

**Implementing an Enhanced Recovery After Surgery Protocol for Adult Surgical Patients
Undergoing a Gynecological Oncology Procedure**

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Enhanced recovery after surgery (ERAS) protocols have become an important tool amongst anesthesia providers to decrease postoperative complications and improve patient outcomes. An anesthesia department at a hospital in Michigan has developed and implemented ERAS protocols for multiple service lines with favorable outcomes. Currently, however, they are lacking a protocol for the gynecologic oncology surgery service line. The gynecologic oncology surgery patient population is specialized, therefore, an ERAS protocol specifically tailored to this population would be helpful in reducing complications associated with these procedures. This evidenced-based quality improvement project aims to research, develop, and implement an ERAS protocol for patients undergoing gynecologic oncology procedures at the project site.

Background/Significance

According to the Centers for Disease Control (2019), 94,000 women were diagnosed with gynecologic cancer between 2012 and 2016. Gynecological cancer includes cervical, ovarian, uterine, vaginal, and vulvar. Surgery is the primary treatment option for most of these cancers. Unfortunately, many gynecological surgical procedures are associated with significant postoperative complications such as postoperative nausea and vomiting (PONV) and inadequate pain management. These two complications prolong hospital stays and are costly (Bogani et al., 2020). Gynecological procedures are associated with up to a 70% risk of PONV (Gress et al., 2020). Studies have shown that each emesis prolongs the post-anesthesia care unit (PACU) stay by twenty minutes. Prevention of PONV is more cost effective than rescue treatment because of the decreased costs of prophylactic medications, shorter PACU stays, and limited readmission rates (Gress et al., 2020). Pain and related opioid use is also a problem in this patient population. Despite the current opioid epidemic in the United States, opioids remain a primary treatment for post-surgical acute pain. Opioids have the potential to lead to many complications like respiratory depression, delirium, ileus, or prolonged sedation. These complications increase length of stay for postsurgical patients. Patients who receive an opioid prescription after short-stay surgeries are 44%

more likely to succumb to long-term opioid use. The cost of opioid-related abuse is over 78.5 billion dollars annually, with healthcare absorbing most of this. Controlling postoperative pain with an opioid-sparing technique helps decrease opioid exposure and related complications (Hah et al., 2017). Due to the specialized patient population and high rate of postoperative complications associated with gynecological oncology surgery, the development and implementation of an Enhanced Recovery After Surgery (ERAS) protocol specific to this population has been shown to offer improved patient outcomes.

ERAS protocols are comprised of many interdisciplinary sets of protocols that include recommendations for anesthesia, analgesia, goal-directed fluid therapy, prevention of nausea and vomiting, thromboembolic prophylaxis, minimally invasive surgical techniques, temperature control, nutrition, and early mobilization. ERAS protocols are intended to be utilized throughout each phase of surgical care, including the preoperative, intraoperative, and postoperative phases. The advantages of ERAS protocols have been well documented in the literature and include shorter hospital stays and an overall reduced number of postoperative complications (Pedziwiatr et al., 2015). In addition to improving patient outcomes, ERAS protocols have also been shown to be cost saving for healthcare institutions. Facilities that implemented ERAS protocols showed a reduction of \$5,500 in median 30-day postoperative hospital costs when compared to traditional management (Glaser et al., 2018).

ERAS protocols are not intended to be created and applied broadly to all surgical patients. Instead, each protocol is reviewed and adapted based on the surgical population and hospital resources (Bugada et al., 2016). Many ERAS protocols have been researched and developed for different populations with favorable outcomes including urologic, gastric, pancreatic, colon, rectal, bariatric, spine, cardiac, and orthopedic surgeries. Additionally, ERAS protocols have been developed for the gynecological oncology population displaying overwhelmingly positive outcomes related to decreased length of stay and reduced postoperative complications. A study conducted by Glaser et al., (2018) that implemented an ERAS protocol for gynecological oncology patients showed a three-day reduction in median length of stay and a 90% reduction in opioid requirements within the first 48 hours postoperatively. Although there is not yet evidence to suggest that an ERAS protocol reduces PONV for

the gynecologic oncology population, the implementation of an ERAS protocol for total mastectomy patients produced favorable results. In this population, implementation of an ERAS protocol significantly decreased PONV from 50% to 27% (Chiu et al., 2018). These results will hopefully be reproduced and applied to the gynecologic oncology patient population.

Problem Statement

The project hospital site currently lacks an ERAS protocol for the gynecological oncology surgical population. According to the chief nurse anesthetist and gynecologic oncology surgeons, the implementation of an ERAS protocol for this population could be beneficial. The intent of this quality improvement project is to develop and implement an ERAS protocol for the adult (ages 18 to 75) gynecologic oncology surgical population. The goal of this project is to improve patient outcomes by decreasing length of stay, PONV, and postoperative opioid consumption.

Clinical Question

Compared to patients within the same population with no standardized protocol, does the development and implementation of an ERAS protocol decrease the incidence of PONV, decrease postoperative opioid consumption (measured in morphine equivalents), and decrease the length of stay in patients undergoing gynecologic oncology surgery?

Quality Improvement Model

The plan-do-study-act (PDSA) model is a useful tool in the implementation of a healthcare quality improvement project. The PDSA model is comprised of four steps to quality improvement: plan, do, study, and act. 'Plan' includes planning the test or observation, stating the objectives, and developing a plan. Step two, 'Do', involves carrying the test out, making observations, and starting to analyze the data. Step three, 'Study', is the complete analysis of the data, and summarizing this data to reflect on what was learned from the implementation. Lastly, 'Act', is comprised of refining the implementation based on what was learned from the study (Institute for Healthcare Improvement, 2022). The application of the PDSA model to this quality improvement project is outlined below.

