Standardizing Ketamine Administration during Colorectal ERAS Cases: An Evidence Based Practice Project

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Abstract

Ketamine is an effective adjunct to pain management, particularly in surgical cases. The goal of this project was to perform an evidenced based practice project focusing on ketamine administration. Ketamine is a standard part of many ERAS protocols, at the project site these include colorectal surgery cases. Education was provided to the certified registered nurse anesthetists of the practice site, charts were audited for provider compliance with ketamine best practice guidelines, then charts were analyzed for PACU opioid administration. Best practice guidelines for ketamine administration include a bolus dose (up to 0.35 mg/kg) followed by an infusion (up to 1 mg/kg/hr) (Schwenk et al., 2018). A total of nine colorectal cases were analyzed with seven CRNAs complying with ketamine administration best practice. Although there was not a significant decrease in opioid administration when following best practice, a high compliance rate (78%) indicates a change in practice. Recommendations include following best practice guidelines as a multimodal approach to surgical pain management is most advantageous for patients.

Standardizing Ketamine Administration during Colorectal ERAS Cases: An Evidence Based Practice Project

There has been a paradigm shift within surgery to decrease practice variability and improve surgical patient outcomes by reducing morbidity and hospital length of stay (Brandal et al., 2017 Riccardi et al., 2021). Through the implementation of enhanced recovery after surgery (ERAS) protocols, patients have a decreased stress response from surgery and an overall improved recovery. Key elements of ERAS protocols include opioid sparing anesthesia and multimodal analgesia by targeting multiple pain receptors in both the peripheral and central pain pathway the quantity of opioids administered is decreased.

Opioid addiction often begins from an episode of acute pain and plagues more than 2 million people in the U.S. (Brandal et al., 2017). Opioids have a long list of side effects including nausea, vomiting, bladder dysfunction, tolerance and respiratory depression (Joshi, 2022). In the

perioperative period, opioid administration during surgery can have an added paradoxical increase in postoperative pain and opioid dosing requirements (Joshi, 2022).

Intraoperative ketamine administration is one of many multimodal adjuncts that is administered during general anesthesia and aids in decreasing opioid administration. Ketamine was first used as a general anesthetic in the 1960s, however the subanesthetic concentrations for analgesia have increased drastically over the years (Schwenk et al., 2018). Ketamine is a phencyclidine derivative and dissociative anesthetic agent that is metabolized by the cytochrome p450 system, producing a number of metabolites which cross the blood brain barrier (Porter, 2019). Ketamine's antagonistic effects on the N-methyl-D-asparate (NMDA) receptors are responsible for the general anesthetic effects but extends to numerous other receptors as well, including the mu, kappa, delta opioid receptors (Porter, 2019). Ketamine is an ideal adjunct with its ability to decrease opioid requirement and reduce opioid induced hyperalgesia while supporting hemodynamics and respiratory drive (Allen & Ivester, 2018). Side effects of ketamine include headache, nausea, vomiting, sedation, tachycardia, hypertension and changes to perception including hallucinations (Allen & Ivester, 2018).

ERAS protocols are implemented at Lyndon B. Johnson hospital in Houston, Texas specifically in colorectal surgery cases. The protocol uses ketamine in the intraoperative period as an adjunct to general anesthesia in an opioid sparing manner. The administration of ketamine varies among anesthesia providers. Some providers administer ketamine via an infusion while others administer ketamine via bolus technique. The following is an evidenced based project that will look to standardize ketamine administration in colorectal ERAS cases.

Project Question

Among colorectal ERAS surgery patients being administered intraoperative ketamine, can standardizing the dose and administration technique reduce opioid administration in the perioperative period?

Search Methods

Search engines used include MEDLINE, PubMed, Cochrane Database of Systematic Reviews and UpToDate.com. Search terms included “ketamine”, “opioid sparing”, “intraoperative”, “perioperative”, “eras”, “enhanced recovery after surgery”, and “colorectal”. Over 20,000 articles resulted from ketamine alone, adding in modifiers such as “opioid sparing” significantly reduced results. Consensus guidelines on the use of intravenous ketamine infusions for acute pain management from the American Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists were found on PubMed and is being used as the guidelines for intraoperative ketamine administration. Over 6,000 articles resulted when searching for ERAS therefore the colorectal modifier was added to narrow the search. Nine articles were included in the literature review and these articles were limited to those published in English and published within the last ten years with an emphasis on the last five years.

