Marian University

Leighton School of Nursing

Submitted in partial fulfillment for the degree of

Doctor of Nursing Practice

Evaluating Anesthesia Providers' Adherence to Enhanced Recovery After Surgery (ERAS) Protocol's Dexamethasone Dosage Recommendations

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Date of Submission: January 12, 2021

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This project is submitted to the faculty of Marian University Leighton School of Nursing as partial fulfillment of degree requirements for the Doctor of Nursing Practice, Nurse Anesthesia track. Enhanced Recovery After Surgery (ERAS) protocols are a significant aspect of postoperative and anesthesia care. Dexamethasone administration, specifically, is an essential component of each protocol. The use of dexamethasone helps to prevent and combat common postoperative complications. However, an adequate dosage must be administered to reap the full benefits of its use. Each healthcare facility develops and establishes its own ERAS protocol for use by anesthesia providers and includes the specific amount of dexamethasone that should be provided. However, variations in dosage administration may occur. To investigate this issue, a retrospective chart review was conducted. The purpose of the review is to assess compliance by anesthesia providers to facility-specific ERAS protocol dexamethasone administration recommendations.

Introduction

ERAS protocols are evidence-based, patient-centered pathways that aim to facilitate postoperative recovery (AANA, 2019). They consist of both multimodal and multidisciplinary approaches (AANA, 2019). Dexamethasone administration is an important component of ERAS regimens, as it is a highly effective method for reducing postoperative nausea and vomiting (PONV) and pain. Dexamethasone dosages are weight-based and commonly range from 4 to 8 milligrams (mg). Although lower dosages have antiemetic effects, higher dosages of approximately 8 mg are shown to have more reliable antiemetic activity with the additional benefit of analgesia (Stanford Medicine, 2018). To fulfill its intended purpose, each ERAS protocol must be precisely adhered to.

Since variation in this aspect of perioperative anesthesia care may exist, there is a need to examine for potential gaps in this specific portion of anesthesia care. This quality improvement project aims to assess anesthesia providers' adherence to their facility's ERAS protocol recommendations for dexamethasone administration.

Background

Complications such as PONV and poorly controlled pain commonly prolong the recovery process (Tan et al., 2014). Both anesthetic gases and opioids can cause PONV (Tan et al., 2014). Opioids can also produce additional detrimental side effects such as respiratory depression, urinary retention, ileus, and hyperalgesia (Tan et al., 2014). As a major component of ERAS protocols, dexamethasone administration can help to bypass these difficulties through its antiemetic and analgesic properties (Tan et al., 2014). However, to ensure efficacy, dexamethasone must be administered and dosed as instructed by the ERAS protocol. Higher dosages have been shown to more reliably prevent the occurrence of PONV and possess the analgesic effects that lower dosages do not (Waldron, Jones, Gan, Allen, & Habib, 2013).

Problem Statement

The following clinical question was used to guide research on this identified clinical problem: In patients receiving care under the facility's ERAS protocol, is the recommended dexamethasone dosage for postoperative nausea, vomiting, and pain reduction being adhered to by anesthesia providers?

Organizational "Gap" Analysis of Project Site

At the designated project site, the ERAS protocol listed in Appendix A was developed for use in open bowel procedures. Compliance has not yet been evaluated for dexamethasone dosing as part of the protocol. If less than the recommended dosage is administered, the protocol may not be effective in producing the desired outcomes. Since ERAS protocols were developed to enhance postoperative outcomes and reduce PONV and pain, the inaccurate incorporation of even one component can defeat these essential purposes. A retrospective chart analysis was performed to determine if a care gap is present and to what extent. The ultimate goal was to promote adherence and consistency so that the efficacy of the protocol could be ensured.

Review of the Literature

A focused search of the available literature included the use of the following keywords: ERAS protocol, ERAS regimen, preoperative dexamethasone administration, dexamethasone and antiemesis, dexamethasone and analgesia, nausea and vomiting prophylaxis, postoperative nausea and vomiting, postoperative pain, and postoperative complications. Databases used include the Joanna Briggs Institute Evidence-Based Practice Database, the Cochrane Library, and the Cumulative Index of Nursing and Allied Health Literature (CINAHL). Articles that were included discussed dexamethasone as part of ERAS protocol use and those that consisted of higher-level evidence. Articles that did not discuss dexamethasone use as part of the ERAS protocol or were lower-level evidence were excluded. Five evidence-based literature sources were chosen, consisting of both primary and secondary sources, and are summarized in a literature review matrix (see Appendix A). The author found the inclusion of secondary sources, such as systematic reviews and meta-analyses, to be beneficial due to the comprehensive

evaluation of available evidence that they provide. Each article's findings will be discussed below.