Plan

A plan will be developed by the student registered nurse anesthetists (SRNAs) in accordance with the project's site chief nurse anesthetist to establish an ERAS protocol for gynecologic oncology surgical patients, implement this protocol, and analyze the data. The objectives of implementing the ERAS protocol are to decrease the incidence of PONV, decrease opioid consumption, and decrease the length of stay in the gynecological oncology patient population. An ERAS protocol will be developed through a literature review regarding current best practice recommendations for the preoperative, intraoperative, and postoperative phases of care in coordination with the gynecology oncology surgeons' recommendations and chief nurse anesthetist input.

Do

After the ERAS protocol has been developed and reviewed by the SRNAs and chief nurse anesthetist, the implementation of the ERAS will begin with an educational presentation delivered by the SRNAs to surgical staff, outlining each member's role in the protocol. A copy of the protocol will be placed on each qualifying patient's chart. Additionally, a link to the protocol will be available for reference on the project site's Intranet. After the 'go live,' a proposed timeline for data collection will occur between June and August 2022.

Study

The SRNAs, in collaboration with the chief nurse anesthetist, will then conduct a complete analysis of the data collected from June to August 2022. Information regarding adherence to the ERAS protocol, the use of rescue anti-emetics, the use of opioids (measured in morphine equivalents), and length of stay will be gathered and ultimately compared retrospectively to previous patients within the same population who did not receive the standardized ERAS protocol. This comparison will provide insight on if the use of the ERAS protocol led to improved patient outcomes regarding PONV, opioid consumption, and length of stay.

Act

The ERAS protocol may need to be refined based on results to optimize gynecological oncology patient outcomes. Implementation strategies to increase staff adherence to the ERAS may also need to be altered.

Search Methods

Using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis as a search guide (Appendix B), a search of the PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases was conducted for applicable studies published between 2015 and 2022. Search terms included were “enhanced recovery after surgery (ERAS),” “gynecologic oncology surgery,” “preoperative,” “intra operative,” “post operative,” “postoperative nausea and vomiting (PONV),” “multimodal analgesia,” and “fluid therapy.” These search terms yielded 55 results, which were reduced to 50 after duplicates were removed. The abstracts of these articles were examined to ensure publication in the English language, full-text articles available, publication within the last ten years, and peer-reviewed status. Exclusion criteria included patients under age 18, recommendations from non-anesthesia staff, and studies not applicable to the gynecologic oncology patient population. 13 articles remained to be used in the literature synthesis.

Literature Synthesis

There are numerous recommendations discussed in the literature on best practices for the gynecological oncology patient population regarding fasting times, antimicrobial prophylaxis, fluid management, temperature management, analgesia, and PONV prophylaxis. All recommendations will be considered in the development of the ERAS. However, for the purpose of this project, the literature synthesis will target the three key endpoints that were specifically identified by the project site: the reduction of PONV, decreased opioid consumption, and reducing the length of stay. The recommendations from the literature that will guide the development of the ERAS will be divided, below, into the three phases of surgical care: preoperative, intraoperative, and postoperative.

Preoperative Care

An effective ERAS protocol is initiated in the preoperative phase. Decreasing preoperative fasting times and consuming a carbohydrate supplement before surgery has been shown to reduce post operative nausea and vomiting (Nelson et al., 2019). Prolonged fasting before surgery leads to an increased post-operative stress response and increased insulin resistance resulting in hyperglycemia (Bisch et al., 2019). Uncontrolled blood glucose is linked to infection and can cause a patient to stay in the hospital longer than anticipated. Carbohydrate loading can be accomplished with the oral supplement Maltodextrin in water or a sports drink, like Gatorade, prior to surgery. This has been shown to have little effect on gastric emptying, and reduces inflammation, increases insulin sensitivity, improves post-operative muscle function, and increases patient satisfaction (Bisch et al., 2019). Based on this evidence, it is recommended to limit fasting times and have the patient consume a carbohydrate supplement prior to surgery. This has been shown to reduce PONV and length of stay.

Multimodal, effective pain management results in decreased opioid consumption. Opioid use commonly contributes to post operative nausea and vomiting. Reducing or eliminating the use of opioids through a multimodal pain management regimen can effectively manage pain while decreasing the risk of PONV. Patients who receive a multimodal approach to pain management preoperatively with the use of oral acetaminophen and gabapentin complain of significantly less pain and require less rescue opioids than patients who do not (Winkelman et al., 2019).

Regional anesthesia techniques are another way to provide a multimodal pain management strategy to patients. A transversus abdominis plane (TAP) block can be utilized to block the sensory nerves involved in gynecologic surgery and better control the severe pain that could result (Dai et al., 2018). Patients may undergo an open gynecologic procedure in which blocking of these sensory nerves is important for pain control. Patients who receive TAP blocks require less opioids in the immediate post operative period than patients who do not (Dai et al., 2018). Patients may also undergo laparoscopic procedures, a less invasive approach to gynecologic surgery, not requiring a TAP block. Instilling 0.25% Bupivacaine, a local anesthetic, at the port sites of laparoscopic procedures can provide a numbing effect to the area which also helps decrease opioid consumption postoperatively (Rivard et al., 2015). It is

recommended that a multimodal approach to pain management be used to decrease opioid consumption in the perioperative period. Decreasing opioid consumption will help to decrease the PONV that may result as a side effect of the opioid medication.

Lastly, post operative nausea and vomiting (PONV) refers to nausea and/or vomiting in the post anesthesia care unit within the first 24-48 hours post-surgery. Patients undergoing gynecologic surgery are at an increased risk for PONV. Other risk factors for PONV include female gender, non-smoking status, a history of PONV or motion sickness, and age less than 50. Incidence of PONV increases based on how many risk factors a patient possesses, going from a 10% risk to a 79% risk when zero to four risk factors are present respectively (Elvir-Lazo et al., 2020). There are four classes of antiemetics that are most often administered. A multimodal approach should be used for these patients who automatically possess two risk factors. 5-HT₃ receptor antagonists, like Ondansetron, are recommended as the first-line treatment for PONV prophylaxis. Dexamethasone, a corticosteroid, is an effective antiemetic agent when dosed at 4-12 mg intravenously. NK-1 receptor antagonists are also effective; studies show that Aprepitant is more effective than ondansetron in decreasing PONV. NK-1 receptor antagonists are costly, however, so should be reserved for patients at the highest risk. Scopolamine, an anticholinergic, has also been shown to reduce PONV in the first hours when administered as a transdermal patch. However, Scopolamine is associated with undesirable side effects like dry mouth, drowsiness, and visual disturbances and should be avoided in the elderly population (Elvir-Lazo et al., 2020). Lastly, any medication that is found to be opioid sparing could provide a decrease in PONV (Elvir-Lazo et al., 2020). It is recommended that a multimodal approach to PONV prophylaxis be used in this patient population. This will start with Dexamethasone and Ondansetron for every patient, with additional antiemetics administered as risk of PONV increases.

Intraoperative Care

There are multiple reoccurring recommendations that have a strong level of support in the literature discussing the intraoperative phase of care for the development of an ERAS protocol for

gynecological oncology procedures. The recommendations discussed include intraoperative fluid management, multimodal pain management and the use of anti-emetics to prevent PONV.

The goal of intraoperative fluid therapy is to maintain hemodynamics and euvolemia while avoiding the risks associated with fluid overload or fluid restriction. Fluid overload is a major cause of postoperative morbidity and is associated with delayed bowel function return, ileus, PONV, and increased length of stay (Kendrick et al., 2019). Additionally, fluid restrictive regimes have also been associated with complications such as acute kidney injury, surgical site infections, sepsis, and increased length of stay (Kendrick et al., 2019). Due to associated risks with both hypervolemic and hypovolemic states, the current recommendation for intraoperative fluid management in gynecological oncology surgeries is euvolemia or goal-directed fluid therapy (GDT) for high-risk patients (Nelson et al., 2019). The theory of GDT, as described by Kendrick et al. (2019), is such that clinicians should manage intraoperative fluid status based on objective hemodynamic monitors to maximize tissue oxygen delivery without fluid overload. Volume status can be monitored by noninvasive monitors including HR, BP cuff, ETCO₂, and, urine output, or by invasive monitors including pulmonary artery catheter, arterial line, and transesophageal echocardiogram. A study mentioned in Nelson et al. (2019) compared surgical outcomes in women undergoing major gynecologic surgery before and after the implementation of an ERAS protocol in which GDT was used. It was concluded that the use of GDT was associated with a substantial decrease in IV fluids. An additional study mentioned in Nelson et al. (2019) investigated the intraoperative fluid administration practices between multiple hospitals and concluded that the highest fluid balance hospitals had significantly longer length of stays than the low fluid balance hospitals. Based on the literature, the use of GDT in high-risk gynecological oncology patients may improve both the length of stay and PONV in this patient population.

Multimodal intraoperative pain management is another important factor to consider when discussing the intraoperative phase of care for gynecological oncology procedures. Intraoperative opioids, although effective in pain management, are associated with multiple complications including increased risk of PONV, respiratory depression, delayed hyperalgesia, and increased post-operative pain (Bogani et

al., 2021). Due to the post-operative complications associated with opioids, it is critical to minimize usage intraoperatively. This can be achieved by the administration of two or more different medications that provide analgesia such as ketamine, lidocaine, nonsteroidal anti-inflammatory drugs, dexmedetomidine, and magnesium. When used in combination, analgesics that have different mechanisms of action can have a synergistic effect and be more efficient in blocking the perception of pain. According to Nelson et al. (2019) ketamine has been proven to have benefits in reducing post-operative pain. Intravenous Lidocaine infusions have also been shown to lower post-operative pain scores, reduce post-operative pain analgesic requirements, improve the return of bowel function, and decrease the length of stay (Nelson et al. 2019). Use of intraoperative NSAIDs, such as ketorolac, was mentioned in Nelson et al. (2019) and Bogani et al. (2020) as an additional adjunct to decrease opioid use. Dexmedetomidine has been more recently highlighted in the literature to decrease post-operative pain as well. A randomized controlled trial conducted by Cho et al. (2021) concluded that dexmedetomidine used in uterine cancer surgery was associated with both decreased pain scores and opioid consumption post-operatively. Lastly, although IV magnesium has not been studied specifically in the gynecological oncology patient population, it has been discussed in other ERAS protocols as a component of multimodal analgesia. Magnesium administered intraoperatively has been associated with decreased pain scores and opioid consumption (Wick, Grant, and Wu, 2017). Based on the research, it is recommended to administer two or more analgesic medications intraoperatively.

Lastly, the prevention of PONV is another crucial element of an ERAS protocol. As mentioned previously, gynecological oncology patients present with multiple risk factors for the development of PONV, therefore a multimodal approach should be incorporated in every phase of care. Within the intraoperative phase, ondansetron and dexamethasone are the two most widely adopted antiemetics used today (Bogani et al., 2020). In addition to the usage of multiple antiemetics, it is important to minimize anesthesia-related modifiable risk factors. First, opioid-sparing analgesia is one component to consider in the prevention of PONV. Second, the minimization of concentrations of volatile anesthetics has been shown to decrease the incidence of PONV (Elvir-Lazo et al., 2020). For high-risk patients with three or

more risk factors, a propofol infusion and total intravenous anesthesia (TIVA) should be utilized instead of a volatile anesthetic agent. Third, the minimization of the use of nondepolarizing muscle relaxant reversal drugs, specifically Neostigmine, has been linked to decreased incidences of PONV. A study mentioned in Elvir-Lazo et al. (2020), reported that reversal with Sugammadex, when compared to Neostigmine, was associated with a lower incidence of PONV and required less rescue antiemetic therapy. Lastly, ensuring adequate intraoperative hydration has been proven to be another important factor in the prevention of PONV (Elvir-Lazo et al., 2020). It should be noted, however, that this adequate hydration should be balanced with the risks of hypervolemia and therefore a euvolemic or GDT approach should continue to be the intraoperative goal.

Postoperative Care

Successful implementation of ERAS protocols requires engagement and understanding from the multidisciplinary healthcare team extending into the postoperative period. The literature highlights recommendations specific to the postoperative period including fluid management, pain management, and the prevention and treatment of PONV.

Fluid management goals must continue through the postoperative period. Maintaining euvolemia following surgery for advanced cancers has been shown to cause earlier return to normal bowel function and reduced length of hospital stay after surgery (Altman et al., 2019). Allowing patients to consume a high energy protein drink as soon as tolerated postoperatively can ensure adequate protein intake during the recovery period and assist in bridging to a normal diet (Nelson et al., 2019). If intravenous (IV) fluids are needed following surgery, a balanced crystalloid solution administered at no more than 1.2 ml/kg/hr has been shown to decrease risk of hyperchloremic acidosis and assist with hydration in the first 24 hours postoperatively (Nelson et al., 2019).

Addressing pain management following surgery is essential to improve patients' outcomes. To maximize benefits, both scheduled pain management and break through pain management need to continue in the postoperative period. These strategies should contain multimodal approaches and attempt to minimize opioids if possible. Many ERAS protocols now routinely advocate for the usage of opioid-

sparing approaches, scheduled doses of NSAIDs (non-steroidal anti-inflammatory drugs) and acetaminophen. These interventions have all been shown in gynecologic ERAS protocols to decrease overall opioid usage and associated adverse effects (Altman et al., 2019). According to a retrospective case-control study by Chapman et. al, opioid usage was decreased by 30% in the ERAS protocol group compared to patients in the control group and patients also reported significantly lower postoperative pain score. In this same study, patients included in the ERAS protocol required no patient-controlled analgesia (PCA) or epidurals. The combination of both an NSAID and acetaminophen is more effective than using either drug alone and should be administered regularly as part of the postoperative phase of ERAS unless contraindication exists (Nelson et al., 2019). According to Chiu et al. (2018), along with scheduled acetaminophen, hydrocodone and oxycodone can be given as needed for moderate pain, and IV hydromorphone for severe pain that is not relieved by oral pain medications in the post operative phase. In one large study, implementation of ERAS lead to a dramatic reduction in opioid usage in the PACU phase falling from 36.7mg to 15.5 mg oral morphine equivalents (Chiu et al., 2018).

About one-third of surgical patients experience PONV leading to patient dissatisfaction, discomfort, expensive extended postoperative time, and potentially unplanned hospital admission (Harkins, 2015). According to a study done by Chiu et al. (2018), incidence of PONV was decreased from 43% to 7% in the PACU/floor setting with the employment of ERAS protocol anti-emetic treatment. Implementing a multimodal strategy regarding anti-emetic medications postoperatively is an essential component to successful and well-rounded ERAS protocols for this patient population. The literature shows that maintenance of the above ERAS recommendations leads to a decrease in length of stay, opioid usage, and PONV.

Conclusion

After completing a thorough literature review regarding the current recommendations for preoperative, intraoperative, and postoperative care for the gynecological oncology surgical patient population, an ERAS protocol was developed by the SRNAs, and chief nurse anesthetist tailored to the

project site (Appendix C). This protocol will be applied to gynecology oncology patients and outcomes will be measured.

Expected Outcomes

Implementation of and adherence to an ERAS protocol will lead to a 20% decreased incidence of PONV, reduced opioid usage (as measured in morphine equivalents) by 10%, and decreased average length of stay in gynecological oncology surgical patients. Some gynecologic oncology procedures are more extensive than others, requiring an inpatient hospital stay. Patients who have planned inpatient stays will decrease their length of stay by 20%. Patients who undergo outpatient procedures will have a reduction in total time from PACU to discharge home by 10%. The protocol will be applied to patients undergoing gynecologic oncology surgery beginning June 14, 2022.

Project Site

The Western Michigan hospital is a Joint Commission-accredited teaching hospital established in 1893. The complete health system includes three hospital campuses (Grand Rapids, Muskegon, and the Lakeshore), 60+ physician offices, 1,300+ medical staff physicians, 800+ hospital beds, and 7,200+ colleagues. Services provided at this facility currently include neurosciences, cardiovascular, cancer care, orthopedics, diabetes and endocrine care, kidney transplants, and integrative medicine.

Setting Facilitators and Barriers

Surgical services involve a multidisciplinary team beginning with optimizing patients prior to surgery all the way through discharge home or to a rehabilitation facility. Due to the nature of surgery and the numerous providers involved, following a specific protocol during each phase of the patients' surgical experience can be challenging. Implementation of an ERAS protocol will involve the coordination and cooperation of preoperative nurses, surgeons, anesthesia providers and PACU staff and their dedication to following the recommended protocol. Specific stakeholders and their involvement in this quality improvement project are outlined below in Table 1. When implementing a quality improvement project, it is important to assess any potential barriers that may be faced. A Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis for this project was conducted and can be found in Appendix D.

Table 1

Stakeholder	Project Role
Chief Nurse Anesthetist	Coordination and collaboration with SRNAs, development of ERAS protocol, assisting SRNAs with data collection from EHR, facilitating staff education and adherence to protocol
Quality Improvement Specialist	Coordination and collaboration with SRNAs, assisting SRNAs with data collection from EHR
Gynecology Oncology Surgeons	Development of ERAS protocol, placement of on-unit ERAS protocol orders
CRNAs/Anesthesiologists	Placement of pre-procedure ERAS orders, knowledge of and adherence to intraoperative ERAS protocol
Preoperative Nurses	Knowledge of and adherence to preoperative ERAS protocol
Post Anesthesia Care Unit (PACU) Nurses	Knowledge of and adherence to postoperative ERAS protocol

Methods

To address the complications associated with gynecologic oncology procedures, the SRNAs, in accordance with the chief nurse anesthetist, plan to develop an ERAS protocol. First, a literature review regarding the current recommendations for preoperative, intraoperative, and postoperative care for the gynecological oncology surgical patient population will be conducted. This literature review will focus on the outcomes identified by the project site of reducing PONV, reducing opioid consumption, and decreasing length of stay. The ERAS protocol will be developed by the SRNAs and Chief Nurse Anesthetist and tailored to the project site (Appendix C).

After the ERAS protocol has been developed by the SRNAs and reviewed by the Chief Nurse Anesthetist and gynecology oncology surgeons, staff education will be conducted by the SRNAs. An educational PowerPoint presentation will be delivered by the SRNAs to surgical staff discussing the ERAS protocol and outlining each member's role. A checklist will also be printed out and placed on each patient's chart. Lastly, a link to the protocol will also be available for reference on the project site's Intranet. After the 'go live' a proposed timeline for data collection will occur for three months.

Data Collection Procedure

Data will be collected retrospectively to compare patients before the implementation of the ERAS protocol to patients after implementation. Charts for thirty patients who underwent a scheduled laparoscopic hysterectomy, open hysterectomy, or exploratory laparoscopy procedure prior to ERAS implementation will be reviewed for the use of rescue antiemetics from the post-anesthesia recovery unit (PACU) to the floor or discharge, use of opioids (measured in morphine equivalents) from PACU to the floor or discharge, and overall length of stay. Length of stay will be divided into two groups: inpatient and outpatient. The inpatient group's length of stay will be measured from arrival to PACU to discharge home from the floor. The outpatient group's length of stay will be measured from PACU to discharge home from phase two recovery. Chart audits will then occur for thirty patients undergoing the same procedures following implementation of the ERAS protocol for comparison, assessing the same metrics. An analysis of adherence to the ERAS protocol will also be conducted.

Data will be collected through the Epic Electronic Health Record charting software. Appropriate patient charts will be identified by the Quality Improvement Specialist and reviewed by the SRNAs for inclusion criteria. A Microsoft Excel spreadsheet will be used to organize and de-identify the data found in each patient's chart.

Ethical Considerations/Protection of Human Subjects

The project site's Chief Nurse Anesthetist has identified this project to be a quality improvement process. The project will be reviewed and approved by the Chief Nurse Anesthetist and HIPPA Compliance Officer at the project site. Additionally, the SRNAs will complete and provide documentation of Michigan State University's "Human Research Protection" training program. Lastly, Michigan State University Internal Review Board (IRB) approval will be obtained (Appendix E) prior to the initiation of this quality improvement project.

Patient charts will be identified and provided by the project site's Quality Improvement Specialist. Initially, these charts will contain patient-specific information, however, the SRNAs will then organize and de-identify the patient data.

Proposed Timeline and Budget

A proposed timeline for implementation of this ERAS protocol has been established. Education of staff will occur on June 8, 2022. This will include a PowerPoint presentation highlighting each staff member's role in the new protocol. The ERAS protocol will 'go live' on June 14, 2022. Data will be collected on patients in the selected population who receive the ERAS protocol for thirty patients, which is anticipated to be around three months. These patients will then be compared retrospectively to previous patients in the same population who did not receive the ERAS protocol.

The cost of this project will be estimated to be minimal. Most of the cost will come from providing educational materials to staff, including paper, copying, and time invested by stakeholders and SRNAs for data collection. If this project were to be reproduced, an additional cost of preadmission screenings would have to be added to the budget. As this hospital already routinely does these screenings for other service lines, we do not have to account for the added salary of the employees performing these screenings. For a detailed breakdown of budget estimates please see Appendix F.

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Appendix A: Literature Table

<u>Citation</u>	<u>Design</u>	<u>Sample</u>	<u>Intervention</u>	<u>Measurement</u>	<u>Findings</u>	<u>Strengths/ Limitations/ Implications</u>
Altman et al., (2019)	Meta synthesis review	110 articles reviewed	Articles related to ERAS protocols	NA	ERAS protocols can be cost effective, decrease stress responses of patients, and improve patient outcomes	Strengths: positive outcome findings related to implemented ERAS protocols Limitations: only a synthesis review of articles related to ERAS
Bisch et al., (2019)	Meta analysis	Examines perioperative nutritional care related to gynecologic oncology and ERAS recommendations	Discusses the important of nutritional assessment in gynecologic oncology patients	Role of immunonutrition, carbohydrate loading, and importance of individualized care	Screening and correcting malnutrition, limiting preoperative fasting, and preoperative carbohydrate loading are all beneficial in gynecologic oncology surgery	Strengths: examined evidence related to gynecologic oncology patients and nutrition. Implications: provides current ERAS recommendations for this surgical population.
Bogani et al., (2021)	Systematic Review	Gynecological oncology patients; randomized controlled trials were used. The sample size was not included.	Discusses the current literature regarding each component of an ERAS protocol for gynecological oncology patients. Categories include: preoperative	Morbidity rates, length of hospital stay, hospital costs.	The adoption of an ERAS protocol for gynecological oncology patients decreased morbidity rates, length of hospital stay and cut down	Strengths: systematic review, utilizing randomized controlled trials Limitations: Implications: The adoption of an ERAS protocol for gynecological oncology patients is associated with decreased morbidity rates,

			e, intraoperative, and postoperative.		on hospital costs.	decreased length of hospital stay, and lower hospital costs.
Byun (2020)	Retrospective study	139 patients with gynecologic cancer who received surgery	1-day antibiotic prophylaxis group and greater than 1-day antibiotic prophylaxis group	SSI, UTI, length of stay, duration of urinary catheterization, and duration of surgical drainage	No difference in SSI and UTI. The longer the period of antibiotic use, the longer the hospitalization.	Strengths: new study. Looked specifically at gynecologic oncology patients. Limitations: retrospective study. Small number of patients. Implications: it is appropriate to use antibiotic prophylaxis for 24 hours. Individualized antibiotic use for patients with increased BMI, longer surgical times, and increased blood loss.
Chapman et al., (2016)	Retrospective case control study	165 patients (55 of whom were included in ERAS group)	To estimate whether an ERAS pathway facilitates early recovery and discharge in gynecologic oncology patients undergoing minimally invasive surgery.	Primary endpoints were length of hospital stay, rates of discharge by noon, 30-day hospital readmission rates, and hospital costs.	An ERAS pathway in patients undergoing gynecologic oncology minimally invasive surgery is associated with significant improvements in recovery time, decreased pain despite reduced	Strengths: significant improvements in recovery time, decreased pain despite reduced opioid use, and overall lower hospital costs. Limitations: selection and information biases integral to retrospective analyses. The patient satisfaction data were significantly limited in its

					opioid use, and overall lower hospital costs.	sample size
Chiu et al. (2018)	Retrospective study	276 pre-ERAS protocol implementation patients, and 96 ERAS group patients for total skin-sparing mastectomy patients	Implementation of an ERAS protocol	Primary outcome: total perioperative opioid consumption. Secondary: high postoperative pain scores, incidence of PONV, and length of stay	Implementation of ERAS pathway improved postoperative analgesia and reduced PONV	Strengths: data collected shows significant improvement in pain scores after ERAS implementation. Suggested use of regional anesthesia as an alternative to increased opioid usage Limitations: ERAS interventions not strictly enforced so patients did not receive all the recommended interventions. Not a randomized study
Cho et al. (2021)	Randomized Controlled Trial	100 patients undergoing uterine cancer surgery	50 patients received dexmedetomidine infusion during surgery, 50 did not	Natural killer cell activity, pain scores, opioid consumption, cancer recurrence.	No difference in NK cell activity or cancer recurrence between the groups. Dex infusion group had decreased opioid consumption and pain scores.	Strengths: randomized controlled trial. Limitations: small sample size, only applicable to uterine cancer.
Dai (2018)	Retrospective	63	32 patients	Length of	TAP block	Strengths:

	ve cohort study	patients undergoing abdominal hysterectomies	received a TAP block, 31 patients did not	hospital stay, total narcotic consumption, pain scores at 2, 4, 8, 12, 16, 20 and 24 hours after leaving PACU.	group consumed significantly less narcotics in the PACU than non-TAP block group. Other outcomes were not significantly different.	provided different ways to control better for variables in future studies. Limitations: small sample size. Could not control for comorbidities between groups. Could not control for differences in administering the TAP block by different providers. Implications: TAP blocks seem to be effective at reducing narcotic requirement in the PACU, but not other stages of care. A longer acting local anesthetic may be useful.
Elvir-Lazo et al. (2020)	Meta synthesis review	Recently published peer reviewed literature and classical references	Prevention and treatment of PONV using evidence-based multimodal prophylaxis regimens	N/A	Management of PONV should be based on level of risk, pre-existing conditions, patient preference and cost efficiency.	Strengths: review of recent literature to provide recommendations. Limitations: gynecologic oncology patients are already high-risk. Need unique/special management. Implications: use of regional anesthesia, limiting opioid use, considering TIVA, adequate

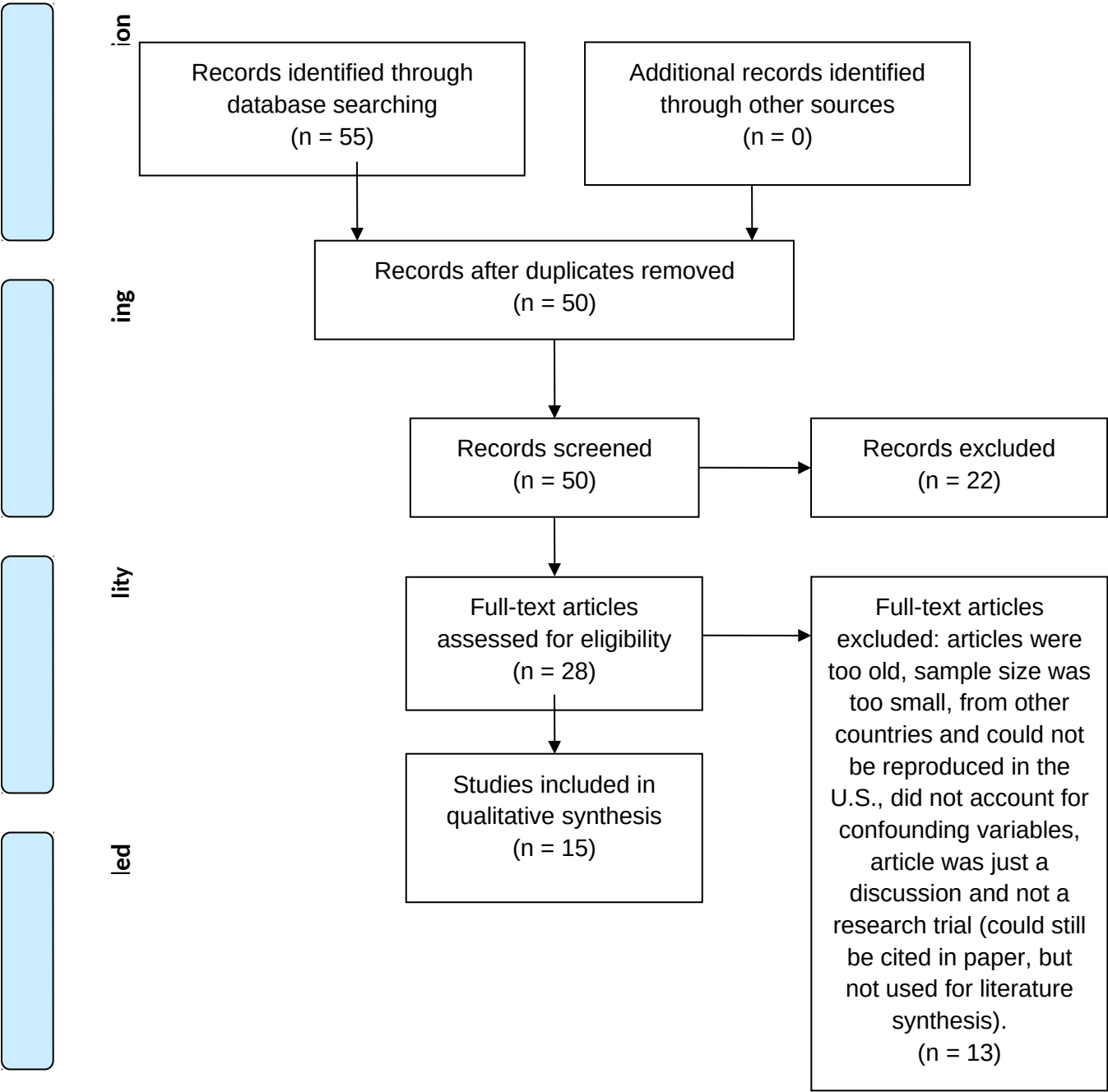
						hydration, and use of three prophylactic agents are recommended for high-risk patients.
Kendrick et al. (2019)	Systematic Review	All studies from the last 5 years, articles including the terms enhanced recovery and goal directed fluid therapy.	Goal directed fluid therapy utilized in an ERAS protocol vs traditional method of predicting fluid loss.	Mortality, morbidity, length of hospital stay.	Utilizing GDT in an ERAS protocol; maintaining euvolemia through the continuous assessment of fluid status.	Strengths: systemic review Limitations: did not discuss or compare intraoperative fluid management for specific surgical cases Implications: GDT is associated with improved post operative outcomes.
Nelson et al. (2019)	Systematic review	Available evidence for management of patients undergoing gynecologic and gynecological oncology surgery	Goal was to critically review existing evidence and make recommendations for elements of ERAS protocol for pre, intra, and post operative stages	Length of stay, complication rate, cost savings	Discussion on different qualities of ERAS protocols and the level of evidence strength relating to each topic	Limitations: limited evidence in regards to some surgical recommendations related to gynecologic/oncology patients Strengths: gave level of evidence rating to different care recommendations within ERAS protocols in regards to our intended surgical population
Rivard et al. (2015)	Retrospective cohort study	All patients who underwent a minimally invasive surgery (laparoscopic)	Beginning August 2012, at the end of the procedure a single dose of 20 mL of	IP bupivacaine group was compared to standard group who underwent surgery	Median narcotic use was significantly decreased in the IP bupivacaine group on	Strengths: studied major gynecologic oncology surgery. All surgeries were performed by the same surgeon. All patients

		pic or robotic) with a single gynecologic oncologist from September 2011 to June 2013 (77 patients)	0.25% bupivacaine was instilled intraperitoneally over the vaginal cuff and along the bilateral pelvic sidewalls. This group was named the IP bupivacaine group.	between September 2011 and July 2012. Both groups received injections of bupivacaine at port sites. Primary outcome was total narcotic use, secondary outcome was self-reported pain score.	day of surgery and postoperative day 1, with a slight decrease in pain scores in this group.	received the same postoperative pain regimen. Limitations: retrospective design. Cannot control for any improvement in surgical technique that the IP bupivacaine group received compared to standard group. Implications: intraperitoneal bupivacaine resulted in decreased postoperative narcotic use, and a trend toward lower pain scores. Should be evaluated in prospective studies.
Thangavel et al. (2021)	Prospective observational study	113 patients	ERAS protocol implementation	The aim of this study is to evaluate patient satisfaction while being managed with the ERAS pathway and to determine whether it is an acceptable model of care	High levels of patient satisfaction from ERAS protocol implementation	Limitations: small sample size, data collected from only one department unit Strengths: provided data regarding improvement of patient outcomes if ERAS protocol was utilized
Wick, Grant, & Wu (2017)	Meta Analysis	27 randomize	Non opioid analgesia	Post operative	After adoption	Strengths: Meta analysis, large

		d controlled trials. Surgical patients receiving non opioid analgesics .	including: regional, acetaminophen, NSAIDs, gabapentin, tramadol, lidocaine, ketamine and magnesium .	opioid consumption.	of multimodal analgesic approach, there was a reduction in post operative opioid consumption while in the hospital.	sample size. Limitations: only looked at opioid consumption, did not look at other factors such as PONV or length of hospital stay. Implications: Multimodal analgesic approach leads to decreased post operative opioid consumption.
Winkelman et al. (2019)	Retrospective cohort study	221 patients. 109 patients treated under standard protocol. 112 patients treated under multimodal protocol.	Implementation of a multimodal pain treatment approach. Included preoperative gabapentin and acetaminophen and postoperative scheduled doses of acetaminophen and NSAIDs.	Pain scores and MME were compared.	The use of a multimodal pain protocol resulted in lower pain scores. MME were similar between the two groups, but opiates are uncommon in this surgical population .	Strengths: study design provides a realistic assessment of the impact of multimodal pain control, generalizable to other populations. Limitations: observational. Differences in patients in the two study groups. Studied ambulatory urogynecologic surgery. Implications: multimodal pain protocol is associated with lower risk of pain and lower pain scores.

Appendix B: Prisma Table

PRISMA Flow Diagram



Appendix C: Gynecology Oncology ERAS Protocol

GYN ONC- ERAS Guideline Checklist

Keep with Chart & Use Check Box when ERAS item completed.
PACU to remove and return by yellows.

Patient Sticker

- **Preoperative**

- ☐ Antimicrobial Prophylaxis
- ☐ Skin Prep-CHG wipe day of surgery
- Verify with patient:
 - ☐ NPO Status, clear liquids allowed up to two hours before procedure
 - ☐ Adherence to carbohydrate drink 2-3 hrs before surgery (except for type 1 diabetics)
 - ☐ Bowel prep completed, if applicable
- ☐ Normothermia -forced air warming
- Pre-anesthetic Medications
 - ☐ Acetaminophen 1000 mg PO once
 - ☐ Gabapentin 300 mg PO once
- PONV Prophylaxis (all patients)
 - ☐ Dexamethasone 4 mg IV once
- PONV Prophylaxis (for pts with 2 risk factors)
 - ☐ Scopolamine patch 1.5 mg (if > 65 years of age use Emend 40 mg instead)
- PONV Prophylaxis (for pts with 3-4 risk factors)
 - ☐ Aprepitant (Emend) 40 mg PO once

- **Intraoperative**

- ☐ General Anesthesia (use TIVA for pts with ≥ 3 PONV risk factors)
 - TIVA: no anesthetic gas. Propofol infusion 100-300 mcg/kg/min.
 - ETT
 - +/- OG/NG (ask surgeon)
- ☐ Regional Block
 - TAP block following induction for open procedures
- ☐ Goal-directed Fluid Therapy (1-4ml/kg/hour)
- Multimodal Pain Management
 - ☐ Ketamine (15-30 mg bolus) pre-incision
 - ☐ Magnesium 2 grams IV in 100 ml NS bag IVPB
 - ☐ Narcotics used sparingly
 - ☐ Toradol +/- (ask surgeon)
- ☐ Multimodal Antiemetics - Ondansetron 4mg IV 30 min before end of procedure
- ☐ Normothermia -forced air warming

- **Postoperative – Recovery Only**

- ☐ Goal-directed Fluid Therapy- Euvolemia
- ☐ Normothermia – forced air warming (if < 36° C)
- Breakthrough Pain
 - ☐ Oxycodone IR 5 mg PO q4hrs PRN pain 4-6 moderate
 - ☐ Oxycodone IR 10 mg PO q4hrs PRN pain 7-10 severe
 - ☐ Hydromorphone 0.5 mg IV x4 if pain not relieved by Oxycodone, or patient unable to tolerate PO
- PONV Rescue: Use medication from different class
 - ☐ 1st Line: Ondansetron 4mg PO or IV (if > 6 hrs from last dose)
 - ☐ 2nd Line: Prochlorperazine 10 mg PO or IV, if inadequate response, contact provider for further options

- **Postoperative- On Unit**

- **Comments:**

Appendix D: SWOT Analysis

Gynecology Oncology ERAS	

S INTERNAL STRENGTHS		W INTERNAL WEAKNESSES	
1	Improved patient outcomes related to pain, PONV, LOS—supported by evidence from the literature	1	Staff education needed for all stages of care
2	Chief CRNA and surgeons interested in protocol	2	Difficulty of locating protocol
3	ERAS protocols already exist for other service lines at project site	3	Involves collaboration of different professions to succeed
O EXTERNAL OPPORTUNITIES		T EXTERNAL THREATS	
1	Opportunity to improve patient outcomes	1	Staff resistance to change, “added work”
2	Can utilize staff meetings and huddles to educate staff on protocol	2	Adequate access to pharmacy medications needed for all stages of care

Appendix E: IRB Approval

Appendix F: Estimated Budget Table

Estimated Budget

	Amount
Ream of colored paper	\$12.99
SRNAs time for data collection (estimated as RN wage of \$34/hour)	\$1,360 (total 3 SRNAs)
Quality Improvement Specialist Time (estimated at \$25/hour)	\$250
Total	\$1,622.99