Review of Study Methods

Upon analyzing the relevant literature, several themes emerged related to the DNP project. The literature reviewed included randomized controlled trials, systematic review of randomized controlled trials, meta-analysis of randomized controlled trials, peer review literature review and narrative literature review. These study methods are valid and support the DNP project as they provide evidence that ketamine is a part of ERAS protocols and reduces opioid administration in the perioperative period.

Review Synthesis

Opioid addiction can be a result of a single acute pain event; therefore, it is beneficial to decrease the administration of opioids when possible (Brandal et al., 2017). In colorectal surgery, patients are at an increased risk for acute pain, similar to patients undergoing thoracic or orthopedic surgery (Wagemans et al., 2020). Ketamine administration is part of the enhanced recovery after surgery protocol aimed at reducing opioid administration, potentially leading to better postoperative outcomes.

Ketamine Pharmacology

Ketamine was discovered in the 1960s and has been used in the anesthesia ever since. A phencyclidine derivative, it exerts its therapeutic effects on the N-methyl-D-aspartate receptors (Nader et al., 2017) as well as mu, kappa, and delta opioid receptors (Porter, 2019). Side effects are often the limiting factor in ketamine administration and include emergence delirium, hallucinations and nightmares, hypersalivation, nystagmus, hypertension, tachycardia as well as dysphoria (Porter, 2019). Unlike opioids, ketamine supports respirations while supporting hemodynamic function making it an ideal adjunct for analgesia (Allen & Ivester, 2018).

Ketamine Dosing

The American Society of Regional Anesthesia and Pain Medicine in conjunction with the American Academy of Pain Medicine and the American Society of Anesthesiologists formulated guidelines for ketamine administration for acute pain management. Within the guidelines developed, they question how best to use ketamine as an adjunct to opioids and other analgesic therapies during the perioperative period. The guidelines included that "the addition of ketamine was associated with a small but significant reduction in pain scores" and "we conclude that subanesthetic ketamine infusions should be considered for patients undergoing painful surgery" (Schwenk et al., 2018, p. 5). In regards to dosing, the guidelines support the use of subanesthetic IV ketamine bolus doses (up to 0.35 mg/kg) and infusions (up to 1 mg/kg/hr) as adjuncts to opioids for perioperative analgesia (Schwenk et al., 2018).

Enhanced Recovery After Surgery

Enhanced Recovery After Surgery (ERAS) is an evidence-based protocol, requiring a multidisciplinary approach that focuses on the reduction of stress and return to function for patients undergoing surgery (Pędziwiatr et al., 2018). ERAS protocol has been proven to lead to fewer postoperative complications while lowering hospital length of stay (Pędziwiatr et al., 2018). ERAS protocol for colorectal surgery can be divided into three phases –preop –periop and –postop and requires a multidisciplinary approach. The preoperative phase begins with educating

the patient on the protocol and giving preoperative instructions around nutrition and infection control. Nutrition includes consuming a carbohydrate rich diet in the days leading up to surgery, including a carbohydrate rich drink (e.g. Gatorade) the morning of surgery. Infection control includes a chlorhexidine based bath, mechanical bowel prep and antibiotics to aid lowering the risk of infection (Bordeianou & Cavallaro, 2019). The final preoperative portion of the ERAS protocol is the administration of analgesia medications such as PO Tylenol and gabapentin. These medications target additional receptors and are part of the multimodal approach to managing perioperative pain (Bordeianou & Cavallaro, 2019).

The perioperative phase of ERAS relies heavily on the anesthesia colleagues to limit the stress response to surgery and provide fluid balance and analgesia. Administration of antiemetic medications to limit post-operative nausea and vomiting, antibiotics to lower infection, and fluid balance maintenance to prevent fluid overload are also included (Bordeianou & Cavallaro, 2019). The postoperative phase of ERAS begins in the post anesthesia care unit (PACU). This phase of the protocol focuses on advancing diet and early mobilization which can be achieved by the removal of the urinary catheter and maintaining an acceptable level of pain in order to being ambulation (Bordeianou & Cavallaro, 2019).

