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Does the Enhanced Recovery Pathway Decrease Length of Stay and Readmission Rates in Patients Undergoing Gynecologic Surgery?

Trinh T. Nguyen
California State University, Northern California Consortium Doctor of Nursing Practice

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Doctoral Project Team Members

Wei-Chen Tung, PhD, RN, FAAN	Associate Professor, San José State University
Doctoral Project Chair	Title and Affiliation
Lisa Walker-Vischer RN, DNP, CNS, CCRN	Associate Professor, San José State University
Doctoral Program Advisor	Title and Affiliation
Lizanne Regudon, MSN, RN, LSSBB	Quality Improvement Coordinator, SCVMC
Practice Mentor	Title and Affiliation

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Trinh T. Nguyen, FNP-BC, MSN, RN, PHN

Doctor of Nursing Practice Program

The Valley Foundation School of Nursing

San Jose State University

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Abstract

The Enhanced Recovery After Surgery (ERAS) pathway promotes an early recovery after surgery using an evidence-based multidisciplinary approach. The ERAS protocol is aimed at standardizing care to improve patient outcomes. There is consistent evidence that ERAS pathways reduce hospital length of stay (LOS) and readmission rates, decrease healthcare costs, and improve patient satisfaction and outcomes. By attenuating the surgical stress response and supporting the return of physiological function, the ERAS pathway achieves its effectiveness. This scholarly project aimed to evaluate how ERAS improves patient outcomes in gynecology patients at a county hospital. A standardized method for improving patient recovery was not in place at the institution prior to the implementation of the ERAS pathway. ERAS-boarded gynecology surgery patients were reviewed retrospectively as part of this quality improvement project. Through this quality improvement project, hospital LOS was reduced without increasing readmissions or complications. There were no significant relationships between readmission rate and categorical extraneous variables. However, two significant relationships were found among LOS and the categorical extraneous variables. Hispanics had a shorter LOS and women who had an open procedure had longer LOS. As a result of the evaluation of this pathway, modifications may be made to the implementation of ERAS to ensure the high level of success of the program and enhance its expansion to other surgical specialties.

Keywords: ERAS, enhanced recovery after surgery, fast track surgery, readmission rate, length of hospital stay, gynecology, improved patient outcomes

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Introduction

Although evidence-based practice drives healthcare, implementation can be labor-intensive and take many years. One practice, the enhanced recovery after surgery (ERAS) pathway, comprises perioperative, intraoperative, and postoperative interventions designed to optimize and standardize surgical patient care (Lemanu et al., 2013). The goal of ERAS is to reduce postoperative complications, resulting in a quicker recovery (Lemanu et al., 2013; Roulin et al., 2013). However, few healthcare facilities have implemented ERAS pathways (Lemanu et al., 2013).

There are approximately 310 million major surgeries performed in the United States each year. In 2014, gynecological surgeries comprised 13.5% of these, with 237,500 hysterectomies, 182,400 oophorectomies, and 254,500 tubal ligations (McDermott et al., 2017). Gynecological procedures are among the country's top 20 most expensive operating procedures. Depending on the surgical extent and approach, Wright and colleagues back in 2012 estimated the average cost for a hysterectomy to be between $31,934 and $49,526 (Wright et al., 2012). The length of stay (LOS, or the length of time between hospital admission and discharge) in the hospital also contributes significantly to healthcare costs (Harrison et al., 2020). The ERAS pathway reduces the LOS by minimizing postoperative complications and readmissions (i.e., unplanned return admissions within 30 days of surgical discharge; Lemanu et al., 2013). As part of the ongoing effort to be current with the latest evidence-based practice, the Doctor of Nursing Practice (DNP) project hospital site plans to offer ERAS pathways to all surgical specialties.

The ERAS pathway is a means to improve the patient's overall surgical outcome by standardizing care. Dr. Henrik Kehlet, a colorectal surgeon and anesthesiologist, introduced ERAS in the 1990s after questioning the efficacy of longstanding, non-evidence-based practices

in traditional surgical care models (Kalogera & Dowdy, 2016). Although the ERAS pathway contradicts the traditional surgical doctrine, it has received research support as being more effective than traditional methods (Carmichael et al., 2017). ERAS has shown reduced surgical stress, accelerated recovery, reduced hospital LOS, and reduced readmission rates. Decreasing overall cost and increasing patient satisfaction by reducing postoperative organ dysfunction are additional goals of ERAS (Grant et al., 2019; Greenshields & Mythen, 2020; Kalogera & Dowdy, 2016; Kalogera et al., 2021).

The ERAS pathway is a multidisciplinary, goal-oriented program that begins during the preoperative stage and continues after hospital discharge (see Appendix A). Among the numerous ERAS pathways, this DNP project focuses on preoperative education and reducing fasting duration with carbohydrate-loading drinks. A detailed explanation of the surgical procedure and the enhanced recovery pathway, ideally both written and oral, should be a part of preoperative education. With this education, patients will know what to expect and how the process works. A patient informed of the procedure and recovery requirements can actively participate in the process. Nutrition is also essential for recovery. Carbohydrate drinks can reduce postsurgery nausea and vomiting and alleviate hunger and thirst (Canbay et al., 2014; Hausel et al., 2005; Rizvanović et al., 2019; Singh et al., 2015). The ERAS pathway suggests two carbohydrate-loading drinks before bedtime the night before surgery and one drink 2 hours before the procedure (Gustafsson et al., 2018).

The ERAS pathway serves several essential purposes. A key goal is to maintain patients' normal physiological function, reduce surgical stress, and accelerate postoperative recovery. In contrast to the traditional single-care model, the ERAS pathway is a multimodal approach to perioperative recovery. Successful implementation requires active patient engagement and

multidisciplinary collaboration among surgeons, anesthesiologists, nurses, pharmacists, nutritionists, therapists, and allied health professionals (Altman et al., 2019; Brown & Kahn, 2018; Kalogera et al., 2021). There has been successful ERAS pathway implementation in a number of surgical specialties (Kalogera & Dowdy, 2016), and acceptance is growing (Brown & Kahn, 2018).

Problem Statement ERAS

Patients who undergo gynecology surgeries often suffer complications, delayed discharge, and readmission after discharge (Feigenbaum et al., 2012; McHugh & Ma, 2013). In addition to increasing the financial burden on patients and the healthcare system, postoperative complications disrupt patients and their families (Ouslander et al., 2014).

Purpose of the Study

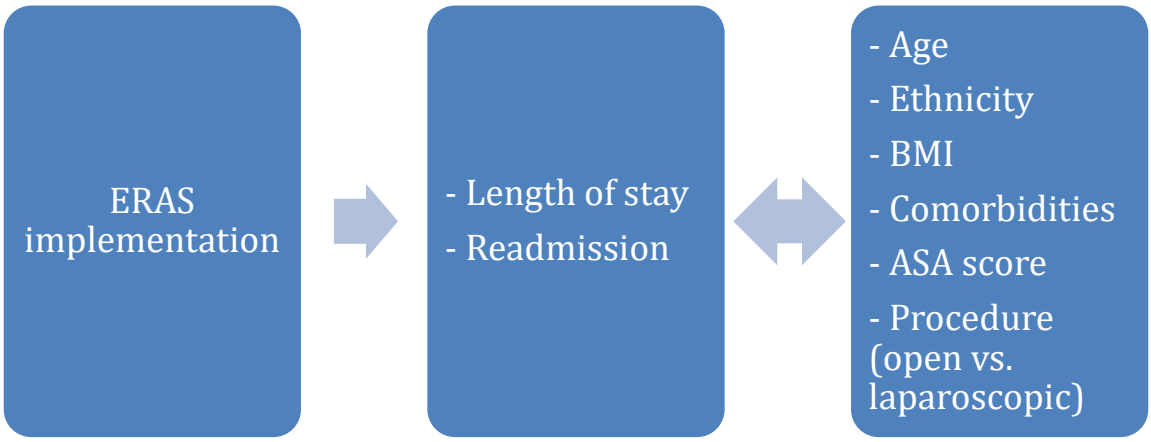
The purpose of this DNP project was to evaluate the impact of ERAS pathways on gynecological surgeries. The aim was to decrease postsurgery LOS and readmission within 30 days after surgery. Further goals included reducing surgical stress and promoting faster recovery by measuring the LOS and readmission after surgery.