A. Effect of intraoperative dexamethasone on pain scores and narcotic consumption in patients undergoing total knee arthroplasty

In this retrospective chart review, a total of 102 patients who underwent a total knee arthroplasty were used as a sample for analysis (Samona et al., 2017). They were divided into two separate groups: one who received 8 mg of dexamethasone intraoperatively and one who did not receive it at all (Samona et al., 2017). A numeric pain scale was used to assess postoperative pain levels at 24 hours after their procedures (Samona et al., 2017). The authors found that the patients who received dexamethasone had significantly lower pain scores and opioid requirements than their counterparts during their standard 3-day hospital stay (Samona et al., 2017).

B. Consensus guidelines for the management of postoperative nausea and vomiting

This systematic review by Gan et al. (2014) found that the administration of 8 mg of dexamethasone preoperatively improves postoperative outcomes. These include nausea, pain, and fatigue (Gan et al., 2014). The authors determined that these benefits are dose-dependent (Gan et al., 2014). Doses greater than 0.1 mg/kg were found to be more effective in producing the maximum benefits (Gan et al., 2014). Patients who received a higher dose as opposed to a lower dose of 0.05 mg/kg reported less sore throat, nausea, pain, and difficulty sleeping at 24 hours after their operation (Gan et al., 2014). Thus, the authors stated that 8 mg is the recommended preoperative dose (Gan et al., 2014).

One article examined in this systematic review examined twenty-four randomized controlled trials as part of a meta-analysis (De Oliveira, Almeida, Benzon, & McCarthy,

2011). The trials consisted of 2,751 subjects collectively. The studies were then separated into three different groups based on the dosages that the subjects received: low, intermediate, and high (De Oliveira, Almeida, Benzon, & McCarthy, 2011). The low group received less than 0.1 mg/kg of dexamethasone, the intermediate received 0.11-0.2 mg/kg, and the high received greater than 0.21 mg/kg (De Oliveira, Almeida, Benzon, & McCarthy, 2011). The intermediate and high groups showed a decrease in opioid consumption, whereas the low group did not (De Oliveira, Almeida, Benzon, & McCarthy, 2011). The authors concluded that a dose greater than 0.1 mg/kg is consistently effective at producing analgesia in multimodal pain strategies than a lesser dose (De Oliveira, Almeida, Benzon, & McCarthy, 2011).

A second article by Waldron et al. (2013) reviewed forty-five studies consisting of 5,796 patients who received dexamethasone in doses ranging from 1.25-20 mg (Waldron et al., 2013). A dose of 8 mg was the most commonly provided dose (Waldron et al., 2013). The authors found that dexamethasone appears to have analgesic effects in the postoperative period (Waldron et al., 2013). Both pain scores and opioid requirements were reported to be reduced at both 2 and 24 hours (Waldron et al., 2013). Furthermore, although blood glucose levels were higher postoperatively, there seemed to be no increase in the occurrence of infection or delayed wound healing (Waldron et al., 2013).

C. Dexamethasone versus standard treatment for postoperative nausea and vomiting in gastrointestinal surgery: randomised controlled trial (DREAMS Trial)

The goal of the DREAMS Trial was to determine if dexamethasone reduces the occurrence of nausea and vomiting in the postoperative period, and if other benefits are also linked to its administration (DREAMS Trial, 2017). A randomized, controlled trial was

conducted with 1,350 participants (DREAMS Trial, 2017). The trial took place in 45 United Kingdom hospitals (DREAMS Trial, 2017). The authors found that a single dose of 8 mg dexamethasone upon induction of anesthesia significantly minimized postoperative nausea and vomiting (PONV) and rescue antiemetics in patients who received gastrointestinal surgery (DREAMS Trial, 2017).