The Role of Anesthesia in ERAS

Anesthesia is a vital component of any ERAS protocol and especially colorectal surgery cases as these cases are particularly painful. The anesthetic plan must maintain a goal of early mobilization and return to normal physiologic function. Opioid sparing and multimodal analgesia are key elements of ERAS protocols and strive to target multiple receptors and pain transmission pathways centrally and peripherally (Brandal et al., 2017). Regional blocks are often used in ERAS to decrease postoperative opioid use as well as decrease intraoperative anesthetic requirements, including opioid administration (Bordeianou & Cavallaro, 2019). Historically, thoracic epidurals were the gold standard in open abdominal cases (such as colorectal surgeries); they aid in decreasing the anesthetic requirement while providing analgesia. However, a thoracic

epidural is no longer required to provide adequate analgesia because of a shift to less painful laparoscopic surgeries, the implementation of ERAS protocols, and the use of transverse abdominal plane blocks (Wagemans et al., 2020). Ketamine is another adjunct in many colorectal ERAS protocols such as that used at Massachusetts General Hospital (Bordeianou & Cavallaro, 2019). As previously stated, ketamine leads to reduced pain scores and decreased opioid administration during the perioperative period (Schwenk et al., 2018).

Project Aims

The aim of this project is to standardize ketamine administration during ERAS colorectal surgery cases at LBJ hospital in Houston, TX.

Project Objectives

In the timeframe of this DNP Project, the host site will conduct an evidenced based practice project focused on ketamine administration during ERAS colorectal surgery cases. The host site will also administer an education seminar for the members of the anesthesia team on the best practice guidelines for ketamine administration during ERAS colorectal surgery cases. At the end of the timeframe the anesthesia providers will be audited for compliance in adhering to the best practice standards of administering ketamine in ERAS colorectal surgery cases. Lastly, the evidenced will be tested in practice. The opioid administration in PACU for patients undergoing ERAS colorectal surgery will be measured during the 5-week implementation frame.

Implementation Framework

The framework that supports this evidence-based project is the IOWA model. The IOWA model (see Appendix A) was developed by Marita G. Titler PhD, RN, FAAN to guide the implementation of research into practice. Marita G. Titler created the IOWA model while working at the University of Iowa Hospitals and Clinics. “The Iowa model highlights the importance of considering the entire healthcare system from the provider to the patient, to the infrastructure, using research within these contexts to guide practice decisions” (Dontje, 2007, p. 1). The IOWA model aims to identify a problem and through the support of evidence, create

practice changes that reflect best practice. Furthermore, it identifies stakeholders and outlines a process for implementing said change.

Application to DNP Project

Following the IOWA model the evidenced based practice project will begin by identifying trigger issues and finish with a plan to disseminate the evidence into practice.

Identifying Trigger Issues

At LBJ Hospital the practice for administering ketamine during colorectal surgeries that are implementing an ERAS protocol is varied from one anesthesia provider to another. There is not a standardized dose that is given nor is there a standardized method of parenteral administration.

Purpose

The purpose of this project is to standardize ketamine administration during ERAS colorectal surgery cases based on best practice.

Is the topic a priority?

The mission of LBJ Hospital is to provide patients with the best care possible. Standardized ketamine administration during ERAS colorectal surgery cases based on best practice can lead to improved patient outcomes.

Team

Patients form the foundation of the team as they are the population being impacted. The anesthesia team, certified registered nurse anesthetists, and physician anesthesiologists are responsible for the care and administration of ketamine in the intraoperative setting. The post anesthesia care team will continue care after surgery and are the first line in pain management after surgery.

Synthesize the evidence

The American Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists created consensus

guidelines on the use of intravenous ketamine infusions for acute pain management. Per the guidelines "Overall, we conclude that moderate evidence supports use of subanesthetic IV ketamine bolus doses (up to 0.35 mg/kg) and infusions (up to 1 mg/kg/hr) as adjuncts to opioids for perioperative analgesia" (Schwenk et al., 2018, p. 5).

Pilot a change

Educate anesthesia team members on the guidelines for ketamine administration as an adjunct to opioids during the perioperative period, specifically in relation to colorectal surgery that implements ERAS protocol. Implement the guideline as a pilot and then evaluate the process and outcomes of the pilot.

Evaluate adaption into practice

If the nest practice of an IV bolus of ketamine followed by an infusion and leads to improved patient outcomes, then it should be added to the LBJ Hospital ERAS protocol. If not, steps to adapt and re-pilot would follow.

Disseminate

Update ERAS protocol at LBJ Hospital and educate staff on best practice, followed by implementation of evidence in other Harris Health facilities that implement ERAS protocol during colorectal surgeries.

