative RNs yielded an increase in knowledge on the side effects and medication interactions of sugammadex. Nursing educators as well as anesthesia providers should consider a similar educational intervention for the perioperative nursing staff in their practice environment. Nursing educators and administrators should also consider creating a protocol or policy for the perioperative nursing staff regarding educating patients on the side effects and medication interactions of sugammadex.

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Appendix A

Pre-Intervention Survey

Sugammadex EBP project pre- education survey

Please select one of the following for each question

1. Hello, I am Dustin Heath, a student registered nurse anesthetist (SRNA) at the University of Saint Francis, Fort Wayne, Indiana. I am conducting a project for my Doctor of Nursing practice (DNP) degree, and I, along with my project advisor Dr. Mueller are seeking your participation in my DNP project.

The purpose of participation in this DNP Project will be to show how an educational intervention will increase nurses' knowledge regarding the side effects and medication interactions of sugammadex. This increase in knowledge will yield more effective teaching to patients which will lead to improved outcomes and satisfaction for patients.

Explanation of Procedures:

1. The participants will complete a pre-intervention survey prior to the educational presentation.
2. An educational presentation will be presented to all participants which will last approximately 15-20 minutes.
3. The participants will complete the post-intervention survey after the educational presentation is completed.
4. Approximately 4 weeks after the educational presentation an online anonymous survey will be distributed to the participants to determine if the educational intervention had a positive effect on the perioperative teaching for patients.

Explanation of the Risks and Benefits of the Research:

1. There are no foreseeable risks associated with participation in this DNP project. The educational intervention will be included in a regularly scheduled meeting and will not require a separate time commitment.
2. There will be no compensation for participation in this DNP project.
3. Benefits include an increase in knowledge and the ability to provide a more thorough teaching for patients receiving sugammadex.

Explanation of the Safeguards:

1. Surveys are anonymous with no identifying information collected.

Freedom to Withdraw:

Participation in the DNP project is voluntary. Participants may withdraw at any time for any reason without consequence

- Yes, I consent to participation in this study
- No, I do not want to participate in this study

2. Years of experience as a registered nurse

- <1
- 1-5
- 6-10
- 11-15
- 16-20
- >20

3. Years of experience as a perioperative nurse

- <1
- 1-5
- 6-10
- 11-15
- 16-20
- >20

4. Highest level of nursing education

- Diploma
- Associate's of Science in Nursing
- Bachelor's of Science in Nursing
- Graduate Degree in Nursing
- Other/not listed

5. Sugammadex is a medication given intra-operatively to:

- Reduce nausea
- Reverse effects of opioids
- Reverse effects of neuromuscular blocking medications
- Increase blood sugar

6. The mechanism of action of sugammadex is:

- Surrounding and inactivating steroidal medications
- Competing for receptor sites on the neuromuscular junction
- Metabolizing steroidal medications directly
- Increasing enzyme production in CYP450 system

7. A side effect of sugammadex is:

- Emergence delirium
- Prolonged effects of anesthesia
- Increase in prothrombin and activated partial thromboplastin time
- Hyperalgesia

8. Sugammadex interacts with:

- Toradol
- Ondansetron
- Angiotensin converting enzyme inhibitors
- Progesterone containing hormonal replacement medications

9. The reversal agent (sugammadex or neostigmine) choice is communicated by the anesthesia provider

- | Never | Rarely | Sometimes | Often | Always |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> |

10. For a female patient, how often do you:

	Never	Rarely	Sometimes	Often	Always
Ask about current use of progesterone containing hormonal replacement medications	<input type="radio"/>				
Pre-operatively teach on possibility of sugammadex to interfere with effectiveness of progesterone containing hormonal replacement medications	<input type="radio"/>				
Post-operatively teach on possibility of sugammadex to interfere with effectiveness of progesterone containing hormonal replacement medications	<input type="radio"/>				

11. For any patient, how often do you:

	Never	Rarely	Sometimes	Often	Always
Pre-operatively teach on the possibility of sugammadex to increase the risk of post-operative bleeding	<input type="radio"/>				
Post-operatively teach on the possibility of sugammadex to increase the risk of post-operative bleeding	<input type="radio"/>				

This content is neither created nor endorsed by Microsoft. The data you submit will be sent to the form owner.