D. Optimizing pain management to facilitate Enhanced Recovery After Surgery pathways

According to the authors of this article, current literature summarized in systematic reviews and meta-analyses indicates that although 4 mg is effective for PONV prophylaxis, 8 mg provides the additional benefit of opioid-sparing effects (Tan, Law, & Gan, 2014). This additional benefit expedites and enhances recovery without causing postoperative complications such as infection (Tan, Law, & Gan, 2014). As an important component of the ERAS pathway, dexamethasone helps to serve as another analgesic modality in managing postoperative pain (Tan, Law, & Gan, 2014).

E. Enhanced recovery after surgery for primary hip and knee arthroplasty: a review of the evidence

Soffin and YaDeau (2016) conducted a systematic review in which they found that dexamethasone increases blood glucose levels in patients with and without diabetes. However, they stated that there is little evidence showing an association with dexamethasone and complications (Soffin & YaDeau, 2016). The authors explained that the peak of hyperglycemia which may occur in diabetic patients is limited (Soffin & YaDeau, 2016). Furthermore, this rise in serum glucose can be adequately managed with perioperative insulin (Soffin & YaDeau, 2016). The article encouraged providers to use their judgment for forgoing dexamethasone administration in diabetic patients on an individual basis based on

the risk of PONV and hyperglycemia (Soffin & YaDeau, 2016).

A prospective randomized controlled study within this review was comprised of eighty-five subjects that were divided into either a diabetic (Type II) or non-diabetic group (Tien et al., 2016). The patients within the groups then randomly received either 8 mg of dexamethasone or 4 mg of ondansetron (Tien et al., 2016). At 2, 4, and 24 hours following the induction of anesthesia, blood glucose levels were measured in both groups. The researchers found that blood glucose levels were increased by all patients who received dexamethasone with no increased severity among diabetics compared to non-diabetics (Tien et al., 2016). Furthermore, they stated that there was no interaction between dexamethasone administration and diabetes, specifically (Tien et al., 2016).

Another article included was a randomized controlled trial conducted by Abdelmalak et al. (2013), in which a total of 185 patients were randomly allocated into a group who received 8 mg of dexamethasone and a group who received a placebo (Abdelmalak et al., 2013). Both groups contained a nearly equal percentage of diabetic patients- 23% and 29%, respectively (Abdelmalak et al., 2013). The authors found that both groups experienced a slight increase in glucose levels; however, the hyperglycemia response appeared to be more closely related to surgical stress rather than dexamethasone administration (Abdelmalak et al., 2013). They concluded that the hyperglycemic effect is limited and should not be a sole reason to deny steroid prophylaxis to diabetic patients (Abdelmalak et al., 2013).

Evidence-Based Practice: Verification of Chosen Option

ERAS protocols are facility-specific and were developed based on the current evidence-based research and guidelines. Hence, it is essential to conduct a chart audit to ensure that anesthesia providers comply with the recommendations within them.

Evidenced-Based Practice Model

The Johns Hopkins Nursing Evidence-Based Practice Model (see Appendix A) aims to ensure that research findings and best practices are properly incorporated into patient care (JHM, n.d.). It consists of a three-step process, known as PET: practice question, evidence, and translation (JHM, n.d.). To utilize the model, a research question is formulated, the evidence is obtained, and the data is then analyzed for translation (JHM, n.d.). In regard to this project, the practice question is as follows: In patients receiving care under the Enhanced Recovery After Surgery Protocol, is the recommended dexamethasone dosage for postoperative nausea and vomiting and pain reduction being adhered to by anesthesia providers? The evidence includes the specific dexamethasone dosages that have been collected from patient charts. Lastly, the translation consists of evaluating the results of comparative analysis and determining whether or not the specific dexamethasone administration component of the ERAS protocol was adhered to. This information can then be used to formulate a plan for process improvement, such as provider education, if the findings indicate a need for such further action.

Goals, Objectives, and Expected Outcomes

The goal of this project was to determine if anesthesia providers within the chosen surgical facility have been adhering to the minimum preoperative dexamethasone dosage recommendations listed within the specific ERAS protocol established by the facility. The exact doses of dexamethasone that were administered to each of the patients within the audit sample were collected and compared to the dose that is recommended by the facility-specific protocol. This information was extracted from approximately 50 patient charts that met the chosen patient criteria. If a gap were to be identified, the findings could then be used to determine strategies for reducing care variation in ERAS protocol use and improving protocol compliance.