Population of Interest

The direct population of interest are members of the anesthesia team. The anesthesia team is comprised of 23 full-time certified registered nurse anesthetists (CRNA) and 27 full time physician anesthesiologists. The indirect population of interest includes patients undergoing colorectal surgery with ERAS protocol. Any patient that is not undergoing colorectal surgery, or is undergoing colorectal surgery without ERAS protocol, will be excluded from the project. Any patient with a contraindication to ketamine will also be excluded, this includes patients with a history of seizures as ketamine can lower the seizure threshold.

Setting

The project setting is a 215 bed, acute care, level III trauma county hospital in Houston, Texas. The hospital has 8 ORs that service general, vascular, orthopedic, urology, GYN, ophthalmology, and plastic surgery. The hospital also has 3 endoscopy suites, 2 IR suites and a busy OB program. The hospital is located in a lower social economic area and the patient demographics include 52.9% Hispanic, 24% African American, 14.4% Caucasian and 8.7% Asian and other. The hospital is a governmental entity and the patient population consists of 45.9% uninsured, 21.2% Medicaid and CHIP, 12% Medicare and 19.9% commercial and other funding. Physician faculty and residents with The University of Texas Health Science Center Houston (UTHealth) oversee the provision of medical care. The CRNAs are also UTHealth employees and function as part of an anesthesia care team model. This model has a physician anesthesiologist supervising up to four CRNAs. The hospital utilizes an electronic medical record system, including the anesthesia record.

Stakeholders

The key stakeholders that have the greatest involvement are the CRNAs as they will be the provider in the operating room administering anesthesia during surgery. The physician anesthesiologist that is supervising the room will also be involved in the care of the patients. The nurses in the pre-op setting are in charge of administering pre-op medications in line with the ERAS protocol. Post-op nurses are responsible for post anesthesia care including measuring post-op pain scores and treating post-op pain if necessary. Pharmacy is another stakeholder as the supply of ketamine is controlled by the pharmacy team. Currently, ketamine is only available in vials or pre-filled syringes. The CRNA would be responsible for reconstituting ketamine into an infusion, communication with pharmacy is ongoing and will hopefully lead to readily available ketamine infusions which would eliminate a potential barrier to project compliance. Chart review of the electronic medical record will take place throughout the project. An affiliation agreement is not required by the hospital and support from the Chief CRNA and Chief Anesthesiologist have been obtained.

Intervention

Intervention will begin by educating staff on best practice guidelines for ketamine administration, this will be provided to anesthesia staff through a handout (Appendix B). A list of all anesthesia providers will be created to ensure all staff receive the education and the education will take place during the first week (Appendix C). A single hard copy handout will be used for one on one education with each provider. The handout will include the administration guidelines for intraoperative ketamine administration in conjunction with opioid administration. The guidelines developed by the American Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists supports use of subanesthestic IV ketamine bolus dose (up to 0.35mg/kg) and infusions (up to 1 mg/kg per hour) as adjuncts to opioids for perioperative analgesia (Schwenk et al., 2018).

Tools

A bespoke audit tool will be used when evaluating whether the administering anesthesia provider followed best practice guidelines. A similar bespoke tool will be used when evaluating opioid administration in the post anesthesia care unit. This tool will then be used for data analysis when comparing ketamine administration following best practice guidelines and when not following best practice guidelines. Consultation from project mentor will be used for appropriateness and accuracy of the tools prior to implementation.

Provider Compliance Tool

The compliance auditing tool (Appendix D) will evaluate whether the provider administered an appropriate weight-based ketamine bolus followed by the appropriate weight-based ketamine infusion during colorectal cases that are implementing ERAS protocol.

PACU Opioid Administration

The opioid administration tool (Appendix E) will be used when looking at the patients stay in the post anesthesia care unit. Opioid administration data will be gathered for each patient undergoing a colorectal case implementing ERAS protocol. The tool will indicate whether the

patient received ketamine as per the guidelines or not. The tool will collect data on the opioid administration each patient received in PACU, this includes what opioid was administered, the dose administered and how many doses were administered. The data will be analyzed to compare the two groups of patients.

Plan for Data Collection

During anesthesia provider education, data will be collected upon completion of each education training. A list of all providers will be used to assure that each provider was properly educated. A printed list of providers will be securely locked in a locker until the education of ketamine best practice has been administered to each provider, the printed list of providers will then be disposed of in the appropriate shred bin located in the anesthesia office.