Project PICOT Questions

As shown in Figure 1, the project PICOT questions were as follows:

1. Does the implementation of enhanced recovery after surgery (ERAS) reduce the hospital length of stay (LOS) and 30-day readmissions compared with traditional postoperative care?
2. Are there relationships among length of stay (LOS), readmission, age, ethnicity, BMI, comorbidities, American Society of Anesthesiologists (ASA) score, and procedure (open vs. laparoscopic) among patients undergoing gynecology surgery?

Figure 1



Description of the Intervention: ERAS

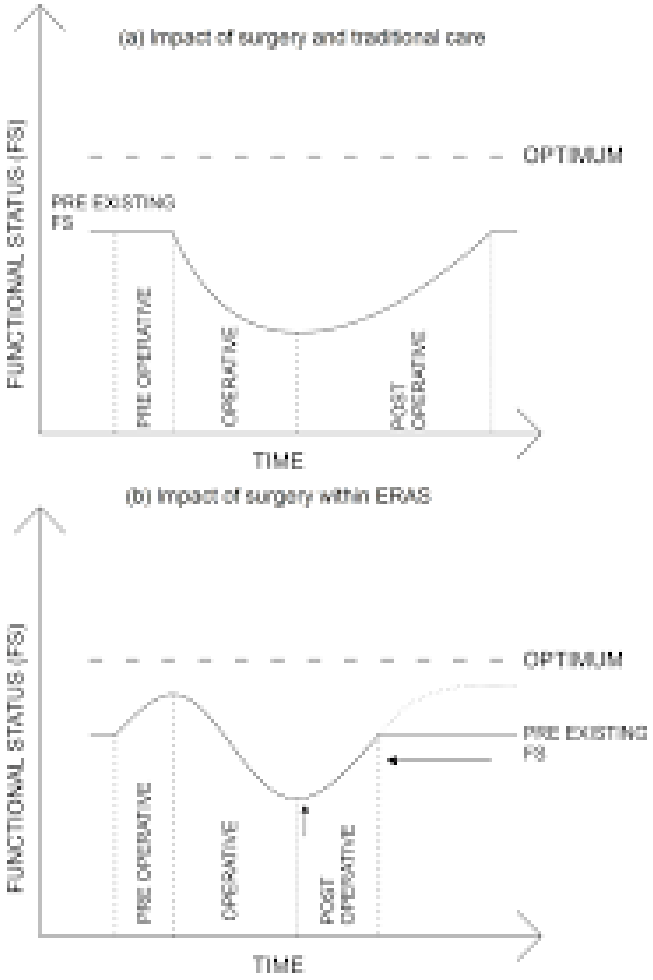
Despite anesthesia and surgical technique advancements, postoperative complications remain significant disadvantages. Surgical stress causes the body to enter a highly catabolic state with relative tissue hypoxia, increased insulin resistance, increased cardiac demands, impaired coagulation profiles, and altered gastrointestinal and pulmonary functions (Carmichael et al., 2017). The stress level is proportional to the amount of injured tissue and amplified by postsurgical complications (Scott et al., 2015). Surgery-induced stress can lead to hormonal and metabolic changes, causing negative hematological, immunological, and endocrine responses. These factors contribute to organ dysfunction, delayed recovery, and morbidity.

Figure 2 shows a comparison of the functional status of patients undergoing surgery with the impact of the traditional versus the ERAS care models. In the preoperative phase, there were no changes for the traditional pathway; ERAS pathways include attempts to optimize patients' health, as reflected in the upswing. In the intraoperative phase, surgical and anesthesia

maneuvers are means to minimize functional status (represented by the downswing), also known as the surgical stress response. In the ERAS pathway, the small vertical arrow at the beginning of the postoperative stage represents a reduced impact observed as minimized functional status. The long horizontal arrow demonstrates postoperative rehabilitation, the objective of which is to hasten recovery demonstrated by a reduced return to preexisting function. It is ideal to rehabilitate as close to the optimum as possible, as represented by the top dotted line.

Figure 2

Traditional Care vs. ERAS Care



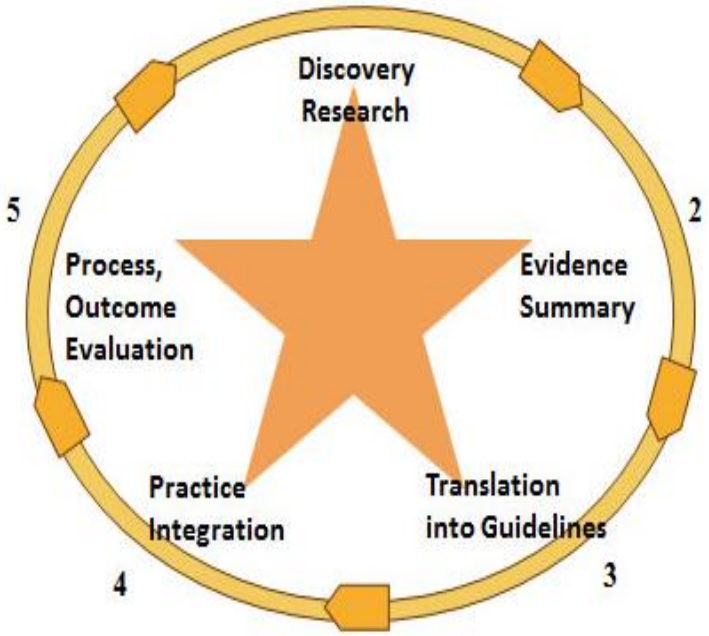
Many interventions used during perioperative care are based on tradition, not evidence. ERAS entails implementing various evidence-based interventions during the preoperative, intraoperative, and postoperative phases of surgery to minimize the surgical stress response (Nelson et al., 2016). The ERAS pathway includes preoperative education and counseling, carbohydrate-loading beverages, goal-fluid therapy, thromboembolism prophylaxis, nausea and vomiting prophylaxis, transverse abdominal plane anesthesia, high-content oxygen therapy, early enteral feeding, early mobilization, and no drain insertion unless medically necessary. In contrast, patients undergoing traditional surgical methods have no presurgery preoperative counseling and receive only the required education, such as type of and consent for surgery. These patients receive presurgery fasting bowel prep, conventional fluid management, no- to low-contact oxygen therapy, postoperative nausea and vomiting control as needed, intravenous patient-controlled analgesia pumps, and conventional mobilization (Nelson et al., 2016). An ERAS clinical practice guideline would be helpful to standardize and improve the quality of care given to surgical patients.

Evidence-Based Model: ACE Star Model of Knowledge Transformation

In this DNP project, the ACE Star Model of the Cycle of Knowledge Transformation (Figure 3) was the evidence-based model most applicable to the problem and PICOT question. The model presents the various stages of transformation from knowledge acquisition to implementation. The ACE Star Model consists of five stages used in introducing an ERAS pathway into practice: (a) knowledge discovery, (b) evidence synthesis, (c) transition into practice recommendations, (d) implementation of these recommendations into practice, and (e) evaluation (Melnyk & Fineout-Overholt, 2019; Stevens, 2013).