Appendix B

Post-Intervention Survey

Sugammadex EBP project post-education survey

Please select one of the following for each question

1. Sugammadex is a medication given intra-operatively to:

- Reduce nausea
- Reverse effects of opioids
- Reverse effects of neuromuscular blocking medications
- Increase blood sugar

2. The mechanism of action of sugammadex is:

- Surrounding and inactivating steroidal medications
- Competing for receptor sites on the neuromuscular junction
- Metabolizing steroidal medications directly
- Increasing enzyme production in CYP450 system

3. A side effect of sugammadex is:

- Emergence delirium
- Prolonged effects of anesthesia
- Increase in prothrombin and activated partial thromboplastin time
- Hyperalgesia

4. Sugammadex interacts with:

- Toradol
- Ondansetron
- Angiotensin converting enzyme inhibitors
- Progesterone containing hormonal replacement medications

This content is neither created nor endorsed by Microsoft. The data you submit will be sent to the form owner.

Appendix C

1 Month Follow-Up Survey

Sugammadex EBP project 1 month follow-up survey

Please select one of the following for each question

1. The reversal agent (sugammadex or neostigmine) choice is communicated by the anesthesia provider

Never

Rarely

Sometimes

Often

Always

2. For a female patient, how often do you:

	Never	Rarely	Sometimes	Often	Always
Ask about current use of progesterone containing hormonal replacement medications	<input type="radio"/>				
Pre-operatively teach on possibility of sugammadex to interfere with effectiveness of progesterone containing hormonal replacement medications	<input type="radio"/>				
Post-operatively teach on possibility of sugammadex to interfere with effectiveness of progesterone containing hormonal replacement medications	<input type="radio"/>				

3. For any patient, how often do you:

	Never	Rarely	Sometimes	Often	Always
Pre-operatively teach on the possibility of sugammadex to increase the risk of post-operative bleeding	<input type="radio"/>				
Post-operatively teach on the possibility of sugammadex to increase the risk of post-operative bleeding	<input type="radio"/>				

This content is neither created nor endorsed by Microsoft. The data you submit will be sent to the form owner.

Appendix D

CITI Training Certificates

		Completion Date 20-Jan-2021 Expiration Date 20-Jan-2024 Record ID 40368021
This is to certify that:		
Dustin Heath		
Has completed the following CITI Program course:		
Public Health Research (Curriculum Group)		
Public Health Research (Course Learner Group)		
1 - Basic (Stage)		
Under requirements set by:		
University of Saint Francis		
		
Verify at www.citiprogram.org/verify/?w4aef474a-43c6-441c-b806-52c781adb3c2-40368021		

Not valid for renewal of certification through CME.



Completion Date 20-Jan-2021
Expiration Date N/A
Record ID 40368018

This is to certify that:

Dustin Heath

Has completed the following Citi Program course:

Not valid for renewal of certification
through CME.

Information Privacy Security (IPS)

(Curriculum Group)

Researchers

(Course Learner Group)

1 - Basic Course

(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wf1e099d3-1c39-4fa2-aa0b-b8f2d798c727-40368018



Completion Date 21-Jan-2021
Expiration Date 21-Jan-2024
Record ID 40368019

This is to certify that:

Dustin Heath

Has completed the following CITI Program course:

Not valid for renewal of certification
through CME.

Social and Behavioral Responsible Conduct of Research
(Curriculum Group)

Social and Behavioral Responsible Conduct of Research
(Course Learner Group)

1 - RCR
(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wcb156d2b-9409-4985-b464-4e3dd0674e47-40368019



Completion Date 16-Jan-2021
Expiration Date 16-Jan-2024
Record ID 40368020

This is to certify that:

Dustin Heath

Has completed the following Citi Program course:

Not valid for renewal of certification
through CME.

GCP – Social and Behavioral Research Best Practices for Clinical Research

(Curriculum Group)

GCP – Social and Behavioral Research Best Practices for Clinical Research

(Course Learner Group)

1 - Basic Course

(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w10fdb95-62a6-46cc-b66c-7a93614a18f3-40368020



Completion Date 14-Jan-2021
Expiration Date 14-Jan-2024
Record ID 40368017

This is to certify that:

Dustin Heath

Has completed the following Citi Program course:

Not valid for renewal of certification
through CME.