At the end of each week, over the five-week period, chart reviews will be performed and data will be collected for provider compliance with ketamine best practice and PACU opioid administration tool for patient pain management. The bespoke compliance auditing tool (Appendix D) will be used to collect data on provider compliance and the data will be stored on a password protected computer. The opioid administration tool will be used to collect data on opioid administration in the PACU. No patient identifiers will be used when collecting data on opioid administration in the PACU and the data will be stored on a password protected computer.

Ethics/Human Subjects Protection

Recruitment of anesthesia providers will occur during ketamine administration education. Following provider education, project participation will be voluntary but highly encouraged as patients may benefit from better post-operative pain outcomes. Providers will benefit from increased knowledge on best practice guidelines. There are no risks for participants and they will not be compensated.

The completed project determination form deemed the project an evidenced based practice project. Touro University Nevada nor the hospital where the project will take place

required IRB oversight for evidenced based practice projects.

Plan for Analysis

Descriptive statistics will be used to determine the percentage of anesthesia providers that received the education on best practice for ketamine administration. Providers educated divided by total providers will provide background information for the project.

Descriptive statistics will be used to analyze the percentage of providers which complied with best practice guidelines. It is important to know which patients received ketamine via best practice and which patients did not. Patients which received ketamine via best practice divided by total patients will provide background information for the project.

Unpaired t-test is the appropriate statistical test to compare the two independent sample groups. Opioid administration will be analyzed on the two groups of patients, those that received ketamine according to best practice and those that did not. Statistical analysis software, such as SPSS, will be used to analyze unpaired t-test. Assumptions include measuring the data on a continuous scale, only comparing two independent groups, in this case, the patients receiving ketamine according to best practice and those who do not.

Analysis of Results

The first week of project intervention began with provider education. 23/23 CRNAs received the provider education, achieving 100% education rate. Over the implementation period, a chart review was performed on all colorectal cases where the ERAS protocol was implemented. The charts were then audited for ketamine administration and compliance with best practice guidelines (see Table 1). 7/9 cases, or 77.8% of the providers, complied with best practice for ketamine administration as adjuncts to opioids for perioperative analgesia (Schwenk et al., 2018).

Table 1

Chart Audits for Compliance

Patient #	Ketamine Protocol (Y/N)	Ketamine Administered total mg/kg	Medication(s)	Dose(s)
1	Y	0.69mg/kg	Dilaudid 0.5mg	4
2	Y	0.68mg/kg	Dilaudid 0.5mg	3
3	Y	0.5mg/kg	Dilaudid 0.5mg	2
4	Y	0.33mg/kg	Dilaudid 0.5mg	0
5	N	0mg	Dilaudid 0.5mg	2
6	N	0mg	Dilaudid 0.5mg	0
7	Y	0.2mg/kg	Dilaudid 0.5mg	0
8	Y	0.59/mg/kg	Dilaudid 0.5mg	3
9	Y	0.35mg/kg	Dilaudid 0.5mg	3

Unpaired t-test was used to analyze the data from the chart reviews following the assumptions that the data compared are two independent groups (see Table 2). These two groups are ketamine protocol compliant and non-compliant, the data is continuous, and the data was normally distributed. *P* value 0.3889 meaning no statistical significance. The mean of compliant minus non-compliant equals 1.14 giving 95% confidence interval of this difference: -1.80 to 4.08. The intermediate values used in calculations: t = 0.95185, d*f* = 7, standard error of difference = 1.244.

Table 2

Unpaired Samples T-test

Group	Compliant	Non-Compliant
Mean	2.14	1.00
SD	1.57	1.41
SEM	0.59	1.00
N	7	2

P value 0.3889 meaning no statistical significance. The mean of compliant minus non-compliant equals 1.14 giving 95% confidence interval of this difference: -1.80 to 4.08. The

intermediate values used in calculations: t = 0.95185, d*f* = 7, standard error of difference = 1.244.

Discussion and Interpretation of Results

There was not a statistical difference in opioid administration between the groups that received ketamine according to best practice and those that did not. A project strength was that a majority of the providers complied with best practice guidelines. The greatest weakness to the project was the small sample size of only nine cases.

In contrasting the two groups, the average dose of opioids administered in the PACU for the compliant group was 2.14 and the average dose of opioids for the non-compliant group was 1.0. Literature supports that a multimodal pain management approach, which is featured in ERAS protocols and includes ketamine administration, leads to a decrease in opioid requirement (Brandal et al., 2017).