Figure 3

ACE Star Model of the Cycle of Knowledge Transformation



Model Application

ERAS pathways decrease LOS and reduce readmissions (Loots et al., 2018; Stevens, 2013). Using the ACE Star Model's five stages is an apt way to introduce an ERAS pathway into practice. The timeline (see Appendix B) began with the literature review in September 2021 and ended with submitting the DNP project for publication in May 2023. Meeting the scheduled milestones was essential for achieving the DNP goal. A first step to combating the problem of increased gynecology surgery LOS and readmission was researching the problem, reading a wide range of studies, including peer-reviewed, quantitative research, cohort, and control studies. In addition to analyzing the causes and statistics regarding the problem, the researchers and authors reviewed rationales for improvement and improved quality of care. An evidence summary was the second step, which included creating an evidence matrix outlining the findings of each study and their implications for practice. The studies analyzed included systematic reviews, meta-

analyses, literature reviews, and randomized controlled trials (see Literature Review section). According to the evidence summary, ERAS implementation decreased hospital LOS and readmission rates after gynecological surgery. Translation, the third step of the ACE Star Model, involved putting into practice the information learned in the evidence summary. Several clinical guidelines are available to assist in educating patients and their families, staff members, and other multidisciplinary team members. The surgeon who recommended surgery for the patient must provide buy-in and approve the fourth step of the clinical pathway. The patients received instructions preoperatively, postoperatively, and at follow-up visits. The implementation also included educating the clinic and surgical department medical staff to ensure a universal understanding of the guidelines. The final step of the ACE Star Model is evaluation, which entailed reviewing and analyzing the LOS and readmission rates between the ERAS-implemented group and the traditional group. Research is continuously evolving, with new information emerging. Because education is an ongoing process in nursing, improvements will continue post implementation.

Literature Review

Literature reviews provide in-depth analyses of the research findings relevant to a proposed study and are an essential part of the research process. A review of recent literature guided and supported this study as a means to identify the role of ERAS pathways in patients undergoing gynecology surgeries. Among the databases and electronic resources used to search for relevant articles were CINAHL and PubMed, available through the Martin Luther King Library (MLK). In addition to being part of the San José Public Library system, the MLK library is also the university library of San José State University and has a greater variety of student resources.

Decrease in Hospital Length of Stay

In a literature review of ERAS pathway guidelines, Nygren et al. (2012) examined large prospective cohorts, randomized controlled trials, and meta-analyses. Among the studies reviewed were evidence-based consensus reviews of perioperative care conducted by the Enhanced Recovery After Surgery Society, the International Association for Surgical Metabolism and Nutrition, and the European Society for Clinical Nutrition and Metabolism. ERAS pathway retrospective control case studies consistently showed a LOS reduction of 3 to 5 days. However, using an ERAS pathway to manage patients has not led to increased complications or mortality (Nygren et al., 2012).

Relph et al. (2014) conducted a controlled study at a North London teaching hospital, comparing 45 women undergoing hysterectomy in two post implementation groups: the ERAS pathway and traditional pathways. The patients receiving the ERAS pathway had significantly reduced catheter usage and hospital LOS. The inpatient readmission rates were similar for both the traditional pathway and enhanced recovery groups. Despite the significant limitations of the

sample size, the study indicated that women undergoing vaginal hysterectomies benefited from the ERAS pathway. The women had increased satisfaction and cost efficiency and decreased morbidity (Relph et al., 2014).

Using a systematic review and meta-analysis, Groot et al. (2016) reviewed current research to examine postoperative outcomes following open gynecologic surgery. The 31 studies included were those with at least three individual enhanced recovery pathways. Compared to traditional perioperative care, enhanced recovery pathways led to a shorter LOS, less postoperative pain, and fewer complications. With just three ERAS pathway elements (preoperative education, early mobilization, and early oral intake) included in the study, the evidence suggested that enhanced recovery pathways can reduce LOS following abdominal gynecologic surgery (Groot et al., 2016).

Bernard et al. (2020) evaluated the impact of the ERAS pathway on a gynecologic oncology population undergoing laparotomy in a Canadian tertiary care center. The researchers used the National Surgical Quality Improvement Program dataset (NSQIP) of the American College of Surgeons (ACS) to analyze 30-day postoperative outcomes. Introducing the ERAS protocol resulted in a significant decrease in the mean LOS, from 4.7 to 3.8 days, and a decrease in complication rates, from 24.3% to 16%. Despite significant decreases in postoperative infections and cardiovascular complications, Bernard et al. observed no significant increases in readmission rates. Implementing an ERAS program for gynecologic oncology patients undergoing laparotomy reduced the overall complication rate and LOS without increasing readmissions (Bernard et al., 2020).

Decrease Readmission Rate

Mendivil et al. (2018) compared gynecological oncology patient outcomes in a community hospital with and without ERAS protocols. Their study was a retrospective analysis of consecutive gynecologic oncology patients managed through open surgery in conjunction with an ERAS pathway. The ERAS and historical groups comprised 86 and 91 patients, respectively. Following ERAS implementation, hospital LOS dropped by 3 days, resulting in decreased costs ($11,877 vs. $9,305 per patient). Two ERAS group members reported readmissions, with four recorded in the historical cohort. Mendivil et al. concluded that complying with an ERAS protocol results in a reduction in hospital readmissions, hospital costs, and LOS.

A systematic review and meta-analysis of 31 studies showed that ERAS implementation resulted in a 1.6-day decrease in hospital stays (Bisch et al., 2020). Implementing ERAS also led to 20% and 32% decreases in readmissions and complications, respectively, with an average per-patient cost savings of $2,129. ERAS protocols reduced LOS, readmissions, complications, and costs without increasing readmissions or mortality. Based on their results, Bisch et al. suggested implementing ERAS as a standard of care. International hospital discharge criteria differ, and LOS could vary significantly between countries, limiting the study's transferability to other countries. The lack of a randomized clinical trial design compromised the study's validity.

Majumder et al. (2016) compared patients who underwent open ventral hernia repair using the ERAS pathway to a historical cohort with the same procedure before ERAS implementation. Flatus and bowel movements occurred significantly sooner in ERAS patients than in the historical cohort: 3.1 versus 3.9 days (flatus) and 3.6 versus 5.2 days (bowel movements), respectively. In ERAS, 90-day readmissions decreased from 16% to 4%, with an average LOS decrease from 6.1 to 4 days. Early feeding strategies and multimodal pain

management led to accelerated intestinal recovery, shorter LOS, and reduced readmissions (Majumder et al., 2016). ERAS appeared to be more effective than other pathways in improving outcomes.

Increased Patient Satisfaction

In a 2021 observational study, Thangavel et al. analyzed patient satisfaction among gynecological oncology patients undergoing the ERAS pathway. Two patient groups completed surveys: those discharged from the hospital after undergoing laparoscopy surgery (n = 68) and those discharged following laparotomy for malignancy or suspected malignancy (n = 45). Patients in both groups reported high levels of satisfaction. Discharge planning was a significant focus of the multidisciplinary team, specifically identifying ways to improve results gained from the initial consultation (Thangavel et al., 2021). Even though the sample size was small, the study showed successful ERAS protocol implementation with gynecological oncological surgery in this unit.

Mirapeix et al. (2016) conducted a literature review on ERAS pathways in gynecology and colorectal surgery to assess their effects on clinical outcomes and to identify key elements of a successful ERAS program. The ERAS pathway began with preadmission counseling and no pre-surgery bowel preparation. Perioperatively, the ERAS pathway included intraoperative fluid therapy, multimodal opioid-sparing analgesia, and minimally invasive surgical techniques, such as limiting nasogastric catheters, drains, and tubes. The postoperative process required early feeding: early mobilization; timely removal of catheters, drains, and tubes, if used; and multimodal analgesics. The study findings showed that successful ERAS pathway implementation requires multidisciplinary teamwork and the patient’s active participation.

Patients who receive the ERAS pathway generally stay in the hospital for a shorter period, have lower healthcare costs and are more satisfied with their care (Mirapeix et al., 2016).

Crater-Brooks et al. (2018) examined whether ERAS implementation would reduce LOS in urogynecology surgery patients. This retrospective study was a comparison of patients who underwent pelvic floor reconstruction surgery before (n = 137) and after (n = 121) implementing the ERAS pathway at a tertiary care hospital to examine same-day discharge, LOS, and postoperative complications. Preoperative fasting and carbohydrate loading were the two primary ERAS components reviewed. The hospital discharged ERAS pathway patients 13.6 hours earlier than the non-ERAS group. Myocardial infarction and chest pain were the primary reasons for readmissions for the group without ERAS implementation. Reasons for ERAS pathway patient admissions were weakness, nausea/ileus, hyponatremia, wound complications, ureteral obstruction, and chest pain. ERAS patients reported higher levels of satisfaction regarding pain control, surgery preparation, and overall surgical experience. ERAS resulted in high patient satisfaction and a higher proportion of same-day discharges. Despite a department-wide initiative to reduce LOS, Craters-Brooks et al. were unable to account for ERAS's contribution discreetly. A limitation of the design was the inability to distinguish between correlation and association between outcomes and interventions.

Lower Health Care Cost

Kalogera et al. (2013) studied whether the ERAS pathway would impact patient recovery in gynecological surgery. The case group included 241 women who experienced ERAS and a control group (n = 235). During the first 48 hours, overall opioid use fell by 80%, and patient-controlled anesthesia use decreased by 66%. There was a 4-day hospital stay reduction and a stable readmission rate. Postoperative complications had no differences in severity or rate.

Savings per patient over 30 days were approximately $7,600. As with all ERAS studies, there were many changes in the management pathway, making it difficult to determine which intervention had the greatest impact on recovery (Kalogera et al., 2013).

In a retrospective case-control study, Chapman et al. (2016) focused on oncology patients undergoing minimally invasive surgery to determine whether ERAS promotes early recovery and discharge. The ERAS components included patient education, multimodal analgesia, pain management, opioid minimization, nausea prevention, early catheter removal, ambulation, and feeding. In the 165-patient cohort, 55 were in the ERAS pathway. Patients who received minimally invasive gynecologic oncology surgery in the ERAS pathway had earlier discharge, less pain with reduced opioid use, and reduced hospital costs. Selection and information bias limited the retrospective analyses, and sample size limited the statistical analysis of patient satisfaction (Chapman et al., 2016).

Barber and La (2015) conducted a literature review to determine how the ERAS pathway affected patients undergoing gynecology surgeries. Randomized-controlled trials indicated that the ERAS pathway decreased hospitalization times, postoperative complications, morbidity, and healthcare costs and increased patient satisfaction while reducing morbidity. As a result, patients had better outcomes. Barber and La concluded that healthcare organizations would benefit from using ERAS pathways, saving resources and costs.

Gap in Literature

According to the literature review, an ERAS program can improve postoperative outcomes. Researchers have shown that ERAS pathways decrease LOS, decrease readmission rates, increase patient satisfaction, and decrease healthcare costs (Barber & La, 2015; Bisch et al., 2020). The differences in hospital discharge criteria and LOS between countries could

prevent applying the results internationally. Anesthesia and surgery are constantly evolving, and it is essential for the individuals involved in treating surgical patients to maintain their knowledge about these fields and receive ongoing training (Nygren et al., 2012).

Methods

Design

A retrospective chart review study design was used to compare hospital LOS and readmission rates at pre- and post-ERAS implementation among gynecology patients.

Setting

This research project occurred at a county hospital in the Silicon Valley region of Northern California. The site is a community tertiary-level acute care hospital with 731 licensed beds. Because the ERAS pathway requires interprofessional collaboration, a team of healthcare providers from multiple disciplines participated in the project, including patients, surgeons, nurses, pharmacists, anesthesiologists, allied health professionals, and management. The discussion of the ERAS pathway at the DNP project site began in summer 2020 with colorectal surgeries. The hospital is currently implementing the ERAS pathway in gynecological and orthopedic surgeries, with urology and plastic surgery included in the future plan.

Sample

The chart review sample included two patient groups, one before and the other after the implementation of ERAS pathways. The review comprised inpatient and outpatient gynecology surgeries, so all participants were female. Patients were eligible for inclusion if they underwent open or laparoscopic gynecology surgeries, had ASA scores of four or less and were 18 or older.

Table 1. American Society of Anesthesiologists (ASA) Scores

Score	Description
ASA I	Normal healthy patient
ASA II	Patient with mild systemic disease
ASA III	Patient with severe systemic disease
ASA IV	Patient with severe systemic disease that is a constant threat to life
ASA V	Moribund patient who is not expected to survive without the operation

A chart review from January 1, 2020, to December 31, 2020, occurred for the pre-ERAS implementation group; the post-ERAS implementation group chart review spanned from May 1, 2021, to May 31, 2022. Exclusion criteria were patients whose surgeries were emergent and urgent, as they might be unable to receive the full ERAS protocol.

Data Collection

The project leader and her project mentor conducted a retrospective chart review of the ACS NSQIP database. The ACS NSQIP collects data that enable surgeons and hospitals to compare the quality of their care to similar hospitals and patients with similar characteristics. Determining the reason for the patient's LOS and readmission entailed reviewing any additional complications that could have contributed to the LOS or post-discharge admission. The data collected were age (years), ethnicity, height (cm), weight (kg), BMI (%), diagnosis (see Appendix C), surgery, ERAS implemented, ASA classification, comorbidities, postoperative complications, LOS, and readmission.

Data Analysis

Data analysis was performed using IBM SPSS Statistics Version 26. Descriptive statistics such as means, standard deviations, frequency distributions, and percentages were used to analyze patient demographic characteristics. We used a Mann–Whitney U test to compare LOS between the two groups. Pearson's chi-square analyses were used to compare readmission between the two groups. Pearson's chi-square was also used to compare categorical extraneous variables (i.e., ethnicity, comorbidities, and procedure type) among LOS and readmission. The independent sample *t*-test was used to compare the two samples on three continuous extraneous factors, including age, ASA scores, and BMI. For categorical variables that contributed to readmission, Fisher's exact tests were performed. To compare readmission based on three

continuous extraneous variables, Mann-Whitney U tests were used. LOS was also compared by categorical extraneous variables using the Mann-Whitney U test. An analysis of Spearman correlation was performed on LOS and three continuous extraneous variables (age, ASA, and BMI). In addition, Mann-Whitney U tests were conducted to compare pre- and post-LOS in subsets of patients (Hispanic vs. non-Hispanic, laparoscopic vs. open, and ASA 1-2 vs. ASA 3-4). An alpha level of 0.05 was assumed to be statistically significant.

Ethical Consideration: Protection of Human Subjects

The hospital Institutional Review Board (IRB) concluded that this DNP project did not meet the federal research project definition and was not subject to IRB review. Santa Clara County Counsel represents the County of Santa Clara as its chief legal advisor and approved this project. Before collecting data, the primary investigator consulted with San Jose State University's IRB. To meet National Institutes of Health (NIH) requirements, the author completed the Collaborative Institutional Training Initiative (CITI) Program for protecting human rights during research (see Appendix D). The Health Insurance Portability and Accountability Act (HIPAA) regulations apply when accessing protected health information (PHI); however, the ACS NSQIP database contains no PHI or identifying information. The data were stored in a computer in a locked personal office, which was accessible only to the DNP project leader and upper management of the hospital. The DNP project leader and mentor were the only ones with access to the project Excel spreadsheet, which remained on a password-protected computer at the project hospital. The Excel spreadsheet included no identifying information and will be retained indefinitely. Because the data extracted from the NSQIP database were deidentified, confidentiality risks were minimal. Only the DNP project leader and mentor had access to the data. The secondary analysis ensured that there would be no direct

benefit derived from the research subjects. There were no changes in the patients' care, so informed consent was not necessary. Moreover, there was no additional cost to the patient, and all patients received exceptional care based on current hospital guidelines at the time of surgery. The literature on quality improvement projects indicates the need for supervision to ensure patient safety and maintain ethical guidelines (Taylor et al., 2010). The author met all ethical guidelines in directly collaborating with the project site to develop quality improvement interventions.

Results

A retrospective chart review conducted prior to ERAS implementation in 2020 included 121 gynecology patients. An additional chart review was performed after ERAS implementation between May 1, 2021, and May 31, 2022, and included 173 gynecology patients. The racial breakdown of the pre- and post-ERAS samples is presented in Table 2. In both pre- and post-ERAS samples, the majority of the patients were Hispanic (n = 56, 46.3% vs. n = 90, 52%). White (n = 30, 24.8% vs. n = 40, 23.1%), Asian (n = 27, 22.3% vs. n = 36, 20.8%). Only a few African Americans (n = 5, 4.1% vs. n = 1, 1.7%) were included in the study.

Table 2. Racial breakdown in the pre- and post-ERAS samples

	Pre-ERAS (n = 121)		Post-ERAS (n = 173)	
	n	*%*	*n*	*%*
Hispanic	56	46.3%	90	52.0%
White	30	24.8%	40	23.1%
Asian	27	22.3%	36	20.8%
Black/African American	5	4.1%	3	1.7%
American Indian/Alaskan Native	0	0.0%	1	0.6%
Mixed race	0	0.0%	1	0.6%
Another race	0	0.0%	1	0.6%
Unknown	3	2.5%	1	0.6%

Relationships among Extraneous Factors for Pre- and Post-ERAS Implementation

The main focus of the study was to compare hospital LOS and 30-day readmission rates in the pre- and post-ERAS samples. Several additional variables were collected to rule out possible extraneous factors between the samples that might account for differences in LOS or number of readmissions. The categorical extraneous variables were compared between the two samples using Pearson chi-square tests. Only three racial groups had sufficient numbers of patients represented in both samples. Each of these racial groups was compared to all other races in turn. The pre- and post-ERAS samples were also compared in terms of the prevalence of

diabetes mellitus and hypertension. Data on COPD revealed only two cases, one in each sample. Finally, the samples were compared on whether the type of gynecological procedure was laparoscopic or open. As shown in Table 3, none of the categorical extraneous factors were significantly different between the two samples.

Table 3. Results of pre-post comparisons of categorial extraneous variables by Person's chi-square

		Pre-ERAS (n = 121)		Post-ERAS (n = 173)		χ^2	df	p
Asian	Yes	27	22.9%	36	21.1%	0.14	1	.711
	No	91	77.1%	135	78.9%			
Hispanic	Yes	56	47.5%	90	52.6%	0.75	1	.387
	No	62	52.5%	81	47.4%			
White	Yes	30	25.4%	40	23.4%	0.16	1	.692
	No	88	74.6%	131	76.6%			
Diabetes Mellitus	Yes	16	13.2%	28	16.2%	0.49	1	.484
	No	105	86.8%	145	83.8%			
Hypertension	Yes	36	29.8%	56	32.4%	0.23	1	.634
	No	85	70.2%	117	67.6%			
Procedure	Laparoscopic	82	67.8%	122	70.5%	0.25	1	.614
	Open	39	32.2%	51	29.5%			

Table 4 presents the results of comparisons between the two samples on three continuous extraneous factors, including age, ASA scores, and BMI. The comparisons were conducted using independent samples *t*-tests. No significant differences were found.

Table 4. Results of pre-post comparisons of continuous extraneous variables by independent samples *t*-tests

	Pre-ERAS (*n* = 121)		Post-ERAS (*n* = 173)				
	Mean	*SD*	*Mean*	*SD*	*t*	*df*	*p*
Age	50.65	11.34	49.27	10.80	1.06	292	.289
ASA	2.24	0.50	2.32	0.55	-1.25	292	.213
BMI	30.34	6.63	30.82	6.95	-0.59	288	.557

Comparison of LOS and 30-day Readmissions

The LOS in the hospital ranged from zero to 17 days. Because the variable was not normally distributed, a nonparametric test, the Mann-Whitney *U* test, was conducted to compare the pre- and post-ERAS samples. As shown in Table 5, the average LOS was significantly shorter in the post-ERAS sample than in the pre-ERAS sample (M = 1.26, SD = 1.94 vs. M = 0.98, SD = 1.85, z = -2.96, p = .003). This result supports the positive effect of the ERAS pathway.

Table 5. Results of pre-post comparisons of length of hospital stay by Mann-Whitney U test

Pre-ERAS (*n* = 121)		Post-ERAS (*n* = 173)			
Mean	*SD*	*Mean*	*SD*	*z**	*p*
1.26	1.94	0.98	1.85	-2.96	.003

*standardized Mann-Whitney *U*

A small number of procedure-related readmissions within 30 days was recorded in both samples. As shown in Table 6, prior to ERAS implementation, four readmissions were recorded. Although half the number of procedure-related readmissions (two) was found after ERAS implementation, Pearson's chi-square analysis indicated that the reduction was not sufficient to produce a statistically significant difference ($\chi 2(1) = 1.65$, $p = .200$).

Table 6. Results of pre-post comparisons of procedure-related readmissions within 30 days by Person's chi-square

	Pre-ERAS (*n* = 121)		Post-ERAS (*n* = 173)		*χ2*	*df*	*p*
Yes	4	3.3%	2	1.2%	1.65	1	.200
No	117	96.7%	171	98.8%			

Length of Hospital Stay and 30-Day Readmission Related to the Extraneous Variables

A series of comparisons were conducted to determine if either the 30-day readmission rate or the length of hospital stay were significantly related to the extraneous variables of age, ethnicity, BMI, comorbidities, ASA score, or procedure.

Fisher's exact tests were conducted to compare the readmission rate to the categorical extraneous variables, including the three ethnicities with sufficient representation (each compared to all others in turn), type of procedure, and the two main comorbidities of diabetes mellitus and hypertension. The low rate of readmission invalidated the use of chi-square tests for the comparisons. As shown in Table 7, no significant relationships were found.

Table 7. Results of comparing readmission by categorical extraneous variables by Fisher's exact test

		30-Day Readmission				
		Yes		No		
		n	*%*	*n*	*%*	*p**
Ethnicity	Asian	0	0.0%	63	22.2%	.589
	non-Asian	5	100.0%	221	77.8%	
	Hispanic	1	20.0%	145	51.1%	.211
	Non-Hispanic	4	80.0%	139	48.9%	
	White	2	40.0%	68	23.9%	.598
	non-White	3	60.0%	216	76.1%	
Procedure	Laparoscopic	3	50.0%	201	69.8%	.375
	Open	3	50.0%	87	30.2%	
Diabetes mellitus	Yes	1	16.7%	43	14.9%	1.000
	No	5	83.3%	245	85.1%	
Hypertension	Yes	3	50.0%	89	30.9%	.381
	No	3	50.0%	199	69.1%	

* Fisher's exact test

Age, BMI and ASA score were compared by readmission using Mann-Whitney *U* tests. As shown in Table 8, no significant relationships were found.

Table 8. Result of readmission on three continuous extraneous variables by Mann-Whitney U tests

Variable Compared	30-Day Readmission	*N*	*Mean*	*SD*	*z**	*p*
Age						
	Yes	6	52.67	10.56	-0.63	.526
	No	288	49.78	11.05		
BMI						
	Yes	6	29.93	8.93	-0.19	.850
	No	284	30.63	6.78		
ASA						
	Yes	6	2.33	0.52	-0.20	.843
	No	288	2.28	0.53		

* standardized Mann-Whitney *U* test

A series of Mann-Whitney *U* tests were conducted to compare the LOS by the categorical extraneous variables, including the three ethnicities with sufficient representation (each compared to all others in turn), type of procedure, and the two main comorbidities of diabetes mellitus and hypertension. As shown in Table 9, two significant relationships were found. Hispanics had a shorter LOS ($z = -3.41$, $p = .001$) and women who had an open procedure had longer LOS ($z = -5.90$, $p < .001$).

Table 9. Results of LOS by categorical extraneous variables by Mann-Whitney U tests

		N	*Mean*	*SD*	*z**	*p*
Ethnicity	Asian	63	1.13	1.18	-1.87	.061
	non-Asian	226	1.10	2.06		
	Hispanic	146	0.88	1.76	-3.41	.001
	Non-Hispanic	143	1.34	2.02		
	White	70	1.30	1.82	-1.54	.123
	non-White	219	1.04	1.93		
Procedure	Laparoscopic	204	0.74	1.45	-5.90	< .001
	Open	90	1.90	2.46		
Diabetes mellitus	Yes	44	1.27	2.65	-0.11	.916
	No	250	1.06	1.73		
Hypertension	Yes	92	1.26	2.62	-0.27	.786
	No	202	1.02	1.45		

* standardized Mann-Whitney *U* test

The relationships between LOS and age, BMI and the ASA score were assessed using Spearman correlations. As shown in Table 10, there was a significant relationship between the ASA score and LOS (r_s = .16, p = .008).

Table 10. Correlations between LOS and three continuous extraneous variables by Spearman Correlations

	r_s	p	n
Age	0.11	.071	294
ASA	0.16	.008	294
BMI	-0.03	.584	290

Subset analyses were conducted to determine if the significant effect of the ERAS on LOS (Table 5) was impacted by any of the three significantly related extraneous variables. These analyses were performed in lieu of regression or analysis of covariance, due to the extreme skewness in the distribution of LOS. As shown in Table 10, the post-ERAS sample of Hispanics had shorter LOS than the pre-ERAS sample of Hispanics (z = -2.57, p = .010). However, the LOS for pre- and post-ERAS non-Hispanics were not significantly different. The post-ERAS sample of women who had laparoscopic procedures had shorter lengths of stay as compared to the sample of pre-ERAS women who had laparoscopic procedures (z = -3.11, p = .002). In contrast, the LOS for pre- and post-ERAS women who had open procedures were not significantly different. Finally, the LOS for post-ERAS women who received ASA scores of 1-2 and for those who received ASA scores of 3-4 were significantly shorter compared to the lengths of stay for pre-ERAs women within those two subsets (z = -2.51, p = .012 and z = -1.98, p = .048, respectively). These results indicate that the significant effect of the ERAS on LOS was impacted by Hispanic ethnicity and by the type of surgical procedure, but not by the ASA score. A review of the means in Table 11 indicates that there was a small reduction in LOS for the post-ERAS sample of non-Hispanic women, but the difference was not statistically significant. The

difference within procedure types was clearer, indicating that the ERAS intervention resulted in shorter LOS but only for women who had received laparoscopic procedures.

Table 11. Pre-post comparisons of LOS for subsets of cases by Mann-Whitney U test

	N	*Mean*	*SD*	*z**	*p*
Within Hispanic					
Pre-ERAS	56	1.00	1.45	-2.57	.010
Post-ERAS	90	0.80	1.93		
Within non-Hispanic					
Pre-ERAS	62	1.53	2.31	-1.71	.087
Post-ERAS	81	1.19	1.78		
Within Laparoscopic Procedures					
Pre-ERAS	82	0.96	1.92	-3.11	.002
Post-ERAS	122	0.59	1.00		
Within Open Procedures					
Pre-ERAS	39	1.87	1.88	-0.83	.409
Post-ERAS	51	1.92	2.85		
Within ASA 1-2					
Pre-ERAS	88	0.97	0.99	-2.51	.012
Post-ERAS	113	0.77	1.28		
within ASA 3-4					
Pre-ERAS	33	2.03	3.26	-1.98	.048
Post-ERAS	60	1.38	2.58		

* standardized Mann-Whitney *U* test

Discussion

ERAS pathways were first implemented in health institutions in the early 1990s (Kalogera, & Dowdy, 2016). The implementation of ERAS protocol has shown its positive effects on patient outcomes and clinical outcomes (Kalogera & Dowdy, 2016; Nygren et al., 2012; Relph et al., 2014; Groot et al., 2016; Bernard et al., 2020). The purpose of this quality improvement project was to examine the impact of the ERAS pathway on hospital LOS and 30-day readmissions among patients undergoing gynecology surgery. This study is one of the first to examine this. Based on the data, the ERAS pathway led to a decrease in the hospital LOS and no significant difference in the 30-day readmission rate, although there was a 50% decrease in procedure-related readmissions (two) after the implementation of ERAS pathways. No significant relationship was found in either the 30-day readmission rate or LOS amongst extraneous variables of age, ethnicity, BMI, ASA score, or procedure.

Hospital Length of Stay

Consistent with the findings of previous studies, Nygren et al. 2012, Relph et al., 2014, Groot et al., 2016, Bernard et al., 2020, ERAS pathways resulted in significant reductions in hospital LOS when implemented in this study. A protocol implementing ERAS was used to evaluate hospital LOS for 294 patients undergoing gynecology surgery at a county hospital in the Northern Bay Area region of California. While 121 patients received traditional surgical pathways, 173 patients received ERAS implemented pathways. Hospital LOS was defined as the length of time between hospital admission and hospital discharge. A patient's LOS in a hospital can be affected by a variety of factors. A patient's LOS in the hospital following gynecology surgery depends largely on postoperative nausea, vomiting, ileus, and pain (Groot et al., 2016; Bernard et al., 2020; Relph et al., 2014; Nygren et al., 2012). The median LOS for ERAS

patients was 5 days, while the median hospital LOS for patients receiving the traditional surgical pathway had a median hospital LOS of 6 days ($p < .001$). Women who had open procedures had a longer LOS and Hispanics had a shorter LOS.

Laparoscopic surgery offers the advantage of avoiding large open wounds or incisions, thereby decreasing pain and blood loss for patients. As compared to open surgery, laparoscopic surgery has a lower rate of postoperative complications (Agha, & Muir, 2003). In comparison to traditional conventional methods, patients in this study who underwent surgery using the ERAS pathway had a shorter hospital stay.

There are large disparities between races and ethnicities in health care. Given the well-known racial disparities in healthcare, the American Society of Anesthesiologists issued a 2021 statement recommending that anesthesiologists consider implementing the ERAS pathway, noting that implementation of enhanced recovery protocols has been shown to minimize variation in care and reduce disparities (Khusid et al., 2023). Through ERAS, previously disadvantaged surgical populations are able to achieve equitable outcomes in LOS and achieve a reduction of racial/ethnic disparities (Goss et al., 2018). As a result, ERAS appears to be of considerable value in achieving health equity. In comparison to traditional conventional methods, patients in this study who underwent surgery using the REAS pathway had a shorter hospital LOS.

Readmissions

Several studies have shown a reduction in hospital readmissions when complying with an ERAS protocol, including Mendivil et al. (2018), Majumder et al (2016), and Bisch et al. (2020). Readmission was defined as unplanned return admissions within 30 days of surgical discharge. In terms of 30-day readmission rates, there was no significant difference between the Pre-ERAS

and Post-ERAS groups ($p = 0.785$). The number of procedure-related readmissions (two) decreased by half after ERAS implementation, but the reduction was not sufficiently significant to produce a statistically significant change. Our findings are similar to those of Bernard et al. (2020), a retrospective analysis of consecutive gynecologic oncology patients concluded that there was no difference in readmission rates between pre-ERAS and post-ERAS pathways.

According to a study performed by Relph and colleagues (2014), patients receiving the ERAS pathway had significantly reduced hospital LOS, and both traditional pathway and enhanced recovery groups had similar readmission rates. A study by Ljungqvist et al. (2017) also showed that the ERAS protocol application led to fewer complications and shorter hospital LOS in postoperative surgical patients. Bernal and colleagues (2020) also evaluated the ERAS pathway's impact on a gynecologic oncology population undergoing laparotomy in a Canadian teaching hospital. Additionally, they observed a significant decrease in LOS and a non-significant increase in readmission rates. As a result of implementing the ERAS pathway, LOS was reduced without increasing readmissions.

Patients will be discharged earlier, and readmissions will be fewer, resulting in more room for surgery. As compliance with the ERAS pathway increases, LOS is reduced. To improve future outcomes, ERAS implementation and compliance rates should be improved. A monthly review of ERAS cases can help ERAS leaders manage and analyze the program, which can help guide education and improve perioperative care. Patient outcomes are further improved as hospital recovery times are shortened, complications are reduced, healthcare providers are educated, clinicians are held accountable, and clinician engagement is increased. The barriers to improving postoperative outcomes and access to health care should be recognized to improve compliance with the ERAS protocol. Our current healthcare system faces a dilemma that needs

to be addressed by the economic savings of the ERAS pathway. In order to improve patients' condition before surgery and make them better candidates for surgery, new practice strategies based on evidence-based practice are required (Montroni et al., 2018).

Limitations

According to research by the American Society of Colon and Rectal Surgeons (ASCR), the ERAS pathway improves postoperative outcomes, reduces complications, and increases patient satisfaction (American Society of Colon and Rectal Surgeons, 2016). Through ERAS, quality care can be improved by creating a culture of excellence based on the latest evidence-based practice. As a result of this program, clinicians will have more opportunities for leadership and collaboration between professionals. The ERAS pathway's ability to decrease hospital LOS allows more surgical procedures to be performed due to vacancies in hospitals.

While ERAS demonstrated benefits, it also has weaknesses, such as resistance to change from staff members, which results in noncompliance with pathway orders, and a shortage of qualified implementation staff. Although ERAS is effective, there may be times when individualized care is required for some patients to receive optimal care. To avoid errors and miscommunication, any modifications to the ERAS pathway should be communicated clearly. Nursing bodies of knowledge can be enhanced by modified ERAS pathways. For patients with similar characteristics and comorbidities, separate ERAS pathways can be developed for those who require modified ERAS pathways.

As this was an evaluation of retrospective charts, missing, inaccurate, and conflicting data affected its analysis. Costs associated with surgical complications should be examined in future analyses. Research should be implemented in the future to examine how information technology applications can facilitate and improve ERAS pathways for clinicians and patients

and to evaluate patients' compliance with recommendations. The results of this study are limited as a result of lack of compliance and inadequate documentation. The results could be distorted if incorrect information was entered into the electronic medical record. This study has demonstrated that the implementation of the ERAS pathway is feasible and can provide some benefits. However, it is critical to continue investing in staff and patient education to ensure sustainability. Documenting and reviewing each pathway portion will be easier when there is an ERAS-specific portion in the charting system.

The study sampled patients at different intervals of time. The pre-ERAS group was collected in 2020, and the post-ERAS group was collected from May 2021 to May 2022. Seasonal variance could have affected the results due to the difference in time intervals.

This ERAS pathway evaluation was limited by the size of the sample. More accurate results could be obtained if the sample size were larger. Sample sizes that are too small decrease statistical power, resulting in a potentially higher margin of error. Although the study's sample size was small, it demonstrated that women undergoing gynecology surgeries benefited from the ERAS pathway. To establish a better understanding of ERAS compliance, a larger sample size would be needed to obtain more accurate results.

Furthermore, the study did not examine ERAS across multiple disciplines. There can be different pathways for each type of procedure, and what works for one population might not work for another. It is possible for results from gynecological surgeries to differ from those of colorectal surgeries because all gynecological surgeries are performed on women.

Future Research

In the future, systemic audits should be carried out at regular intervals so that data collected through ERAS can be directly compared (Berry, 2014). The ERAS pathway continues

to evolve as surgical populations and procedures change. A number of elements of the pathways will have to be modified to make them more specific to each type of procedure. To ensure the most successful results for patients and healthcare enterprises, systemic auditing can address problems with application and adherence. Future studies are essential to show how the ERAS pathway impacts patient outcomes, clinical effectiveness, and healthcare costs. The extent to which specific nurse interventions can be studied, such as the documentation of mobility performed, proper documentation of diet initiation, and documentation of ERAS education, can demonstrate a higher degree of effectiveness for ERAS implementation. To gain a more in-depth understanding of the impact of implementing ERAS, it would be necessary to examine causes that affect LOS, such as hospital-acquired infections and patients' comorbidities. ERAS pathway implementation and maintenance should be assessed based on the patient's costs throughout the process from preoperative care to discharge.

Contributions to the Doctor of Nursing Practice Essentials

The American Association of Colleges of Nurses (AACN) developed the essentials for the DNP. To become a doctorate-prepared nurse, graduate students must fulfill eight DNP essentials (American Association of Colleges of Nursing, 2006). All of the DNP essentials were met in the development of this DNP project.

By examining and integrating nursing theory into the DNP project, Essential I: Scientific Underpinnings for Practice was met. The clinical benefits and impact of the ERAS protocol on surgical patients have been extensively researched. Thus, the student's knowledge and skills related to ERAS grew, resulting in a DNP proposal and then a practical project for nursing practice. To improve patient outcomes, this project utilized the ACE Star Model of Knowledge Transformation theory.

In order to investigate the ERAS protocol effectively and maintain the sustainability of the program, Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking was essential (American Association of Colleges of Nursing, 2006). As part of the ERAS protocol, there are several key components, such as avoiding prolonged fasting before surgery, using selective mechanical bowel preparation with oral antibiotics, sparing intraoperative opioids, giving patients goal-directed fluid therapy, allowing them to mobilize early, and allowing them to feed early at the same time, all requiring teamwork, standardization, and agreement between disciplines in the peri-operative setting (Gustafsson et al., 2018). Additionally, it requires continuous analysis of metrics as well as discussion of non-compliance situations (Ljungqvist et al., 2017). For the ERAS protocol to be successful and sustainable, an audit of compliance is essential (Gustafsson, 2018). The ERAS protocol influences LOS, which was reaffirmed in this study, although it could not be statistically assessed for every element.

To improve the care and outcomes of patients, evidence-based protocols were incorporated into Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice. The ERAS protocol for gynecology surgery patients was examined for improvement of patient outcomes, thus supporting essential III. This protocol will improve the patient's recovery after a gynecology surgery by changing the traditional protocol to one that relies on evidence (American Association of Colleges of Nursing, 2006). As a result of the ERAS protocol, standardized peri-operative care can be provided to surgical patients, integrating evidence-based practices while maintaining an interdisciplinary approach (Ljungqvist, 2014).

An important aspect of DNP Essential IV is to focus on the improvement and transformation of healthcare through information systems-technology and patient care technologies. A key objective for meeting this essential was to gain experience with information

and technology systems that could not only support the DNP project, but also collect and analyze postintervention data to determine whether interventions had been effective. The programs used included Microsoft Excel to collect data and generate charts, Microsoft Word to document the project, Microsoft PowerPoint to create an informational presentation, and IBM SPSS Statistics Version 26 to perform data analysis.

As a result of Essential V: Health Care Policy for Advocacy in Health Care (American Association of Colleges of Nursing, 2006), the ERAS protocol was developed. ERAS strives to improve patient experience, quality, and appropriate utilization of health care through a triple aim framework. To direct quality improvement efforts and measure outcomes, hospitals collect data and benchmark them against other hospitals (AACN, 2006). The collection and analysis of internal data is essential for determining outcomes and improving interventions. As a result of the ERAS protocol, a rapid surgical recovery was achieved without increasing complications, resulting in a shorter hospital stay. It is therefore likely that the ERAS protocol will improve patient care in other surgical specialties. The ERAS protocol was found to be cost effective and savings are evident even at the early implementation stages according to Roulin et al. (2013). As a result, LOS and complications were significantly reduced, which offset post-operative resource utilization (Melnyk et al., 2011).

Interprofessional collaboration is emphasized in DNP Essential VI to improve patient care and population health. As part of the DNP project, collaboration with all stakeholders was essential to meeting this essential. Surgical staff, department staff, and upper management continuously discussed current practice guidelines and standards of care within the healthcare setting. Among the methods used to accomplish this was effectively employing the leadership skills associated with creating and leading interprofessional teams, meeting with key

stakeholders, and organizing an effective implementation plan that resulted in improved healthcare provider collaboration.

Clinical prevention, population health, and clinical practice are evaluated in DNP Essential VII to improve the health of the nation. To accomplish this essential goal, ERAS protocols for gynecology surgeries were evaluated for implementation to improve patient outcomes. In addition, statistics from national and institutional sources indicate that gynecology surgeries are increasing every year. In order to improve the health status and outcomes of patients within this population, the project synthesizes concepts and evaluates the best strategies to improve the operative care pathway that promotes optimal surgical recovery.

The requirement for Essential VIII: Advanced Nursing Practice was met by collaborating with a range of healthcare disciplines to improve patient outcomes. Multiple disciplines were involved in this project: the anesthesia department, perioperative nurses, and floor nurses. Additionally, the hospital administration, anesthesia department and nursing staff were presented with the development of an ERAS pathway, fulfilling essential VIII.

Conclusion

This study examined the impact of the ERAS pathway on LOS and 30-day readmission rates. A reduction in LOS was observed in the gynecology population during the period reviewed. Extraneous variables such as age, ethnicity, BMI, ASA score, and procedure had no significant impact on either 30-day readmission rate or LOS. A shorter LOS was noted for Hispanics and a longer LOS was noted for women who underwent open surgery. As a result of the evaluation of this pathway, modifications may be made to the implementation of ERAS to ensure the high level of success of the program and enhance its expansion to other surgical specialties.

As healthcare continues to advance, nursing leaders must implement evidence-based practice in clinical settings to improve care delivery. The ERAS pathway was evaluated for its effect on patient outcomes and effectiveness in this study. Patients undergoing gynecology surgery could benefit significantly from this project. The process of implementing an ERAS pathway is tedious, and collaborative, but it produces significant benefits for patients.

Evaluation of quality improvement measures is an imperative part of any quality improvement project. To determine if the quality improvement change is beneficial for patients as well as the hospital, follow-up is necessary. For ERAS pathway adherence to be successful, proper documentation is necessary. To facilitate easier documentation and review of the pathway, an ERAS-specific portion should be added to the charting system to improve compliance.

According to our findings, high compliance with the ERAS pathway for gynecology surgery reduces LOS. A fundamental principle of nursing practice is to maintain the highest standard of care for patients. Integrating evidence from the literature into practice and integrating

new knowledge into practice is essential to implementing ERAS (AACN, 2006). Through the use of information systems, an ERAS pathway was integrated into the project to improve patient care and support patient support.

Compliance with multiple ERAS components constitutes a significant challenge. Re-education, auditing, and reinforcement are necessary to ensure compliance. Postoperative complications and hospital LOS were associated with compliance with the ERAS protocol (Gustafsson, 2018).

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Appendices

Appendix A: Summary of ERAS Guidelines Recommendations

Guideline	Recommendation
Preoperative	Preoperative counseling
	Reduced fasting duration
	Carbohydrate drinks
	No mechanical bowel preparation
Intraoperative	NSAIDs (non-steroidal anti-inflammatory drugs)
	± TEA (thoracic epidural analgesia)
	No abdominal drains
	No nasogastric tubes
	No abdominal tubes
	Multimodal pain management
	Thromboprophylaxis
	Surgical site infection (SSI) prophylaxis
	Goal-directed fluid management
	Normothermia
	TEA or intravenous (IV) lidocaine
Postoperative	Fluid restriction
	Early removal of urinary catheters
	Gum chewing
	Early ambulation
	Early feeding
	Multimodal pain management

Appendix B: Timeline

Research activity	Mar 2022	Apr 2022	May 2022	Jun 2022	July 2022	Aug 2022	Sept 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023
County council approval	X	X	X	X	X	X									
IRB approval							X								
Data cleaning and analysis					X	X	X	X	X	X					
Literature review	X	X	X	X	X										
Writing	X	X	X	X	X	X	X	X	X	X	X	X			
Dissertation chapter complete													X	X	
Submit to committee for review														X	
Exit interview															X

Appendix C: Inclusion Criteria List of Gynecology Surgery ICD-10 Codes

ICD-10 Codes	Diagnosis Definition
57260	Combined anteroposterior colporrhaphy, including cystourethroscopy, when performed;
57265	Combined anteroposterior colporrhaphy, including cystourethroscopy, when performed; with enterocele repair
57268	Repair of enterocele, vaginal approach (separate procedure)
57282	Colpopexy, vaginal; extra-peritoneal approach (sacrospinous, iliococcygeus)
58140	Myomectomy, excision of fibroid tumor(s) of uterus, 1 to 4 intramural myoma(s) with total weight of 250 g or less and/or removal of surface myomas; abdominal approach
58145	Myomectomy, excision of fibroid tumor(s) of uterus, 1 to 4 intramural myoma(s) with total weight of 250 g or less and/or removal of surface myomas; vaginal approach
58146	Myomectomy, excision of fibroid tumor(s) of uterus, 5 or more intramural myomas and/or intramural myomas with total weight greater than 250 g, abdominal approach
58150	Total abdominal hysterectomy (corpus and cervix), with or without removal of tube(s), with or without removal of ovary(s);
58200	Total abdominal hysterectomy, including partial vaginectomy, with para-aortic and pelvic lymph node sampling, with or without removal of tube(s), with or without removal of ovary(s)
58210	Radical abdominal hysterectomy, with bilateral total pelvic lymphadenectomy and para-aortic lymph node sampling (biopsy), with or without removal of tube(s), with or without removal of ovary(s)
58240	Pelvic exenteration for gynecologic malignancy, with total abdominal hysterectomy or cervicectomy, with or without removal of tube(s), with or without removal of ovary(s), with removal of bladder and ureteral transplantations, and/or abdominoperineal resection of rectum and colon and colostomy, or any combination thereof
58260	Vaginal hysterectomy, for uterus 250 g or less;
58262	Vaginal hysterectomy, for uterus 250 g or less; with removal of tube(s), and/or ovary(s)
58542	Laparoscopy, surgical, supracervical hysterectomy, for uterus 250 g or less; with removal of tube(s) and/or ovary(s)
58545	Laparoscopy, surgical, myomectomy, excision; 1 to 4 intramural myomas with total weight of 250 g or less and/or removal of surface myomas
58546	Laparoscopy, surgical, myomectomy, excision; 5 or more intramural myomas and/or intramural myomas with total weight greater than 250 g
58548	Laparoscopy, surgical, with radical hysterectomy, with bilateral total pelvic lymphadenectomy and para-aortic lymph node sampling (biopsy), with removal of tube(s) and ovary(s), if performed
58550	Laparoscopy, surgical, with vaginal hysterectomy, for uterus 250 g or less;

58552	Laparoscopy, surgical, with vaginal hysterectomy, for uterus 250 g or less; with removal of tube(s) and/or ovary(s)
58553	Laparoscopy, surgical, with vaginal hysterectomy, for uterus greater than 250 g;
58554	Laparoscopy, surgical, with vaginal hysterectomy, for uterus greater than 250 g; with removal of tube(s) and/or ovary(s)
58570	Laparoscopy, surgical, with total hysterectomy, for uterus 250 g or less;
58571	Laparoscopy, surgical, with total hysterectomy, for uterus 250 g or less; with removal of tube(s) and/or ovary(s)
58572	Laparoscopy, surgical, with total hysterectomy, for uterus greater than 250 g;
58573	Laparoscopy, surgical, with total hysterectomy, for uterus greater than 250 g; with removal of tube(s) and/or ovary(s)
58940	Oophorectomy, partial or total, unilateral or bilateral;
58950	Resection (initial) of ovarian, tubal or primary peritoneal malignancy with bilateral salpingo-oophorectomy and omentectomy;
58951	Resection (initial) of ovarian, tubal or primary peritoneal malignancy with bilateral salpingo-oophorectomy and omentectomy; with total abdominal hysterectomy, pelvic and limited para-aortic lymphadenectomy
58952	Resection (initial) of ovarian, tubal or primary peritoneal malignancy with bilateral salpingo-oophorectomy and omentectomy; with radical dissection for debulking (ie, radical excision or destruction, intra-abdominal or retroperitoneal tumors)
58953	Bilateral salpingo-oophorectomy with omentectomy, total abdominal hysterectomy and radical dissection for debulking;
58954	Bilateral salpingo-oophorectomy with omentectomy, total abdominal hysterectomy and radical dissection for debulking; with pelvic lymphadenectomy and limited para-aortic lymphadenectomy
58956	Bilateral salpingo-oophorectomy with total omentectomy, total abdominal hysterectomy for malignancy

Appendix D: Collaborative Institutional Training Initiative (CITI)

Good Clinical Practice Certificate

CITI PROGRAM

Completion Date 31-Jan-2022
Expiration Date N/A
Record ID 47105080

This is to certify that:

Trinh Nguyen

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

CITI Good Clinical Practice
(Curriculum Group)
CITI Good Clinical Practice Course
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

San Jose State University

CITI
Collaborative Institutional Training Initiative

This GCP training contains all of the attested CITI Program modules from the **GCP for Clinical Trials with Investigational Drugs and Medical Devices (U.S. FDA Focus) Version 2**. This ICH E6 GCP Investigator Site Training meets the Minimum Criteria for ICH GCP Investigator Site Personnel Training identified by TransCelerate BioPharma as necessary to enable mutual recognition of GCP training among trial sponsors.

Verify at www.citiprogram.org/verify/?w4eb969cb-f1eb-45f0-9226-d635a29dc997-47105080