Social & Behavioral Research - Basic/Refresher

(Curriculum Group)

Social & Behavioral Research

(Course Learner Group)

1 - Basic Course

(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w51931fcb-23ec-4db6-b7a6-09b162f4cbe9-40368017

Appendix E

Project Team Agreement

5-2019

University of Saint Francis
DOCTOR OF NURSING PRACTICE

DNP SCHOLARLY PROJECT TEAM AGREEMENT

Name: Dustin Heath

Cohort: 2022

Student ID: 467323

Project Name: An Educational Intervention to Increase Nurse's Knowledge of Side Effects and Medication Interactions of Sugammadex

Project Facility: Marion General Hospital

Signatures on this form indicate an agreement that all team members will work collaboratively toward timely completion of the scholarly project [implementation Spring 2022]. The completed form before is to be submitted into Canvas by the specified due date.

Name	Signature	Date
Student – Dustin Heath		4/24/21
Project Advisor – Dr Carla Mueller		4/27/21
Practice Mentor – Ric Pennington		4/25/21
Academic Advisor – Dr Keith Cotrell		4/25/21

Appendix F

Letter of Support



August 18, 2021

To the University of Saint Francis Institutional Review Board:

This letter is being written in support of University of Saint Francis NAP/DNP Dustin Heath's Doctor of Nursing Practice Scholarly Project entitled An Educational Intervention to Increase Nurse's Knowledge of Side Effects and Medication Interactions of Sugammadex. Marion General Hospital understands that the aims of the DNP Scholarly Project are to determine if an educational intervention to perioperative nurses will increase their knowledge of the side effects and medication interactions of sugammadex which will translate to more effective discharge teaching for the patient.

Marion General Hospital is supportive of the aims of the project. Marion General Hospital will allow Dustin Heath to present an educational intervention to our perioperative staff, as well as collect a pre-intervention survey and 2 post-intervention surveys. Marion General Hospital does not require approval from our Institutional Review Board.

Marion General Hospital is committed to facilitating the implementation of Dustin Heath's DNP Scholarly Project An Educational Intervention to Increase Nurse's Knowledge of Side Effects and Medication Interactions of Sugammadex.

Sincerely,

Brandon Scott

A handwritten signature in black ink, appearing to read "Brandon Scott", enclosed in a rectangular box.

Administrative Director of Surgery
Marion General Hospital
765-660-6271
Brandon.scott@mgh.net

Appendix G

IRB Approval

**University of Saint Francis
Institutional Review Board
Human Subjects Review Committee/ACUC/IBC
Institutional Review Board Approval Form**

Protocol Number: 16319989918

Reviewed by (underline one): HSRC ACUC IBC

Date Reviewed: Monday, November 1, 2021

Principal Investigator: Dustin Heath

Faculty Advisor: Dr. Carla Mueller

Protocol Title: Education to Increase RN Knowledge of Sugammadex

Study Site(s): University of Saint Francis, Main Campus

Type of Proposal:

- Original research
 Replication or extension of previous research
 Quality Improvement/Evidence-Based Practice Project

Items submitted for review:

- CITI Certificate
 Initial protocol
 Abstract
 Informed Consent Form (if applicable)
 Approval letter from outside institution
 Other – explain: Email request was made for waiver

Type of Review:

- Full Review
 Expedited Review
 Exempt Review

Approval:

- Approval granted on Monday, November 1, 2021 for a period of one year.
 Conditional approval* granted on _____ for a period of one year.
 Not approved*
 IRB approval is not required:
 Other

*Comments:

The committee performing this review is duly constituted and operates in accordance and compliance with local and federal regulations and guidelines.

Michael P. Bechill, IRB Chair
 Printed Name (Chair or designee)

Michael P. Bechill
 Signature

2021-11-01
 Date

Appendix H

Informed Consent

Informed Consent

An Educational Intervention to Increase Nurses' Knowledge of Side Effects and Medication Interactions of Sugammadex.

Hello, I am Dustin Heath, a student registered nurse anesthetist (SRNA) at the University of Saint Francis, Fort Wayne, Indiana. I am conducting a project for my Doctor of Nursing practice (DNP) degree, and I, along with my project advisor Dr. Mueller are seeking your participation in my DNP project.