Project Design

A sample population was formed by identifying patients at the facility who have received anesthesia care under the ERAS regimen. The protocol was displayed as "activated" within their charts. Inclusion criteria included adult patients greater than 18 years old, having received the ERAS protocol for a surgical procedure within the past year (2019-2020), and having dexamethasone administration documented in the chart. Exclusion criteria included patients less than 18 years old, not having the ERAS protocol activated within the chart, procedures having occurred greater than 1 year ago, and no documentation of dexamethasone administration. A retrospective chart review was then performed to determine ERAS protocol dexamethasone administration compliance. Compliance was determined by comparing the amount of dexamethasone administered with the amount recommended. Since providers are more likely to alter the dose of dexamethasone if the patient has a history of diabetes, this was accounted for by identifying the patients as either diabetic or non-diabetic based on their listed medical history.

Project Site

This project was carried out at Indiana University Health (IU Health) Arnett Hospital, located in Lafayette, Indiana. The facility is a not-for-profit, full-service hospital that has an adjacent outpatient surgery center (IU Health, 2016). It has been designated as a Magnet Hospital, which acknowledges its nursing excellence and high-quality patient outcomes (IU Health, 2020). Arnett hospital's parent system, IU Health, prioritizes academia and breakthrough research (IU Health, 2020). In 2018, the system reported an annual total of 110,445 surgical cases, which consists of a wide range of specialties and complexity (IU Health, 2020). Lafayette, Indiana is the largest city in Tippecanoe County (STATSIndiana, n.d.). Tippecanoe County has a

population of 195,732 citizens and is comprised of both rural and urban areas (STATSIndiana, n.d.).

Methods

Project review was completed by Marian University's Institutional Review Board (IRB) prior to data collection. A de-identified sample consisting of 50 patient charts was then created based on the inclusion and exclusion criteria previously mentioned. The adult patients within the sample all received the ERAS regimen and dexamethasone administration, specifically, as part of their surgical care from January 2019 to April 2020. Additionally, patients were identified as either diabetic or non-diabetic based on their available medical histories since this patient factor commonly contributes to the inadequate dosing of dexamethasone for PONV and analgesic purposes.

The exact amount of dexamethasone in mg that was administered to each patient by the anesthesia provider was extracted and compiled. The data was then analyzed by the researcher for the diabetic group, non-diabetic group, and as a whole to determine if these amounts match the amount that is part of the ERAS protocol. Data analysis was conducted with the use of Statistical Package for Social Sciences (SPSS) Statistics software to produce descriptive statistics and conduct a T-test to determine result significance.

Measurement Instrument

The specific amount of dexamethasone that was administered to each patient in the sample was collected through the use of the facility's EHR system with the assistance of a Quality and Safety staff member. The system displays which patients have had the ERAS protocol in place for their surgical care. The amount of preoperative dexamethasone that was

administered by the anesthesia provider is recorded in the anesthesia record of each patient's chart. Additionally, documented medical history was used to identify diabetic patients.

Data Collection

Using the Johns Hopkins Model for guidance, evidence was obtained through a retrospective chart review. The specific data that was collected is the dose of dexamethasone in mg that was administered to each patient within the sample who received care under the facility's ERAS protocol. Medical histories were also reviewed to identify a history of diabetes. Next, the data was analyzed by SSPS software. Finally, the doses collected in the data set were compared to the facility's ERAS protocol recommendations.

Data Analysis

Data analysis was conducted using SSPS software. The minimum dose that was administered was 4 mg, while the maximum dose was 20 mg. The most common dose was 8 mg, with the mean dose being 8.2 mg. Out of 50 patients examined, 45 (88%) received the minimum ERAS-recommended dose of 8 mg, 1 received 5 mg, and 5 received 4 mg (see Appendix B, Table 1). All patients with a history of diabetes received a dose of 8 mg (see Appendix B, Table 2). However, only 83% of patients without a history of diabetes received a minimum dose of 8 mg (see Appendix B, Table 3). A one-sample t-test was conducted, for which the test value was set to 8, representing the 8 mg dose that the ERAS protocol recommends. The P-value for significance was set to less than or equal to 0.03. Since the value produced by the test was 0.62, the results were deemed as statistically insignificant.