Ketamine administration in the majority of the cases aligned with the best practice guidelines set out by the American Society of Regional and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists (Schwenk et al., 2018). Ketamine is already a staple of the ERAS protocol at the hospital conducting the project and therefore there is no additional cost required to implement best practice for ketamine administration rather just an alteration to administrative and dosing practices by the anesthesia providers.

Limitations

This project has potential limitations. There is potential for risk bias as this project and full time personal employment occurred in the same facility. Colleagues may have felt compelled to participate in the project due to the nature of our working relationship rather than wanting to follow best practice. This could have potentially been mitigated by forgoing the details of the project, particularly about auditing for provider compliance. Project design could have potential limitations as the total number of cases analyzed were nine. Other cases, such as laparoscopic gynecology surgeries, could have been included in the project as it is common practice to

implement ERAS protocol in them as well. This could have increased the total cases analyzed however, the decision to limit the project to solely colorectal cases was made in an effort to analyze cases with similar pain profiles. The short implementation period of five weeks also posed a limitation, if the project implementation period was longer, more cases could have been analyzed.

Conclusion

The overall goal was to change current ketamine administration practice into best practice by educating providers and implementing change in colorectal surgery cases that are following ERAS protocol. These cases were than analyzed for efficacy by looking at opioid administration in the PACU. Ketamine has analgesic properties, when combined with the other multimodal pain management techniques that are included in ERAS protocols, fewer opioids are often required to manage pain. This change is easily sustainable as cost is not a factor, rather only changing provider administration and dosing techniques. This project has the potential to spread to other surgical cases other than colorectal. At the project site, laparoscopic gynecology cases also follow ERAS protocol, this would be an easy demographic to carry over ketamine administration best practice. Disseminating results to the rest of the hospital system would be a logical next step as well as presenting at local and state conferences for anesthesia and pain management.

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Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists. *Regional Anesthesia and Pain Medicine*, 1. https://doi.org/10.1097/aap.0000000000000806

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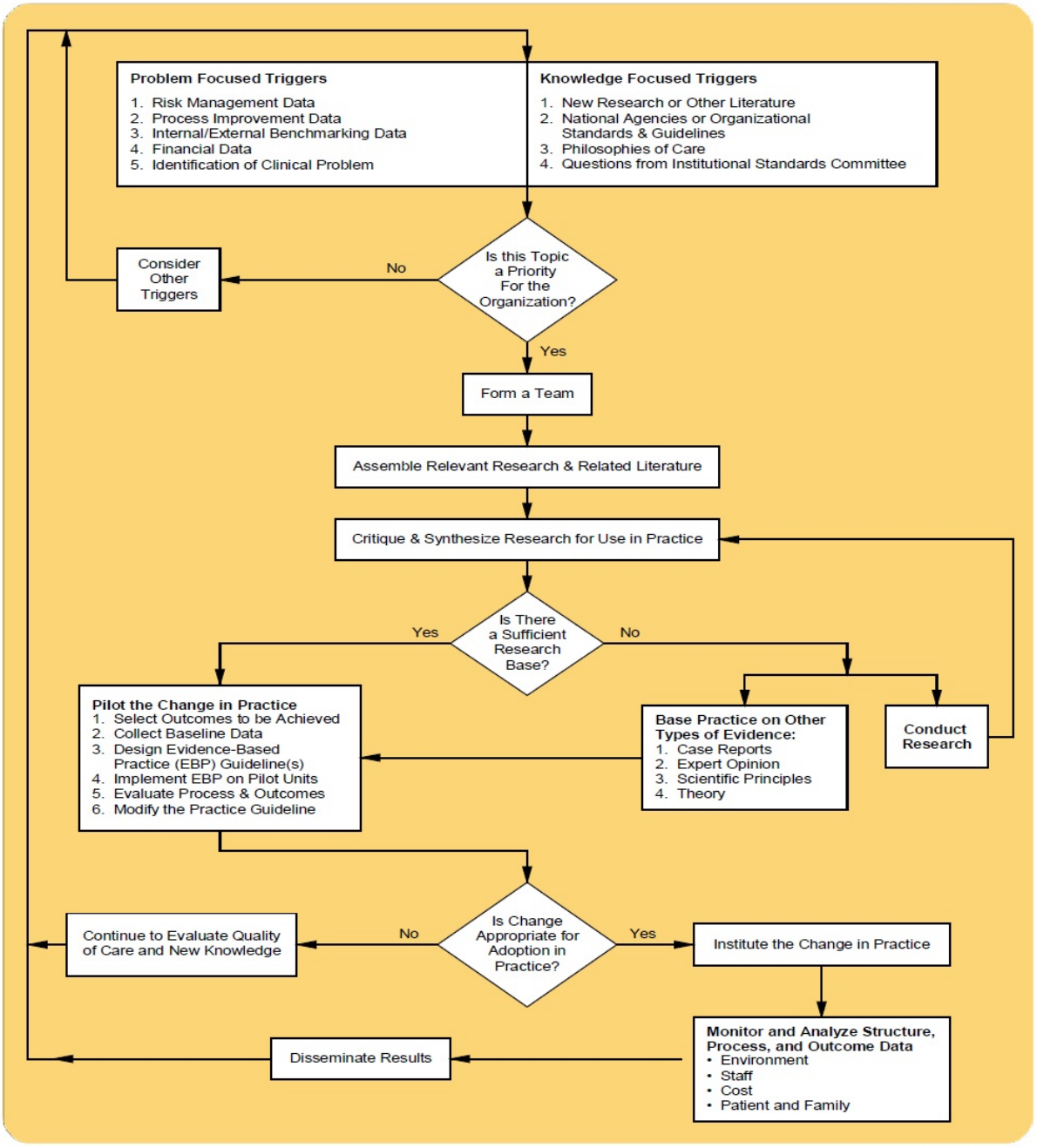
Appendix A