The purpose of participation in this DNP Project will be to show how an educational intervention will increase nurses' knowledge regarding the side effects and medication interactions of sugammadex. This increase in knowledge will yield more effective teaching to patients which will lead to improved outcomes and satisfaction for patients.

Explanation of Procedures:

1. The participants will complete a pre-intervention survey prior to the educational presentation.
2. An educational presentation will be presented to all participants which will last approximately 15-20 minutes.
3. The participants will complete the post-intervention survey after the educational presentation is completed.
4. Approximately 4 weeks after the educational presentation an online anonymous survey will be distributed to the participants to determine if the educational intervention had a positive effect on the perioperative teaching for patients.

Explanation of the Risks and Benefits of the Research:

1. There are no foreseeable risks associated with participation in this DNP project. The educational intervention will be included in a regularly scheduled meeting and will not require a separate time commitment.
2. There will be no compensation for participation in this DNP project.
3. Benefits include an increase in knowledge and the ability to provide a more thorough teaching for patients receiving sugammadex.

Explanation of the Safeguards:

1. Surveys will be anonymous with no identifying information collected.

Freedom to Withdraw:

1. Participation in the DNP project is voluntary. Participants may withdraw at any time for any reason without consequence.

Offer to Answer Inquiries

Once the DNP project is completed, we would be glad to share the results.

If you have any questions, please contact us at:

Dustin Heath, SRNA
University of Saint Francis
Department of Nurse Anesthesia
2701 Spring Street

Fort Wayne, Indiana, 46808
(765) 469-7248
heathd@cougars.sf.edu

If you have any complaints about your treatment as a participant in this DNP project, please call or write:

IRB Chairperson,
University of Saint Francis,
Fort Wayne, Indiana, 46808
(260) 399-7700
Administration email: irb@sf.edu

I have received an explanation of this project and agree to participate. I understand that my participation in this project is strictly voluntary.

Name (*Print and Sign*): _____ Date: _____

This DNP project has been approved by the University of Saint Francis' Institutional Review Board for the Protection of Human Subjects for a one-year period

Appendix I

PowerPoint Presentation



Side Effects and Medication Interactions of Sugammadex

Dustin Heath, SFNA
University of Saint Francis

Use of Sugammadex

- Reverses the effects of a steroidal non-depolarizing neuromuscular relaxant medications such as Rocuronium and Vecuronium.
- Has no effect on medications such as Succinylcholine or Cisatracurium



Mechanism of Action

- Sugammadex is a cyclodextrin molecule that is designed to encapsulate steroidal molecules and create a water-soluble compound that is easily eliminated (Murphy, 2016).
- One molecule of sugammadex can bind to one molecule of steroidal NDNMR with the highest affinity to rocuronium (Murphy, 2016).



(Mechanism of Action for Bridion (sugammadex), n.d.)

Side Effects

Multiple studies show that sugammadex prolongs the prothrombin time (PT) and activated partial thromboplastin time (aPTT) after administration for approximately 1 hour.

(Awad et al., 2020; Bosch et al., 2016; Carron, 2015; Carron et al., 2018; De Kam et al., 2013; De Kam et al., 2014; Dirkmann et al., 2016; Kang, E. et al., 2020; Kruithof et al., 2020; Lee, 2019; Moon et al., 2018; Pafit et al., 2015; Rahe-Meyer et al., 2015; Tase et al., 2015)

Medication Interactions

Sugammadex is designed to sequester steroidal NDNMR medications, but has also been shown, in vitro, to sequester steroidal progesterone containing hormonal replacement medications, which could displace steroidal NDNMR and lead to residual neuromuscular blockade, as well as decrease levels of steroidal progesterone containing hormonal replacement medications leading to unintended pregnancy

(Corda & Fobards, 2018; Dalton & Van Hasselt, 2015; Et et al., 2015; Gunduz et al., 2016; Hormonal-contraceptives/sugammadex interaction, 2020; Lazorwitz et al., 2019; O'Driscoll & Parrott, 2019; Richardson & Raymond, 2020; Shu et al., 2007; Webber & Kreso, 2018; Williams & Bryant, 2017; Zwiers et al., 2010).

Communication

- Clearly identify patients that have received sugammadex.
 - Anesthesia provider should report reversal agent (sugammadex vs neostigmine) during hand-off report.
 - If anesthesia provider does not indicate reversal medication given, the recovery room RN should clarify which medication was given.

When to Teach?

- As much as 50% of discharge teaching is not understood by patients, however teaching preoperatively and written instructions are associated with a greater level of recall postoperatively (Albrecht et al., 2014; Horwitz et al., 2013; Horstman et al., 2017)

Conclusion

- The mitigation of the risk of unintended pregnancy and vigilance for post-operative bleeding and residual neuromuscular blockade are outcomes that the perioperative nurse can directly impact through discharge teaching (Kang, W.S et al., 2020; Naqib et al., 2018; O'Driscoll & Parrott, 2019).

Appendix J

Adaptation of Survey Permission

Wednesday, July 14, 2021 at 13:02:00 Eastern Daylight Time

Subject: Re: Sugammadex survey
Date: Wednesday, July 14, 2021 at 11:15:09 AM Eastern Daylight Time
From: Justice Parrott
To: Heath, Dustin
CC: Lisa O'Driscoll

WARNING: This email originated from outside of USF. Do **NOT** click links or attachments unless you recognize the sender and know the content is safe.

Mr. Heath,

Greetings. You have our permission to adapt our survey for your project.

Please let us know how it turns out!

Respectfully,

CAPT Parrott

Wednesday, July 14, 2021 at 13:02:19 Eastern Daylight Time

Subject: Re: Sugammadex survey
Date: Wednesday, July 14, 2021 at 12:19:06 PM Eastern Daylight Time
From: Richardson, Michael G
To: Heath, Dustin

WARNING: This email originated from outside of USF. Do **NOT** click links or attachments unless you recognize the sender and know the content is safe.

By all means, Dustin. We are flattered you wish to do so.
We look forward to whatever you will learn in your project.

Best regards,
Michael, on behalf of my co-authors

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Appendix K

Force Field Analysis

Driving Forces	Restraining Forces	Actions to be Taken
Operating room staff supportive of EBP projects		Engage with operating room staff prior to implementation to reinforce need for DNP project
Unit Practice Council in place to focus on EBP		Meet with Unit Practice Council to increase buy in for DNP project
Leadership supportive of DNP project		Continue to engage with stakeholders on regular basis
Sugammadex is readily available for use without constraints from pharmacy		Communicate with pharmacy about the safety and efficacy of sugammadex to ensure continued access
Increase in number of patients that sugammadex is an appropriate medication due to expansion of bariatric surgical services		Ensure that the anesthesia staff is aware of the risks and benefits of sugammadex for bariatric patients
	Staffing turnover – new staff may be hired after the educational intervention	Create educational handouts that can be given to new staff to ensure continued learning
	Lack of communication between CRNA and PACU RN of reversal agent administered	Ensure that the anesthesia staff is reporting the reversal agent administered
	Multiple DNP projects being implemented at MH	Communicate with other DNP project managers to ensure that the implementation does not create conflict

	Workload of staff during implementation phase may hinder follow-up	Create a follow-up procedure that allows for staff to complete conveniently
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Appendix L

SWOT Analysis

<p>Strengths</p> <ul style="list-style-type: none"> ▪ The operating room staff share a culture of embracing EBP ▪ Unit Practice Council to focus on EBP ▪ Leadership supportive of DNP project ▪ Availability of Sugammadex 	<p>Weaknesses</p> <ul style="list-style-type: none"> ▪ Staffing turnover – new staff may be hired after the educational intervention ▪ Knowledge deficit – the information in the educational intervention may be new to the RNs, and prior to the presentation they may not be aware that the information is important to know ▪ Lack of communication between CRNA and PACU RN on reversal agent administered
<p>Opportunities</p> <ul style="list-style-type: none"> ▪ Establishment of bariatric program will increase number of patients that require sugammadex ▪ The information in this DNP project will likely be new to staff RNs and will empower them to more effectively teach patients ▪ Enhance interdisciplinary team relationships 	<p>Threats</p> <ul style="list-style-type: none"> ▪ Several new CRNAs being hired, they may not be supportive of the proposed education ▪ Multiple DNP projects being implemented at MH ▪ Workload of staff during implementation phase may hinder follow-up