Ethical Considerations

IRB review was obtained from Marian University before the start of this project, which was determined to be exempt. No patient interventions were conducted and all patient-related

information used was de-identified. The researcher obtained the data with the assistance of a member of the facility's Quality and Safety Team, ensuring that all identifiable patient information remained protected.

Conclusion

The use of ERAS protocols has helped to make major strides in improving postoperative care and outcomes (AANA, 2019). They prioritize patient-centered, evidence-based, multimodal perioperative care and are intended to reduce surgical stress, optimize physiologic function, and enhance recovery (AANA, 2019). When followed precisely, ERAS protocols are highly effective in accomplishing these goals. Thus, it is crucial to ensure that anesthesia providers are closely adhering to the recommendations within them.

The results produced by this retrospective chart analysis suggest that anesthesia providers are largely complying with ERAS protocol dexamethasone recommendations. A history of diabetes did not appear to correlate with under-dosing of the medication, contrary to what was anticipated (see Appendix B, Table 1). However, a gap in care is still present, as evidenced by the instances where dexamethasone was underdosed. Although the occurrence percentage of inadequate dosing was rare, this deviation certainly still has the potential to impact the quality of anesthesia care and patient experience. Anesthesia providers should continue aiming for 100% compliance so that *all* patients may fully receive the recovery-enhancing benefits provided by dexamethasone administration as part of ERAS protocol implementation.

One limitation of this project was having a small sample size. In future assessments, the use of a larger sample size may produce different or more reliable results. Additionally, weights and preoperative blood glucose levels were not examined or obtained for each patient as part of the data collection process. A low body weight or significantly elevated blood glucose level may

have contributed to providers administering a dose less than the 8 mg that the facility's ERAS protocol calls for. The collection of this information in future studies may also be helpful in fully examining compliance.

To improve compliance, educational briefings and reminders can be provided for anesthesia providers regarding the importance of adequate dexamethasone dosing. Some providers may not be aware of the additional benefits that a larger dose provides, especially for patients under the ERAS regimen. In the future, dexamethasone administration can be examined outside of the ERAS protocol, which may provide a broader view of dosing variation. Care consistency is an essential aspect of anesthesia care, along with evidence-based practice. Hence, variation reduction and protocol adherence should continue to be a top priority.

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Tien, M., Gan, T. J., Dhakal, I., White, W. D., Olufolabi, A. J., Fink, R., Mishriky, B. M., Lacassie, H. J., & Habib, A. S. (2016). The effect of anti-emetic doses of dexamethasone on postoperative blood glucose levels in non-diabetic and diabetic patients: a prospective randomised controlled study. Anaesthesia, 71(9), 1037–1043.

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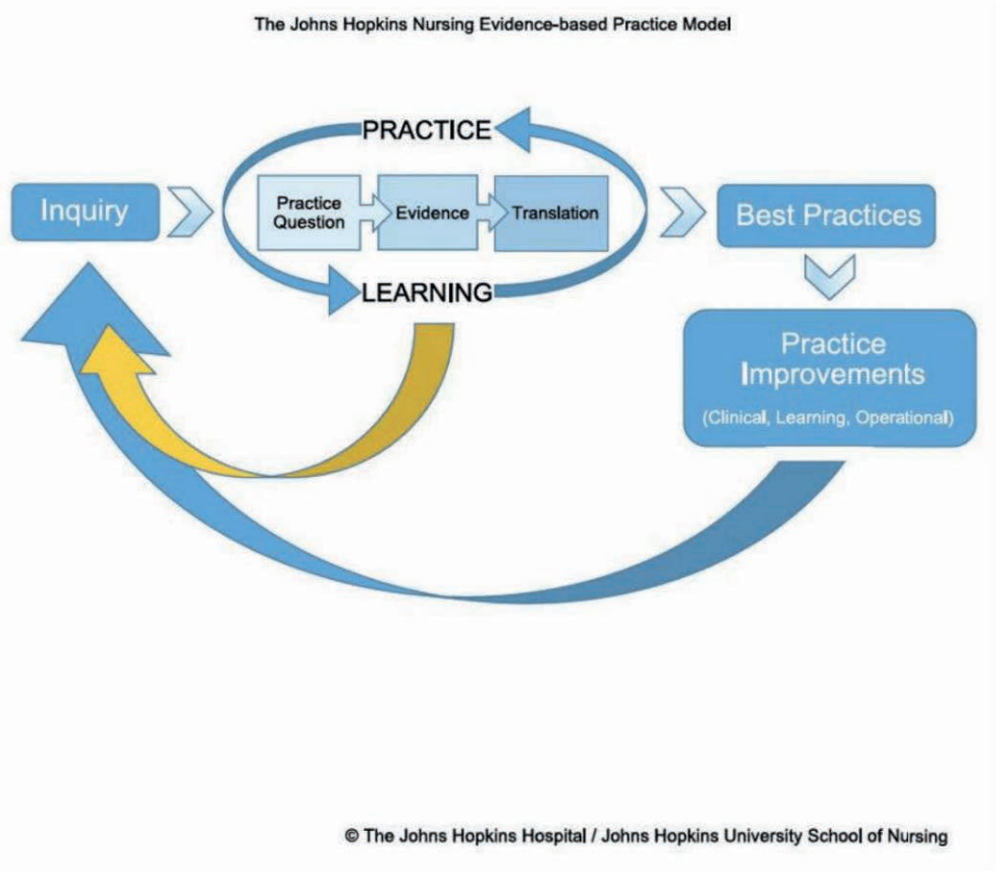
Appendix A



Arnett ERAS Protocol

Arnett ERAS Anesthesia Summary/Checklist

Preop

1 Check NPO status and inquire about carbohydrate intake and any liquids taken > 2 hours ago
2 Adequate IV access
3 Check preop temperature and make sure prewarming blanket is on
4 Low (T8-11) thoracic level epidural catheter placement
5 Oral Preop medications (Celebrex, gabapentin, etc)
6 Check blood sugar regardless of DM

Intraop

1 PONV prophylaxis with 2 or more agents
   a. 8 mg Dexamethasone with induction
   b. 4mg Ondansetron prior to extubation
2 If NO EPIDURAL: 20-50mg Ketamine with induction
3 If NO EPIDURAL: Lidocaine infusion at 2 mg/min and continue in recovery room
4 5000 unit heparin SQ after induction and before incision
5 Pre-incision antibiotics and check renal status before re-dosing
6 Use a BIS monitor in elderly patients and titrate volatile as indicated
7 If NO EPIDURAL give 30 mg toradol (consider renal status). Do not use toradol if epidural is in, It increases the risk of epidural hematoma
8 Desflurane is the preferred volatile anesthetic
9 80% or lower FIO2 during the case
10 Strict fluid therapy as above, preferably use vasopressors if required
11 Minimize opioids
12 Maintain normothermia ie >36 C
13 2-3mL 0.125% Bupivacaine Q5-10min towards the end of the case, monitoring for hypotension

PostOp

1 Confirm adequate analgesia via Epidural in PACU
2 Confirm stable patient vital signs and normothermia

Citation	Variables of Interest (Keywords)	Literature Type	Research Design & Sample Size	Key Findings
Samona, J., Cook, C., Krupa, K., Swatsell, K., Jackson, A., Dukes, C., & Martin, S. (2017). Effect of Intraoperative Dexamethasone on Pain Scores and Narcotic Consumption in Patients Undergoing Total Knee Arthroplasty. Orthopaedic surgery, 9(1), 110–114.	• Intraoperative dexamethasone • Narcotic requirements • Opioid requirements • Postoperative pain • Analgesia	Level of evidence: IV (retrospective study)	Case series 102 patients	• Patients who received dexamethasone required significantly less opioids than those who did not • A single dose of dexamethasone given intraoperatively significantly decreases narcotic consumption and decreases pain scores 24 postoperatively.

Consensus guidelines for the management of postoperative nausea and vomiting: Erratum. (2015). *Anesthesia & Analgesia, 120*(2), 494-494.	• General anesthesia • Anesthesia recovery period • Postoperative pain • Nausea • Vomiting • Postoperative nausea and vomiting • Postoperative complications • Preanesthetic medication • Preoperative care • Intraoperative care	Level of evidence: I (systematic review)	Review # of studies not explicitly stated	• Preoperative dexamethasone 8 mg enhances the post-discharge quality of recovery in addition to reducing nausea, pain, and fatigue • Dexamethasone has dose-dependent effects on quality of recovery • At 24 hours, patients receiving dexamethasone 0.1 vs 0.05 mg/kg required less opioid and reported less nausea, sore throat, muscle pain, and difficulty falling asleep • Doses >0.1 mg/kg are an effective adjunct in multimodal strategies to reduce postoperative pain and opioid consumption

DREAMS Trial Collaborators and West Midlands Research Collaborative (2017). Dexamethasone versus standard treatment for postoperative nausea and vomiting in gastrointestinal surgery: randomised controlled trial (DREAMS Trial). *BMJ (Clinical research ed.)*, *357*, 1455.	• Dexamethasone • Postoperative nausea and vomiting • Gastrointestinal surgery	Level of evidence: II (pragmatic blinded multicenter randomized controlled trial)	Randomized controlled trial 1,350 participants 45 U.K. hospitals	• Addition of a single dose of 8 mg intravenous dexamethasone at induction of anaesthesia significantly reduces both the incidence of postoperative nausea and vomiting at 24 hours and the need for rescue antiemetics for up to 72 hours in patients undergoing large and small bowel surgery, with no increase in adverse events

Tan, M., Law, L.S., & Gan, T.J. (2014). Optimizing pain management to facilitate Enhanced Recovery After Surgery pathways. *Canadian Journal of Anesthesia/Journal canadien d'anesthésie, 62*, 203-218.	• Enhanced recovery after surgery • Multimodal • Pain • Analgesia	Level of evidence: I (systematic review)	Review # of papers reviewed not explicitly stated	• Current literature supports a single prophylactic dose of dexamethasone 4 mg at induction for PONV prophylaxis, with 8 mg providing additional opioid-sparing effects and quicker recovery without postoperative complications such as infection, wound separation, and dehiscence • Enhanced recovery pathways facilitate evidence-based comprehensive perioperative care, including postoperative pain management, with the aim of accelerating recovery and discharge after surgery • The use of more than one analgesic modality to achieve effective pain control while minimizing the side effects of opioids that delay discharge has become the standard of care in ERAS protocols • Postoperative pain continues to be undermanaged

Gan, T., Meyer, T., Apfel, C., Chung, F., Davis, P., Habib, A., . . . Society for Ambulatory Anesthesia. (2007). Society for ambulatory anesthesia guidelines for the management of postoperative nausea and vomiting. *Anesthesia and Analgesia, 105*(6), 1615-28.	• Ambulatory anesthesia • Postoperative nausea and vomiting	Level of evidence: I (evidence-based clinical practice guidelines)	Review Recommendations were made only if they were supported by randomized trials and systematic reviews of randomized trials # reviewed not explicitly stated	• Dexamethasone is recommended at a prophylactic dose of 4 – 5 mg IV for patients at increased risk for PONV

Appendix B

Table 1. Frequency of individual dexamethasone dosages administered.