The Iowa Model of Evidence-Based Practice to Promote Quality Care



◇ = a decision point

Titler, M.G., Kleiber, C., Steelman, V.J., Rakel., B. A., Budreau, G., Everett, L.Q., Buckwalter, K.C., Tripp-Reimer, T., & Goode C. (2001). The Iowa Model Of Evidence-Based Practice to Promote Quality Care. *Critical Care Nursing Clinics of North America,* 13(4), 497-509.

REQUESTS TO:
Department of Nursing
University of Iowa Hospitals and Clinics
Iowa City, IA 52242-1009

Appendix B

Guideline for Ketamine Administration

Consensus Guidelines on the Use of Intravenous Ketamine Infusions for Acute Pain Management From the American Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists

Subanesthestic IV ketamine bolus doses (up to 0.35mg/kg) and infusions (up to 1mg/kg per hour) as adjuncts to opioids for perioperative analgesia (Schwenk et al., 2018).

Schwenk, E. S., Viscusi, E. R., Buvanendran, A., Hurley, R. W., Wasan, A. D., Narouze, S., Bhatia, A., Davis, F. N., Hooten, W. M., & Cohen, S. P. (2018). Consensus guidelines on the use of intravenous ketamine infusions for acute pain management from the American Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists. *Regional Anesthesia and Pain Medicine*, 1. https://doi.org/10.1097/aap.0000000000000806

Appendix C

Project Timeline

Week 1

- Education of anesthesia staff with in-person, one on one education with ketamine guidelines handout. Education will be completed by end of week 1.
- At the end of week 1, analyze data on patients that have had colorectal surgery with ERAS implementation. Analysis includes provider compliance and PACU opioid administration.

Week 2

- At the end of week 2, chart review and gather data on patients that have had colorectal surgery with ERAS implementation. Analysis includes provider compliance and PACU opioid administration.

Week 3

- At the end of week 3, chart review and gather data on patients that have had colorectal surgery with ERAS implementation. Analysis includes provider compliance and PACU opioid administration.

Week 4

- At the end of week 4, chart review and gather data on patients that have had colorectal surgery with ERAS implementation. Analysis includes provider compliance and PACU opioid administration.

Week 5

- At the end of week 5, chart review and gather data on patients that have had colorectal surgery with ERAS implementation. Analysis includes provider compliance and PACU opioid administration.
- Gather data from week 1 – 5 for cumulative data analysis.

Appendix D

Provider Compliance Tool

1. Appropriate bolus given based on patient weight?

   YES NO

2. Appropriate infusion started AFTER bolus administered, based on patient weight?

   Yes NO

3. Was the provider compliant in following the administration guidelines?

   YES NO

Appendix E

PACU Opioid Administration Tool

Patient #	Ketamine Protocol (Y/N)	Ketamine Administered Total mg/kg	Medication(s) Dilaudid 0.5mg	Dose(s)

Appendix F

DNP Project Team Determination: Quality Improvement Project or Research

All DNP Projects, regardless of methodology, must uphold the highest standards of ethical practice including confidentiality and privacy as described in the ANA Code of Ethics. Accordingly, basic principles of ethics, confidentiality, and privacy must be addressed and maintained in each phase of the DNP Project implementation. Methods for maintaining such should be described in full detail within body of the DNP Project Paper.