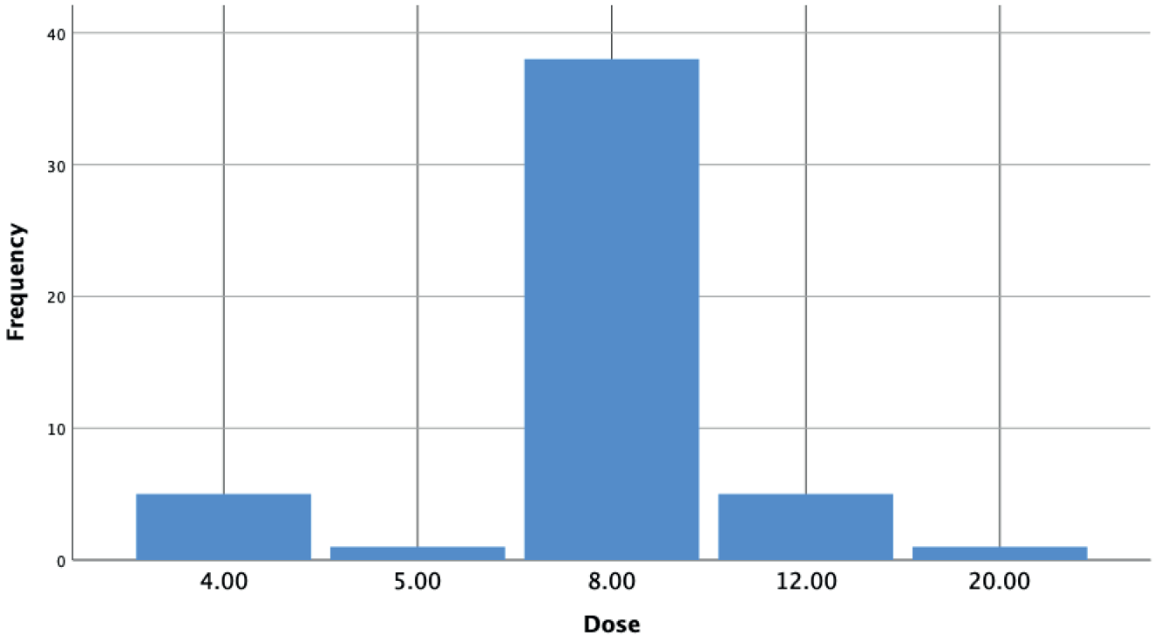


Table 2. Dexamethasone dosages administered to diabetic patients.

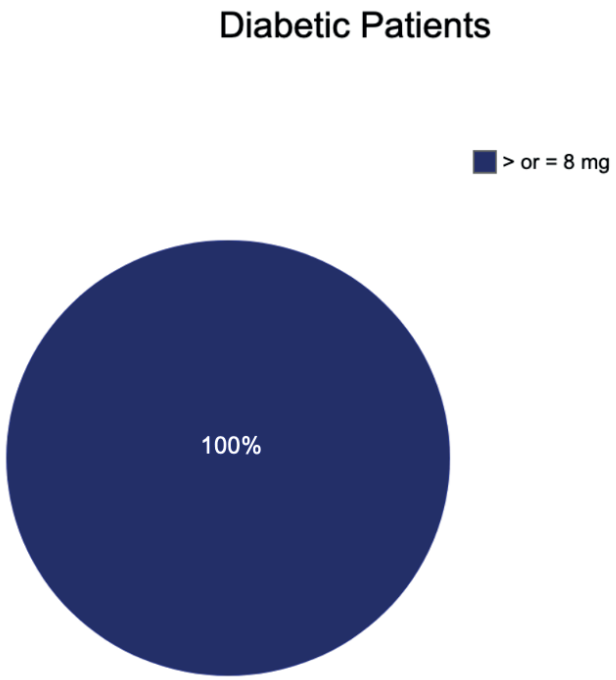
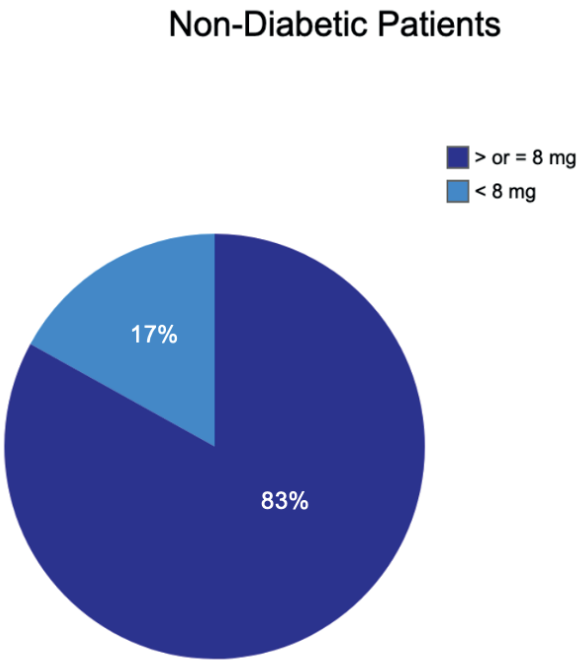


Table 3. Dexamethasone dosages administered to non-diabetic patients.



T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Dose	50	8.1800	2.52085	.35650

One-Sample Test

	Test Value = 8					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Dose	.505	49	.616	.18000	-.5364	.8964

Frequencies

Statistics

Dose

N	Valid	50
	Missing	0
Mean		8.1800
Median		8.0000
Mode		8.00
Std. Deviation		2.52085
Variance		6.355
Minimum		4.00
Maximum		20.00

Dose

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4.00	5	10.0	10.0	10.0
	5.00	1	2.0	2.0	12.0
	8.00	38	76.0	76.0	88.0
	12.00	5	10.0	10.0	98.0
	20.00	1	2.0	2.0	100.0
	Total	50	100.0	100.0	