If the determination is made that the DNP Project is a "Quality Improvement Project," then the project should be referred to as such in all future communications–both written and verbally. Quality Improvement projects should not be referred to as research or research projects and are not subject to any form of IRB review. Additionally, the student should not make any claims in writing or verbally of IRB exemption status, acceptance, or review in such projects.

Sections A and B should be completed and submitted by the student. **Section C** should be completed by the faculty.

SECTION A

Student Name: __Joshua Davis_____

DNP Project Title: __ Standardizing Ketamine Administration during Colorectal ERAS Cases: An Evidence Based Practice Project_____

DNP Project Instructor: ___Dr. Julie Astrella _____

DNP Project Mentor: _____Dr. Lauren Teague_____

Quality Improvement or Research Worksheet

Rachel Nosowsky, Esq.

ITEM	Issue and Guidance	Rating
1	Are participants randomized into different intervention groups to enhance confidence in differences that might be obscured by nonrandom selection? Randomization done to achieve equitable allocation of a scarce resource need not be considered and would not result in a "yes" here.	____ YES __X__ NO
2	Does the project seek to test issues that are beyond current science and experience, such as new treatments (i.e., is there much controversy about whether the intervention will be beneficial to actual patients – or is it designed simply to move existing evidence into practice?). If the project is performed to implement existing knowledge to improve care – rather than to develop new knowledge – answer "no".	____ YES __X__ NO
3	Are there any potential conflicts of interest (financial or otherwise) among any researchers involved in the project? If so, please attach a description of such in an attachment to this form.	____ YES __X__ NO
4	Is the protocol fixed with a fixed goal, methodology, population, and time period? If frequent adjustments are made in the intervention, the measurement, and even the goal over time as experience accumulates, the answer is more likely "no."	____ YES __X__ NO
5	Will data collection occur in stages with an effort to remove potential bias? If so, is there any potential for data skewing from this process?	____ YES

		__X__ NO
6	Is the project funded by an outside organization with a commercial interest in the use of the results? If the answer to this question is "Yes" please also answer question 6a and 6b. If the project is funded by third-party payors through clinical reimbursement incentives, or through internal clinical/operations funds vs. research funds, the answer to this question is more likely to be "no."	____ YES __X__ NO
6a	Is the sponsor a manufacturer with an interest in the outcome of the project relevant to its products?	____ YES __X__ NO
6b	Is it a non-profit foundation that typically funds research, or internal research accounts?	____ YES __X__ NO

Adapted from Hastings Center, "The Ethics of Using Quality Improvement Methods to Improve Health Care Quality and Safety" (June 2006) If the weight of the answers tends toward "yes" overall, the project should be considered "research" and approved by an IRB prior to implementation. If the weight of the answers tends toward "no," the project is not "research" and is not subject to IRB oversight unless local institutional policies differ. Answering "yes" to sequence #1 or #2 – even if all other answers are "no" – typically will result in a finding that the project constitutes research. It is important to consult with your local IRB if you are unsure how they would handle a particular case, as the analysis of the above issues cannot always be entirely objective and IRB policies and approaches vary significantly.

Obtained from: Quality Improvement or Research Worksheet

SECTION B

All projects, including student QI or EBP projects, are required to be registered with the Department of Research at TUN. Please register your project via this Qualtrics survey. Provide your information as the PI for your project.

_X_ Yes, I registered my project with the Department of Research at TUN via the link above

___ No, I did not register my project with the Department of Research at TUN. Please provide rationale.

SECTION C

Project Classification Decision:

The project instructor will select one of the three classifications listed below.
_____ This DNP Project is a quality improvement project. Do not submit to IRB for review.

_____ This DNP Project contains research methodology, and an IRB application should be submitted to the TUN IRB committee for exemption determination and/or full IRB review.

_____ This DNP Project is not clearly delineated as quality improvement or research of discovery. Additional consultation will be obtained from the IRB committee by the project team. The advice of the IRB committee regarding the need for review will be noted in writing and the student will be informed of such (Please attach any pertinent documentation from IRB review as an Appendix to this document.)

By signing below, the project instructor indicates that they agree with the above selection.

Printed Name of Project Instructor: _____Julie Astrella, DNP, RN, CNE_____

Electronic Signature of Project Instructor: