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An Evaluation of Utilization of Enhanced Recovery After Surgery Protocols
at Travis Air Force Base

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EVALUATION OF ERAS PROTOCOLS	3
Title Page.....	1
Copyright Acknowledgement Statement.....	2
Table of Contents.....	3
Abstract.....	4
Introduction.....	5
Significance of the Problem.....	6
Clinical Question.....	8
Focus Areas.....	8
Project Short and Long Term Goals.....	8
Global Impact.....	9
Organizing Framework.....	9
Project Design.....	10
General Approach.....	10
Setting.....	10
Procedural Steps.....	11
HIPAA Concerns.....	12
Literature	
Synthesis.....	13
Analysis	of
Results.....	15
Organizational Impact/ Implications to Practice and Policy.....	16
Future Directions for Research and	
Practice.....	20

Conclusion.....	21
References.....	22
Appendices.....	27

Abstract

Phase II Site: Travis Air Force Base

DNP Project Title: An Evaluation of Utilization of Enhanced Recovery After Surgery Protocols at Travis AFB

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Background or Problem/Issue: Postoperative complications (POCs) following total hip arthroplasty (THA) and total knee arthroplasty (TKA) lead to prolonged recovery time, increased length of stay (LOS), higher healthcare costs, and provide a negative surgical experience for the patient. Postoperative complications can include surgical site infections, blood loss more significant than expected; unplanned returns to the operating room, and pulmonary complications. Evidenced based enhanced recovery after surgery (ERAS) protocols are multi-modal, perioperative care pathways that have been shown to decrease hospital length of stay and decrease post-operative complications.

Clinical Question or Purpose: In patients receiving total hip arthroplasties and total knee arthroplasties at David Grant Medical Center (DGMCC), how do the current protocol practices compare to ERAS protocols recommended by the literature?

Project Design: Our project design is a comparative, correlational project to evaluate current practices at Travis Air Force Base and determine if there are gaps present between the literature and clinical practice. After determining if any differences exist in current practice and recommended ERAS protocols, we will convene with a multidisciplinary board to determine feasibility of ERAS implementation in the orthopedic surgical service.

Analysis of Results: There is currently no formal ERAS protocol utilized at DGMCC for THAs and TKAs. There is sufficient infrastructure in place to support a program, but implementation would

require multidisciplinary support from the departments germane to the perioperative environment. Furthermore, an ERAS champion from each discipline involved would be required to monitor and facilitate implementation and adherence to ERAS protocols to ensure program success and sustainability.

Organizational Impact/Implications for Practice: Injured military members treated in military medical treatment facilities are predisposed to the same POCs that have been displayed in civilian institutions. The surgical operations squadron at Travis Air Force base cares for 3300 surgical patients annually. ERAS protocol adherence leads to improved patient outcomes including decreased length of stay, POCs, readmissions, and costs; thus, returning the military member to service sooner and decreasing cost to the military health service.

Introduction

Postoperative complications following total hip arthroplasty (THA) and total knee arthroplasty (TKA) are associated with prolonged recovery time, increased length of stay (LOS) higher healthcare costs, and a negative experience for the patient (Kehlet, 1997; Maempel, Clement, Ballantyne, & Dunstan, 2016). Postoperative complications (POCs) can include surgical site infections, blood loss, unplanned returns to the operating room, and pulmonary complications (Bergs et al., 2014). Enhanced Recovery After Surgery (ERAS) protocols have been integrated into practice in general surgery across the world to standardize care and counter these complications; improving patient safety and decreasing healthcare costs (Dhruva Rao & Haray, 2014). The focus of ERAS is to implement interdisciplinary interventions aimed at improving patient care and surgical outcomes in the perioperative period. The main components of ERAS protocols focus on preoperative patient education, nutritional optimization, postoperative pain management, uniform anesthesia management, and early mobilization

(Recovery, 2016). ERAS protocol adherence leads to improved patient outcomes including decreased LOS, POCs, readmissions, and costs (Recovery, 2016).

The introduction of ERAS protocols has shown as much as a \$2500/case decrease in cost for THAs and \$240/case for TKAs (Zhu, Qian, Jiang, Ye, & Chen, 2017). Recent studies have indicated, with the implementation of ERAS protocols, patients report lower pain scores and improved quality of life (Recovery, 2016).

Significance of the Problem

The need for total hip and knee arthroplasties is a growing trend in the American population with osteoarthritis accounting for over 26 million Americans (Galbraith, McGloughlin, & Cashman, 2017). Added to this patient population is the increasing age to which Americans are living and the growing number of obese adults that will require total joint replacements (Galbraith et al., 2017). The growing surgical population that these statistics supports increases the risk of post-operative complications and the need for more American hospital bed space. ERAS protocols have shown to decrease LOS stay by as much as 42%, helping to alleviate the problem of limited bed availability (Galbraith, Fenelon, Gibbons, Kelly, & Bennett, 2017).

The adoption of ERAS protocols by the Military Health System has tremendous potential to benefit military members. Ongoing conflicts in the Middle East, and the continued use of improvised explosive devices, cause a significant number of injuries to United States military members (Jansen et al., 2012). While it is not possible to apply all parts of the ERAS protocols to the initial salvage surgeries, these trauma victims can benefit from ERAS on subsequent operations. Recovery from damage control surgery, as well as the need for any follow-up surgeries, predisposes injured military members treated in military medical treatment facilities to

the same POCs displayed in civilian institutions (Sambasivan et al., 2010). These complications increase healthcare costs and delay healing, thus postponing the return of the military member to service and increasing cost to the military health service.

Nurses play a vital role in ERAS pathways throughout the perioperative period and surgical process. Nurses are essential for the planning, implementation, and success of ERAS protocols because they are present in the clinic, the operating room, the post-anesthesia care unit (PACU), and the ward, (Recovery, 2016). Anesthesia providers, such as nurse anesthetists, are ideally positioned to implement ERAS protocols, like goal-directed fluid administration, as they follow the patient through the entire perioperative period. The anesthesia provider is responsible for selecting and delivering the anesthesia technique chosen during the case, directly influencing post-operative recovery time (Kahokehr, Sammour, Zargar-Shoshtari, Thompson, & Hill, 2009). Following discharge from the operating room, the PACU nurse is responsible for maintaining patient comfort through the administration of intravenous and oral analgesics and can directly influence the reduction of infection and post-operative ileus through the discontinuation of Foley catheters and advancement of patient diet (Brady, Keller, & Delaney, 2015). The role of the bedside nurse is crucial to the successful recovery of the patient by implementing early ambulatory and pulmonary mobilization techniques (Recovery, 2016). Preoperative education on surgical expectations and pain management, beginning with the patient's initial interview and assessment by the surgeon's nurse, can reduce the bedside nurses' workload by decreasing the analgesic medication requirement of each patient during initial surgical recovery (Recovery, 2016).

Clinical Question

In patients receiving total hip arthroplasties and total knee arthroplasties at David Grant Medical Center, how do the current protocol practices compare to ERAS protocols recommended by the literature?

Focus Areas

This project was comprised of three focus areas. The first focus area was assessing and documenting the current state of ERAS implementation for total hip and total knee arthroplasties at DGMC, including barriers to and facilitators of ERAS protocol adoption and adherence. This step included determining what parts of ERAS are currently working, what problems they are currently facing and need to overcome, and what additional pathways are possible at this facility. The second focus area compared that current state to the evidence-based recommendations of the ERAS society to identify opportunities for improvement. Thirdly, after identified discrepancies, we shared these findings with a multidisciplinary group of stakeholders including leadership, surgeons, anesthesiologists, nurses, and all other ancillary services as applicable, in an effort to determine priorities, develop a plan to improve adherence to current ERAS protocols, and facilitate adoption of new ERAS protocols as appropriate for the priorities, needs, and capabilities of DGMC.

Project Short and Long-Term Goals

The short-term goal of the project was to ascertain what ERAS protocols are being utilized at DGMC and how they align with the current literature. The long-term goals of the project had much broader implications. Ideally, ERAS policy and protocols would be implemented for all surgeries across all surgical disciplines at DGMC. Eventually, all surgical practices would mirror the recommended protocols when appropriate, thus providing surgical

patients with the benefits of evidence-based care. The final goal would be the application of ERAS protocols to all hospitals DoD wide.

Global Impact/Relevance to Military Nursing

Implementing the ERAS protocols can optimize post-operative cardiopulmonary and muscle function earlier than following conventional surgical programs (Kahokehr et al., 2009). The quick return of function will improve patient satisfaction, result in fewer continuing complications, and reduce the financial burden on the Tricare Health System (Pędziwiatr, 2015). Additionally, the military member will return to duty sooner, preserving mission readiness and maintaining quality of life for all soldiers, sailors, and airmen.

Organizational Framework

We utilized the AGREE 2 model for this project. This model is a 23-item tool with six quality domains (Introduction, 2017). These domains include scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. Each of the 23 items has detailed instructions on how to rate it using a seven-point scale. The sum of the questions in each domain is then determined and divided by the total possible points. This percentage obtained is the final score for that specific quality domain. This tool is well cited in over 100 publications. It allows for a thorough evaluation of current and future protocols and order sets. The purpose of the AGREE 2 tool is to assess the quality of guidelines, provide a methodological strategy for the development of guideline, and inform what information and how information ought to be reported in guidelines. This tool can be used to target any step of the health care continuum, to include treatments and interventions. For this DNP project, we used this tool to evaluate the current perioperative protocols in place for total hip and total knee arthroplasty surgery.

Project Design

General Approach

PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL) were searched for articles on the implementation of ERAS protocols for major abdominal surgery and total hip arthroplasty on 24 January 2017. We refocused our search on December 9, 2017, and searched for ERAS protocol literature on TKAs and THAs. We identified 94 articles using the primary search terms ERAS, total hip arthroplasty, total knee arthroplasty, LOS, recovery, outcome, implement, and barriers. Forty-five duplicates were removed. The level of evidence of the articles was limited to Meta-Analyses, Systematic Reviews, Randomized Controlled-Trials, and Observational Studies (PubMed). Titles and abstracts of the 49 articles were screened for the inclusion criteria of articles that addressed the implementation of ERAS protocols in TKAs or THAs, or that documented the effectiveness of the ERAS protocols on reducing POCs, LOS, or cost of healthcare following TKAs or THAs. Fifteen full-text articles were further evaluated.

Setting

The setting for our project design took place at David Grant Medical Center located at Travis AFB, CA. The facility is responsible for the care more than 500,000 DoD and Department of Veterans Affairs eligible beneficiaries in the immediate San Francisco-Sacramento vicinity. The 60th Medical Group annually supports more than 1.7 million patient encounters including more than 466,000 outpatient visits, 5,600 admissions, with more than 2,400 staff and a total annual expense of more than \$310.5 million (60th Medical Group Organizations, 2014, July 10). The project focused on TKA and THA surgery protocols and order sets. The information acquired to determine the current implementation of ERAS protocols came from the orthopedic department. There is an average of five total hip arthroplasty and total knee

arthroplasty surgical cases at DGMC each week (Surgical Scheduling System Reports, 2017, Dec 9).

Procedural Steps

The first step was to identify the current ERAS protocols used in THA and TKA surgeries. Our group evaluated orthopedic order sets currently in place and performed an interview with the orthopedic surgery department head. We spoke with Dr. George, the ERAS champion and the head of the orthopedic department, to determine the use of ERAS protocols. We also questioned if the department used any standardized protocol order sets. It was concluded that they do not currently use a specific ERAS protocol for the perioperative experience. We also examined order sets to determine if parts of ERAS pathways were being used but not referenced as “ERAS protocols”. During the interview with Dr. George, barriers to implementation and methods to overcome these barriers were discussed.

For the next step, we used our literature review and synthesis to compare the current practices with ERAS protocols that are recommended and determined the gaps between clinical practice and evidenced-based practice. Several studies show ERAS protocols effectively used to decrease LOS and POCs following THA and TKA (Zhu et al., 2017). We determined specific ERAS pathways that have been implemented and examined how standard practices at DGMC compare as well as discover which parts of the protocols may be in place currently.

After comparing current practices to the literature, we convened with a multidisciplinary group to determine the feasibility of implementing ERAS protocols from the literature. Some parts of the ERAS protocol proved to not be feasible due to: limited resources, provider preferences, and impact on mission readiness. The future plan is to implement ERAS protocols in THA and TKA surgeries at DGMC. Buy in from key stakeholders, such as hospital and

department leadership, surgeons, physical therapist, nurses, pharmacists, anesthesia providers, dietary, financial providers, and patients will be crucial. The department may utilize implementation plans that have been used at other successful facilities. Educating all parts of the perioperative team, as well as all ancillary services involved, will be critical to effective implementation.

HIPAA Concerns

Our group compared the evidenced based protocols from our literature search to current practice at Travis Air Force Base. We analyzed the barriers to implementing ERAS protocols in order to make recommendations for future practice. Our review of the literature indicates ERAS protocols meet current standard of care practices. The data collection methods consisted of review of generic orthopedic order sets and standardized questioning of providers to ascertain current ERAS utilization. The project was submitted to the Evidenced-Based Practice Review Panel, at Davis Grant Medical Center, for human subjects determination. However, following the guidance of the Health and Human Services (HHS) Office for Human Research Protections (Office for human research protections, 2009), it was determined that our evidenced based project was non-research or exempt from Institutional Review Board and only needed approval from the EBP panel.

Our evidenced based project did not generate any new knowledge. According to the Health Insurance Portability and Accountability Act, certain “identifiers” can be used to identify individuals (Health Information Privacy, 2017). In compliance with the HIPAA privacy rule, no patient identifiers were collected, and all computers used for data collection and analysis are maintained behind a locked door, on a secured system at David Grant Medical Center, Travis

AFB, CA. Only HIPAA certified personnel were involved the data collection process. We did not track individual patient data or provider compliance.

Project Results

Literature Synthesis

Each author assessed fifteen full-text articles. Two people evaluated the quality of the articles for methodology, threats to validity, and comprehensiveness using the Equator Network standardized checklists. The ERAS evaluation table details the findings of the articles reviewed (see Appendix B). Articles that met at least 90 percent of the chosen checklist's criteria were considered high quality, articles that met 75 percent of the criteria were deemed moderate quality, and anything less than 75 percent was considered low quality. The authors assessed the level of evidence for each article using a seven-level pyramid (LoBiondo-Wood, 2014). We determined the meta-analysis to be high quality, level I article using the PRISMA checklist.

The final fourteen articles were evidence levels III, IV, V, VI, and VII. The two level III articles were of moderate quality. Both were quasi-experimental cohort studies evaluated with the STROBE checklist. Four articles were determined to be level IV evidence, as they were non-experimental, cohort studies with no control group. Three of these articles were determined to be high quality and in line with the project as they focused on ERAS implementation for total knee and hip arthroplasty and gathered data regarding the length of stay and post-op complications.

We assessed two level V evidence articles; both were retrospective literature reviews that focused on total joint arthroplasties and how ERAS reduces length of stay and post-op complications. Both articles contained encouraging statistics with regard to ERAS efficacy. Three articles were level VI evidence. One was a survey-based, qualitative study evaluated with

the SRQR checklist to be of moderate quality. One article was poor evidence as it contained a very small sample size. The last article was a simple literature review without explicit inclusion or exclusion criteria. The final two articles included in our synthesis were level VII evidence. Both articles seemed to have a good grasp on the current literature but were poorly cited and written more like informative journal articles. One article is mostly an anecdotal personal observation of many of the pathways within ERAS.

After careful evaluation of all the articles, the authors chose to exclude three of the assessed articles. A level VII evidence article only discussed oral multimodal analgesia and did not add value to our synthesis. A level VI qualitative study on return to work after hip surgery did not include ERAS components. The final article the authors excluded is a level V evidence review article that summarizes some components of ERAS but focuses on future challenges with fast track surgery that are not currently studied in the literature.

The remaining twelve articles included in our final synthesis had a wide range of purposes, but rigorous review illuminated a few central themes. The most prominent theme identified suggests that ERAS compliance and adherence are not only critical factors for the successful implementation of the pathways but also potential markers for diminishing effectiveness in the succeeding months. Many of these articles also suggested that compliance with ERAS diminishes over time. Additionally, a few of the articles briefly identified barriers to implementation. Barriers identified included resistance to change, lack of designated personnel, limited hospital resources, lack of coordination between the various medical disciplines, lack of human resources, and poor adherence to implemented protocols. Some of the studies also eluded to patients' attitudes, understanding of ERAS pathways, social support, and individual staff preferences as ERAS barriers. The literature indicates that further studies could help determine

ways to manage the barriers to implementation and improve methods to increase compliance and adherence to the ERAS programs.

Overall, the quality of evidence in our synthesis was moderate. The heterogeneity of the literature highlights many components of implementing and adhering to the ERAS pathways. Though the articles included had a wide variety of purposes, the consensus is that ERAS reduces LOS, improves patient satisfaction, and is cost-effective. Many barriers to the success and longevity of ERAS have been identified and need to be considered before implementation begins; however, the evidence reviewed suggests that implementation of ERAS is beneficial for the patients, providers, and the facility as a whole. By using insight gained from this synthesis and our review of the background literature, it is our recommendation for practice, that an ERAS pathway protocol be developed and implemented at Travis Air Force Base.

Analysis of the Results

The Uniformed Services University of the Health Sciences Class of 2019 student registered nurse anesthetists at David Grant Medical Center (DGMC), Travis Air Force, California, Doctor of Nursing Practice project was three-fold. Our goals were to: determine the current utilization of Enhanced Recovery After Surgery (ERAS) protocols in Total Knee Arthroplasties (TKA) and Total Hip Arthroplasties (THA), identify any barriers that are hindering ERAS protocol implementation, and identify from the literature what other facilities have done to overcome these barriers and lead to a successful implementation. The ERAS protocols are designed to decrease length of stay for the patient, improve patient outcomes, and reduce the cost of care. The population for this project will be those admitted to DGMC for TKA and THA. There will be no discovery for other surgical procedures in this project.

The stakeholders for this project will consist of the: orthopedic surgeons, anesthesia staff, operating room nursing, medical/surgical technicians, Post Anesthesia Care Unit (PACU) staff, physical therapists, pharmacy staff and the leadership from each of these departments. There was no planned implementation in this project, and such, no specific individual patients for implementation, patient preferences were not evaluated or sought. If implemented by future providers, the previously mentioned stakeholders would be the target users for the ERAS protocols.

We determined there are no standard ERAS protocols in THA and TKAs at David Grant Medical Center. Components of the protocols are occasionally implemented depending on the surgeon and patient preferences. Preoperative nurses call patients to address health questionnaires, but usually only a couple of days prior to the scheduled surgery. Early identification and treatment of anemia is done on a case by case basis by each surgeon. Many total hip arthroplasties are done under regional anesthesia, and nerve blocks are performed for total knee arthroplasties when not contraindicated. Appropriate prophylactic antibiotics are ordered and tranexamic acid is frequently administered. Day of surgery mobilization is attempted when the patient is appropriate and physical therapy is available. However, no standardized order set exists, and David Grant Medical Center lacks ERAS champions in each department to ensure adherence to such guidelines.

Organizational Impact/ Implications to Practice and Policy

The recommendations laid forth by this evidence-based-practice project are specific, unambiguous, and easily identifiable. As we are not recommending specific interventions of an ERAS guideline, we will not discuss the different interventions available. Our only

recommendation is the use of an ERAS protocol on all total-joint patients at David Grant Medical Center.

Discussions with representatives from key departments have been performed revealing a general interest in adopting a standardized ERAS protocol. An interview with the head of Orthopedic Surgery at Travis Air Force Base, along with a baseline appreciation of various departmental capabilities has been performed to assess potential barriers for implementation. Predicting all barriers to implementation before initiating a preliminary protocol with execution is unlikely, but immediately foreseeable difficulties can be illuminated.

The most obvious and universal barrier is lack of knowledge about ERAS protocols within all affiliated departments. A broad, comprehensive education tool outlining critical aspects of ERAS and validating its importance would help to overcome some of this. Additionally, a tailored training program for each department will have to be developed. This training tool must be sustainable and easily repeatable. Other universal barriers that can be expected are patient apprehension, patient noncompliance, staff resistance to change, and staff noncompliance. To help overcome and assess the barriers as they arise, it is recommended that an ERAS champion is appointed to each relevant department. This title would act as a liaison, identifying barriers as they arise, educating staff and patients, and recommending department specific alterations.

ERAS begins in the patient's pre-operative appointment, and so do the barriers. Creation of an educational DGMC-specific brochure will require buy-in and input from the preoperative clinic staff. Following preoperative fasting guidelines and carbohydrate loading will require buy-in and compliance from patients. Occasional noncompliance to current fasting guidelines has been witnessed, therefore, adding complexity to these recommendations may make

adherence more difficult for patients. Additionally, buy-in and adherence from each of the orthopedic surgeons is a necessity. At this point, all parties have expressed interest in adopting the ERAS protocol, but, currently, each physician endorses a unique set of perioperative processes.

ERAS protocol greatly depends on pharmacy support. ERAS requires thrombolytics, prophylactic antibiotics, anti-emetics, local anesthetics, and multi-modal analgesics. Preliminary reports from DGMc anesthesia and surgery staff posit difficulties acquiring medications from pharmacy already. Lack of access to desired medications has stemmed from multiple roots: hospital shortage, national shortage, slow delivery from main pharmacy, pneumatic tube breakdown, and dosage discrepancies to name a few. Designing a protocol, that must be strictly adhered to in order to assess outcomes, relies on uniformity and must overcome these potential barriers to be successful. Developing a pharmacy department ERAS champion would go a long way to assisting with this, but additionally key players will have to be on board. Orders for shipments of medications will have to anticipate surgical need, deficiencies in supply would have to be communicated, and potential resolutions will have to be created on a case-by-case basis.

Anesthesia plays a significant role in the execution of ERAS protocols. Developing a champion in the anesthesia department is paramount. The administration of perioperative medications, performance of regional anesthetic techniques, and adherence to fluid plans all rely on educated, competent, and motivated providers. Buy-in from the anesthesia department must be universal. Communication between anesthesia and the other participating departments will be critical to overcome any barriers and develop solutions. Adherence to the protocols may be assisted with the development of ERAS-specific pyxis profiles, regional anesthesia carts, and a checklist for documentation and reminders. Anesthesia providers should be qualitatively

interviewed at intervals after implementation to acquire departmental feedback. Depending on staffing allowances, it may be prudent to develop an ERAS specific team to provide all, or the majority of, anesthesia for patients participating in the protocol to promote adherence. At DGMC, the anesthesia provider in the orthopedics room is also responsible for any regional anesthesia techniques required. An ERAS-specific team would be beneficial to assist with regional anesthesia and promote protocol adherence. Lastly, an evidence-based ERAS order set needs to be created and implemented to replace the current order set.

Nursing personnel is the backbone of many ERAS protocols. At DGMC, preoperative nurses and PACU nurses are staffed from the same pool of resources. This can be beneficial because education is more accessible, and continuance of care is feasible. Similar to the anesthesia recommendations, an ERAS specific team of nurses could be developed for the in-processing and recovery of all ERAS protocol patients to promote adherence. Additionally, an ERAS specific checklist that could be passed on and continued by anesthesia may be beneficial. Timely acquisition of all ERAS related materials, like medications, is reliant on these nurses. In the past, staffing demands have not aligned with the number of personnel available and have led to delays in the initiation of pre-operative orders. Delays in the pre-operative area have a cascade effect on the rest of the ERAS protocol, like delaying regional anesthesia times. Overcoming these staffing inadequacies may be a potential barrier requiring coordination between the orthopedics department, patient scheduling, and nursing staffing to accommodate needs.

The final components of ERAS protocol rely on participation from physical therapy, nutritional medicine, and general inpatient nurses. No readily identifiable barrier, outside of staffing availability and specific, timely, accurate order sets from admitting physicians, have

been identified pertaining to these parties. If any resistance or barriers are identified during the implementation process, an additional champion for these areas should be considered.

The final category of foreseeable barriers stems from the unique, military aspect of DGMC. The medical staff, support personnel, and patients at DGMC are often transient secondary to the inherent mechanizations of a military lifestyle. Staffing is in a constant state of flux. Orthopedic surgeons, anesthesia personnel, and nurses are frequently deployed for periods in excess of three months. Frequent retirements, permanent changes of station, and temporary duties all add insult to any semblance of normativity or continuity and will be a continual concern for protocol adherence. With the abnormally high rate of turnover, repeat education sessions and ongoing assessments for barriers or shortcomings will be a vital determinant of ERAS protocol success and longevity. To assist with this, multiple forms of safeguards may be considered: interval assessments by each champion assessing both promoters and detractors of adherence, an accessible form of feedback for all participants in the protocol to voice considerations, and periodic re-education by each department are a few recommendations. Additionally, the use of a checklist denoting completion of each step in the protocol throughout the perioperative process would assist with monitoring or auditing the adherence of all implemented portions of the ERAS protocol. Further adherence may be appreciated through chart audits and interviews with participants.

Future Directions for Research and Practice

The future course for ERAS based utilization at DGMC would include implementation of the aforementioned protocols and procedures. Selection of an ERAS pathway for THA and TKA should be chosen based on the current literature and the resources available. DGMC should implement careful monitoring of the ERAS program to provide an accurate data collection of the

end results so that outcomes may be quantified. ERAS champions should convene monthly to continually identify barriers and ensure swift intervention in overcoming the barriers to prevent program hinderance. The champions and leaders in the ERAS initiative should apply set time points for project evaluation in order to ensure goals are being met.

The implementation team should publish the results, and stakeholders notified of implementation results, once program success has been gauged within the established time frame. Program sustainability should always be at the forefront of team focus and based on currently available literature. If outcomes and sustainability are favorable, as they have been in other facilities that have implemented similar protocols, then ERAS pathways should be employed into other surgical genres, and utilization expanded to other military treatment facilities.

Conclusion

The authors determined that DGMC is not currently utilizing ERAS protocols in THAs and TKAs. ERAS protocol utilization is well documented in the literature and is currently being successfully employed at other facilities. The barriers identified at DGMC are not unique to the facility and have been overcome by other organizations. By following the recommendations set forth in this project, successful implementation of ERAS protocols is achievable, and we have laid the ground work for future implementation.

The views expressed belong solely to those included in this evidence-based practice project and in no way represent the views of the Uniformed Services University or the United States Government. None of the individuals involved with the project have any financial interests within the project. There were no competing interests with guideline creation as this evidence-based practice project did not include specific guidelines.

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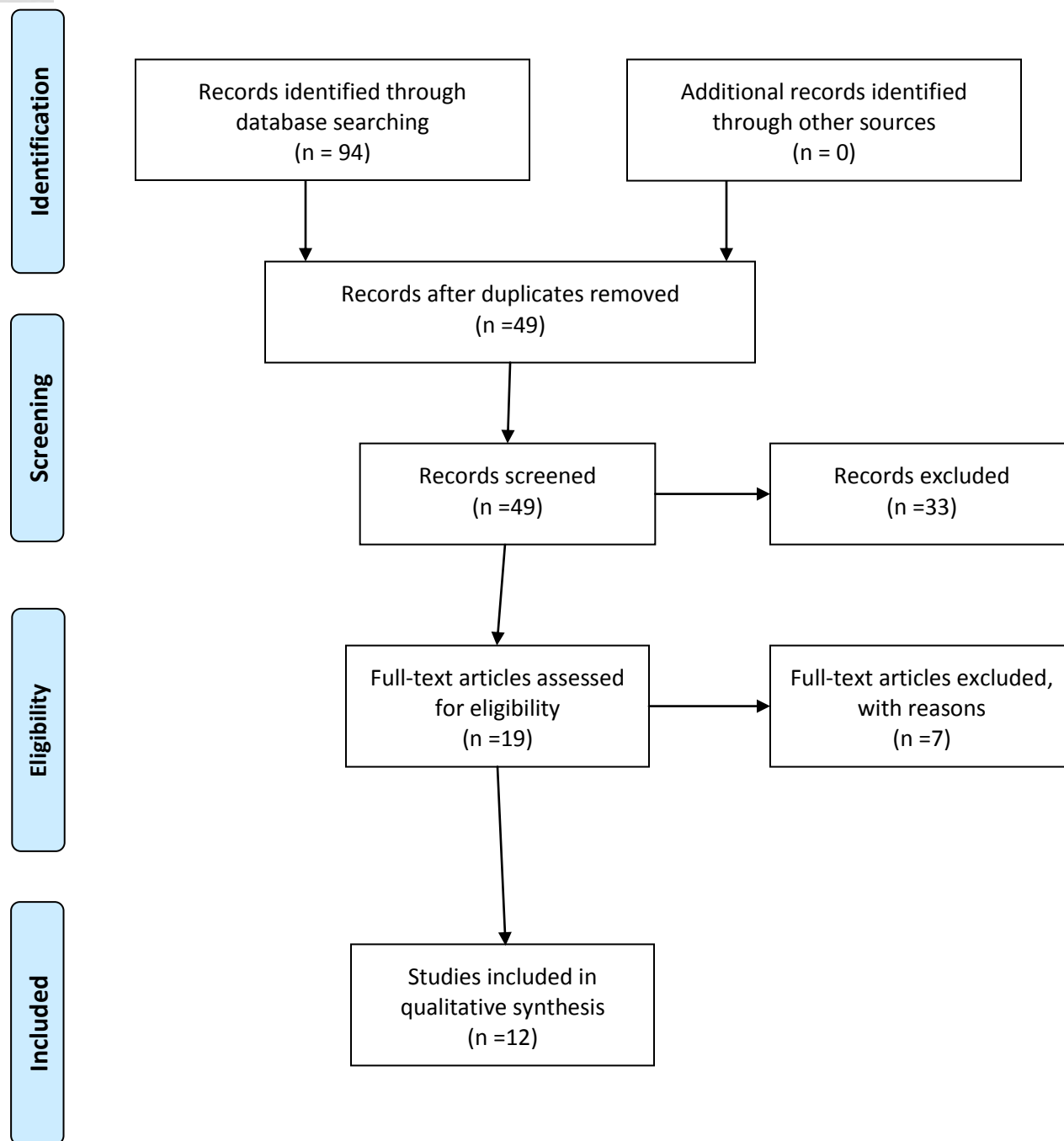
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Appendix A

PRISMA 2009 Flow Diagram



(Moher, Liberati, Tetzlaff, & Altman, 2010).

Appendix B

ERAS Evaluation Table								
Bibliographic Citation	Study Design	Level of Evidence & Quality	Purpose	Methods/Statistical Tests	Sample/Setting	Major Variables Studied: Independent variables	Dependent Variables	Relevant Results
Bardgett, M., Lally, J., Malviya, A., Kleim, B., & Deehan, D. (2016).	Cross-sectional, population-based postal survey	Level VI; Qualitative study with well-designed questionnaire.	Explore the factors influencing return to work following hip and knee replacement from the patient's perspective.	Postal delivered questionnaire. Thematic analysis used for identifying, analyzing and reporting patterns (themes) within data	102 patients. The sample included patients between 6 months and 3 years after surgery and under the age of 60 at the time of their joint replacement. Patients were identified from the Freeman Joint Registry (FJR), an ongoing clinical audit monitoring outcomes following total hip and knee replacement at the Freeman Hospital (Newcastle Hospitals NHS Foundation Trust, Newcastle upon Tyne, England). Total number of mailed questionnaires not listed.	Further qualitative work is needed to explore how each of these factors affect patients' experiences of returning to work.		Return to work following hip and knee replacement is influenced by a combination of patient, healthcare, and employment factors. The impact of these factors needs to be considered in order to facilitate patients' return to work.
Galbraith, A. S., McGloughlin, E., & Cashman, J. (2017).	Literature review to recover what enhanced recovery program protocols were being utilized in total joint arthroplasties.	Level VI at best. High quality for its intended purpose - to qualify what protocols are being utilized for the specific surgeries by a review of the literature.	Identify what enhanced recovery protocols are being utilized for total joint arthroplasties.	Review of the literature utilizing: PubMed, Cochrane, Embase, and OVID.	NA	Keywords: Enhanced recovery after surgery . Enhanced recovery programme. Rapid recovery. Total hip arthroplasty. Total joint arthroplasty. Total joint replacement. Total knee arthroplasty		Current best evidence suggests that all patients should be on a pathway to enhance their recovery. Limitations to the adoption of enhanced recovery programs should be identified in individual centers and measure taken to address these issues.
Galbraith, J. G., Fenelon, C., Gibbons, J., Kelly, G. A., & Bennett, D. (2017).	Retrospective case control	Level IV: high quality utilizing computer software for data collection and processing. 310 test subjects. Groups were assessed and allocated to be as	Evaluate the effect of Enhanced Recovery Programs for primary total hip arthroplasty and total knee arthroplasty on length of stay in the Irish setting.	Statistical analysis performed using SPSS version 20 (IBM) software. Chi-Square test used to determine difference between the 2 groups for gender and procedure type. Mean age	310 patients over a 2-year time frame	LOS, age, and gender when utilizing enhanced recovery programs		Utilizing enhanced recovery programs decreased LOS by 42%.

		close to identical in healthcare history as possible.		compared by independent t test. Correlation between LOS and age explored using Pearson correlation coefficient.				
Golladay, G. J., Balch, K. R., Dalury, D. F., Satpathy, J., & Jiranek, W. A. (2017).	Review of previously published data.	Level VII. Simple review of literature for talking points.	Review of previously published literature evaluating the use of various oral medications in the management of postoperative pain after lower extremity arthroplasty that was presented as part of a symposium at the November 2016 American Association of Hip and Knee Surgeons Annual Meeting.	No search criteria was presented only references for cited data.	NA	Studied the use of multimodal analgesia as opposed to the accepted practice of narcotic/opioid pain relief.		Multimodal analgesia represents a more comprehensive approach to pain management in lower extremity arthroplasty. A pre-emptive pain management approach using a variety of oral agents can help reduce postoperative and chronic pain. This improves outcomes, reduces complications, and diminishes side effects associated with the isolated use of opioids.
Goncalves, B. M., Silva Santos, A. M., Santos, C., Vaz, S., & Pinto, C. (2016).	case control study	Level IV; high quality Abstract- unable to locate full article	Evaluate the impact of ERAS protocol in total knee replacement on functional capacity and postoperative rehabilitation	n/a	Hospital Pedro Hispano, Matosinhos, Portugal; 1:1 pair matched, a total of 7 pairs of cases matched by sex, age, and ASA class were purposed to total knee replacement. 14 total patients, 12 females, age 67-77.	Knee joint catheter with 0.2% ropivacaine; Epidural catheter with 0.2% ropivacaine and morphine in the control group	POCs, pain rating, LOS, postoperative rehabilitation	Numeric pain scale ≤ 3 in 71% in case group and 28% in the control group. avg LOS was 5.1 +/- 1.9 in the case group and 6.0 +/- 0.6 in the control group. No complications in either group. 13 walking with crutches and 1 from control group dependent on wheelchair.
Gwynne-Jones, D. P., Martin, G., & Crane, C. (2017).	quasi experimental	Level III: moderate to high quality	To compare outcomes following the introduction of an ERAS program for hip and knee	Statistical analysis was performed using Stata v13 (College station, TX). Two tailed t tests were used	public hospital in Australasia; consecutive series of all patients (528) undergoing primary elective total hip or knee replacement	Early identification and treatment of preoperative anemia; preoperative health questionnaires to patients and GPs; weekly	Day of surgery admission rate; average LOS; transfusion rate; death rates;	substantial reductions in avg LOS, increased patient satisfaction, no increase in

			replacements	for continuous variables and chi-square tests for categorical data.	from Jan 1, 2013 to June 30, 2014 (ERAS group) 507 patients in the historical control group from July1, 2011 to Dec 31, 2012, well matched with respect to age, gender, and ASA grade.	preoperative education class run by the ward nursing and allied health staff; rewritten patient information guide; streamlined preadmission process; day of surgery admission for all patients; standardized anesthetic and analgesia guidelines; intraoperative local anesthetic infiltration; perioperative blood management algorithm; day of surgery mobilization; development of nurse- and physiotherapy-led discharge criteria	readmission rate; patient satisfaction;	complications. 30-day readmission rate was increased from 3.2% to 5.5%
Liu, V. X., Rosas, E., Hwang, J., Cain, E., Foss-Durant, A., Clopp, M., . . . Parodi, S. (2017).	A pre-post difference-in-differences study	Level III: high quality- however does not include any total hip or total knee arthroplasties	To evaluate the outcomes of an ERAS program among 2 target populations: patients undergoing elective colorectal resection and patients undergoing emergency hip fracture repair.	Unadjusted comparisons between groups are based on unpaired 2-tailed t tests, Wilcoxon rank sum tests, or x2 tests. For binary values a Poisson distribution with a log-link function was used. For continuous values, a Gaussian distribution with log-link values was used. All analyses were performed in SATA/SE version 14.1 (StataCorp)	Kaiser Permanente Northern California integrated healthcare delivery system, 20 medical centers throughout 2014; 3768 patients undergoing elective colorectal resection and 5002 patients undergoing emergency hip fracture repair in the study group compared to 5556 patients undergoing elective GI surgery and 1523 patients undergoing emergency orthopedic surgery in the control group	ERAS program elements: pain management, mobility, nutrition, and patient engagement	LOS, POCs, hospital mortality, discharge to home, 30-day readmission	In patients undergoing colorectal resection and hip fracture repair, ERAS implementation was associated with favorable reductions in hospital LOS and POC rate.
Malviya, A., Martin, K., Harper, I., Muller, S. D., Emmerson, K. P., Partington, P. F., & Reed, M. R. (2011).	observational study	Level IV: no control	To evaluate if ERAS reduces the economic burden, decreases LOS, and reduces early complications in total hip and knee replacements	two-tailed unpaired t-test compared the LOS between the 2 groups. Chi-squared tests compared the complications of the 2 groups.	Hospital in North Umbria, UK. evaluated 4500 TKA and THA during hospital stay: 3,000 underwent traditional protocol from 2004 to 2008. 1500 underwent ERAS from 2008 to 2009.	ERAS pathways for staff education, pre-medications, urinary caths, spinal anesthesia, IV infusions, interop medications, fluid administration, mobilization, discharge	mortality, LOS, post-op complications	significant reduction in 30 and 90-day mortality, reduction in LOS, reduction in blood transfusions
Molko, S., & Combalia, A. (2017).	literature review	level V: high quality review	To summarize ERAS study results and analyze future	conducted a lit review with search terms: fast track, rapid recovery,	11 articles from European authors selected	LOS, readmissions, transfusions, patient satisfaction, mortality,		overall reduction in LOS, transfusions, mortality, post-op

			challenges	enhanced recovery, accelerated rehabm arthroplasty - only included articles with clinical findings, review up to Sept2015		post-op complications		complications - recommendations for future ERAS considerations and potential protocols given
Proudfoot, S., Bennett, B., Duff, S., & Palmer, J. (2017).	cohort study	IV: no control, no randomization	To report the results of ERAS implementation	ERAS protocols developed form TKA and THA using breakthrough series collaborative methodology, monthly data collected on compliance and avg LOS, data analyzed using run charts and shewhart control charts	18 New Zealand hospitals (district health boards)	standardized ERAS pathways	LOS, compliance	ERAS components achieved rose from 33 to 75%, LOS reduced by 0.9 days on average
Ranawat, A. S., & Ranawat, C. S. (2007).	journal article/opinion	VII - one authors perspective	informative	n/a	n/a	n/a	n/a	ability to achieve painless recovery after THA and TKA is possible
Schotanus, M. G. M., Bemelmans, Y. F. L., Grimm, B., Heyligers, I. C., & Kort, N. P. (2017).	Prospective observational comparative case study	Level VI-Low quality, small sample size of 20 patients	Evaluation of activity level status post total knee arthroplasty	Patients divided into two groups, ERAS (10), outpatient surgery pathway (10)	Between April 2015-December 2015; 20 total patients, 10 in each group	Use of non-invasive triaxial accelerometer activity monitor: number of steps, sit-to-stand transfers		Early physical activity parameters very similar in both groups with no benefit in using ERAS pathway
Sibia, U. S., Waite, K. A., Callanan, M. A., Park, A. E., King, P. J., & MacDonald, J. H. (2017).	Retrospective review	Level V- Moderate quality because sample size (655), 196 of which excluded; drawn from a narrow period of time; discussed many comorbidities.	Evaluation of one/two-day LOS on readmission rates	Patients divided into two groups: 1-day and 2-day LOS. Keywords used: Enhanced recovery after surgery, complications, readmissions, total joint replacement, length of stay	All THA/TKA from April 2014-March 2015, with the exclusion of those discharged to rehabilitation facilities	LOS, comorbidities, age, BMI, gender		Early discharge doesn't increase readmission and may lower costs associated with TJRs. 1-day LOS patients were male, younger, and have lower BMI. They usually had shorter surgeries and spinal anesthesia.
Vehmeijer, S. B. W., Husted, H., & Kehlet, H. (2017).	Systematic Review	Level V-Higher quality as it uses many studies of ERAS in well-established	To review ERAS studies with a focus on feasibility of Outpatient TJA after using ERAS protocols	Review of current literature	Europe-institutions with papers published on outpatient TJA	LOS primarily with discussion on cost as well		For outcomes, focus must be first better, then faster. Challenges include organizational

		facilities						aspects, improving interventions to reduce risk of organ dysfunction, safety issues, and economical consequences.
Zhu, S., Qian, W., Jiang, C., Ye, C., & Chen, X. (2017).	Meta-analysis of ERAS studies prior to 2016; utilized Revman 5.2	Level I-High quality with over 9,000 patients total, only used CCTs and RCTs	Evaluating 10 previous studies regarding ERAS protocol implementation and their impacts on LOS, complication and readmission rates	Lit review using PubMed, EMBASE, Ovid, and others. Keywords: arthroplasty, joint replacement, enhanced recovery after surgery, fast track surgery, multi-mode analgesia, diet management, and steroid hormones	9,936 total cases, 4205 ERAS cases, 5,721 standard cases	LOS, complication rates, readmission rates		Decrease was found of variable intensity in all categories
Notes ERAS= Enhanced Recovery After Surgery; LOS= Length of Stay; CPG= Clinical Practice Guideline; PRISMA= Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist; RCT= Randomized controlled trial; ERP= Enhanced recovery program; PT= physical therapy; OT= occupational therapy; GI= Gastrointestinal; SSPS= Statistical software; STROBE= The Strengthening the Reporting of Observational Studies in Epidemiology checklist; PONV= post operative nausea and vomiting; BMI= Body Mass Index; ASA= American Society of Anesthesiologists physical classification; NG= nasogastric; EBL= Estimated Blood Loss; IVF= intravenous fluid; GP= general practitioner								

Appendix C

Project Year 1 (2018)

Activity/Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
USUHS VPR Submission and Approval	X	X										
Site IRB Submission and Approval			X									
Project Planning			X									
Project Implementation/Data Collection				X	X	X						
Data Analysis							X	X	X			
Dissemination										X	X	X
<u>Project Year 2 (2019)</u>												
Activity/Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
USUHS VPR Submission and Approval												
Site IRB Submission and Approval												
Project Planning												
Project Implementation/Data Collection												
Data Analysis												
Dissemination	X	X	X	X	X							

Appendix D



Completion Date 28-Aug-2016
Expiration Date 28-Aug-2019
Record ID 20629388

This is to certify that:

Anthony Reddin

Has completed the following CITI Program course:

OUUSD P&R Human Research (Curriculum Group)
Biomedical Investigators and Research Study Team (Course Learner Group)
1 - Biomedical Investigators (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w53755f7b-2a7a-40d0-9809-3d9c9f5e802c-20629388



Completion Date 29-Aug-2016
Expiration Date 29-Aug-2019
Record ID 20637662

This is to certify that:

Kenneth Narayan

Has completed the following CITI Program course:

OUUSD P&R Human Research (Curriculum Group)
Biomedical Investigators and Research Study Team (Course Learner Group)
1 - Biomedical Investigators (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w706fa913-cb92-4193-8ad6-1724febb0a7d-20637662



Completion Date 28-Aug-2016
Expiration Date 28-Aug-2019
Record ID 20628881

This is to certify that:

Steven Holmes

Has completed the following CITI Program course:

OUUSD P&R Human Research (Curriculum Group)
Biomedical Investigators and Research Study Team (Course Learner Group)
1 - Biomedical Investigators (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w507cfda4-1ad9-459f-a7d2-57378d79f7ad-20628881

1 - Biomedical Investigators (Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w6373228d-1308-4537-bf4f-bae3e4163e8c-20625435

Appendix E

USUHS FORM 3202N

DANIEL K. INOUE GRADUATE SCHOOL OF NURSING

EVIDENCE-BASED PRACTICE/PERFORMANCE IMPROVEMENT PROPOSAL

VPR Date Stamp

Project Number: _____

(VPR will assign)

Project Title: **An Evaluation of Utilization of Enhanced Recovery After Surgery Protocols at Travis AFB**

SECTION A: STUDENT POC INFORMATION

1. Name (Last, First, MI): **Holmes, Steven, A.** Student E-mail: **steven.holmes@usuhs.edu**

2. Home Address: _____

SECTION B: COMMITTEE CHAIR / SENIOR MENTOR INFORMATION

3. Name (Last, First, MI): **Oyemade, Adeleke, A.**4. Telephone: **707-423-5005** Fax: **N/A** E-mail: **Adeleke.oyemade@usuhs.edu**5. USUHS Building/ Room No.: **N/A**

SECTION C: PROJECT INFORMATION

6. Attach the Abstract for the proposal, including the following sections: Site Location of the Project, Title, Authors, Background or Problem/Issue, Clinical Question/Purpose, Project Design, Anticipated Organizational Impact/Implications for Practice and also include the Proposed Timeline. Single space the abstract and use Times New Roman font, size 12.

7. Is this proposal related to an active research project of the Chair/Senior Mentor identified in Section B? ☐ Yes ☒ No
If yes, complete below; if no, proceed to Part 8.

Project Number: _____

Project Title: _____

Project Start Date: _____

Project End Date: _____

8. Anticipated period of performance: Project Start Date: **01FEB2018** Project End Date: **19MAY2019**9. Performance Site(s): **David Grant Medical Center, Travis AFB, CA**10. Does this project involve any classified information? (Contact the USUHS Security Office for guidance) ☐ Yes ☒ No11. Do you have a funding source for this project? ☐ Yes ☐ No ☒ NA

If yes, specify the funding agency and the amount provided: _____

SECTION D: SIGNATURES

The following signatures attest to the validity of the above information:

Student (Project Point of Contact for the Group)**15 DEC 17**
(Signature and Date)_____
Chair/Senior Mentor**15 DEC 2017**
(Signature and Date)_____
Chair/Program Director

(Signature and Date)

Chair/Program Director

(Signature and Date)

DNP Project Director or PhD Director

(Signature and Date)

Associate Dean for Academic Affairs, GSN

(Signature and Date)

Associate Dean for Research, GSN

(Signature and Date)

Dean, DKI Graduate School of Nursing

(Signature and Date)

In light of the above signatures, the project is approved.

USUHS Vice President for Research_____
Date

**OFFICE OF RESEARCH**

4301 JONES BRIDGE ROAD

BETHESDA, MARYLAND 20814

PHONE: (301) 295-3303; FAX: (301) 295-6771

NOTICE OF PROJECT APPROVAL

Change Number: Original

VPR Site Number: GSN-61-10260
Principal Investigator: Meaders, Rachael
Department: Graduate School of Nursing
Project Type: Student
Project Title: Implementation of Enhanced Recovery after Surgery Protocols in Total Hip/Knee Arthroplasty at David Grant Medical Center, Travis AFB
Project Period: 10/1/2018 to 5/19/2019

Assurance and Progress Report Information:

<u>Name</u>	<u>Sup</u>	<u>Approval Type</u>	<u>Status</u>	<u>Approved On</u>	<u>Forms Received</u>
Progress Report	0		Final	To be Submitted	N/A

Remarks:

This Notice of Project Approval has been reviewed and approved. Please remember that you must submit a final Progress Report (Form 3210) upon completion of this project.

Questions regarding this approval should be directed to the following person in the Office of Research:

Sharon McIver, (301) 295-9814.



Yvonne H. Maddox, Ph.D.
Vice President for Research
Uniformed Services University of the Health Sciences

6 Dec 2018
Date

cc: Meaders, Rachael
File

Appendix F**DEPARTMENT OF THE AIR FORCE
60TH MEDICAL GROUP (AMC)**

MEMORANDUM FOR LT COL ADELEKE OYEMADE & EBP TEAM

FROM: 60 MDG/SGSE

SUBJECT: Start Letter for Protocol EBP#20180002

Principle Project Name(s): Capt Steven Holmes, Capt Rachael Meaders, Capt Kenneth Narayan

E-mail address: adeleke.a.oyemade.mil@mail.mil

Phone: 707-423-5277

EBP#: EBP#20180002

Activity Title: An Evaluation of Utilization of Enhanced Recovery after Surgery Protocols for Total Hip (THA) and Total Knee Arthroplasties (TKA) at Travis, AFB

1. This memorandum represents the official **Start Letter** for the David Grant USAF Medical Center (DGMG) performance site. The EBP protocol was reviewed and approved on 18 December, 2018 by the DGMG Center of Clinical Inquiry (C2I) Evidence-Based Practice Review Panel, and determined to be non-research activity.
2. The DGMG C2I EBP mission is aligned with improving patient safety, clinical outcomes, and medical readiness. All local EBP efforts are reported up through the SGN and shared with the Air Force C2Is. Therefore, it is the responsibility of the EBP team to report the protocol progress to the DGMG C2I Evidence-Based Practice Council (EBPC) on a quarterly basis Mar/Jun/Sep/Dec 2019. A member of the team will need to submit a quarterly update slide (Attachment 1) and present at the designated EBPC meetings which occur the second Wednesday of each month at 1530 in the DGMG Commander's Conference Room. The EBPC POC is Col Shawna Greiner at shawna.m.greiner.mil@mail.mil.
3. Congratulations on moving forward with this important contribution to translational science and efforts to improve surgical care and patient outcomes.
4. For questions or concerns, please contact me at 707-423-7280 or email: laurie.a.migliore.mil@mail.mil



LAURIE A. MIGLIORE, Lt Col, USAF, NC, PhD
Director, Nursing Research
Chair, Evidence-Based Practice Review Panel

Appendix G**DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 60TH AIR MOBILITY WING (AMC)**

1 April 2019

MEMORANDUM FOR CAPTAIN STEVEN HOLMES
CAPTAIN KENNETH NARAYAN
CAPTAIN RACHAEL MEADERS
CAPTAIN ANTHONY REDDIN

SUBJECT: Approval of Submission / Presentation

1. On 1Apr19, the Clinical Investigation Facility Publications Monitor received clearance/approval for your Abstract, Manuscript, Poster, and PowerPoint, presentations /submissions titled: **"The Evaluation of Utilization of Enhanced Recovery After Surgery Pathways at David Grant USAF Medical Facility – Travis AFB"**.
2. Please contact our office if your submission is published and provide a printed version for our records. Also, please contact our office if you receive any awards for your submission.
3. If you have any questions, I can be reached at 707-423-7316 / DSN 799 or e-mail at eileen.m.foster4.civ@mail.mil.


EILEEN M. FOSTER, CIV, DAF
Gifts and Grants Technician

1st Ind, 60 AMW/PA

MEMORANDUM FOR CAPTAIN STEVEN HOLMES, ET. AL.

PA Security and Policy Review was conducted IAW 35-102 and there were not any issues.

Approved/~~Disapproved~~ for publication.

4/2/2019

X Tonya A. Racasner

TONYA A. RACASNER, GS-12 USAF
Deputy Chief, Public Affairs
Signed by: RACASNER.TONYA.A.1231677131

TERMINI NON EXISTENT ... THERE ARE NO BOUNDS

Appendix H

Appendix G: Daniel K. Inouye Graduate School of Nursing
DNP Project Completion Verification Form

**DOCTOR OF NURSING PRACTICE PROJECT
Completion Verification Form**

The DNP Project titled: An Evaluation of Utilization of Enhanced Recovery After Surgery Protocols at Travis Air Force Base was completed at David Grant Medical Center, Travis AFB, CA by the following student(s):

(type student name)	(signature)	(date)
Steven Holmes		<u>11 Apr 2019</u>
Rachael Meaders		<u>11 Apr 2019</u>
Kenneth Narayan		<u>11 Apr 2019</u>
Anthony Reddin		<u>11 Apr 2019</u>

The DNP Practice Project Team verifies that the following components of the DNP project, accomplished by the above students, is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation:

- Presentation of DNP project to the leadership/stakeholders at the Phase II Site,
- Abstract/Impact Statement (Appendix F), and
- DNP Project written report.

Verified by:

(type name)	(signature)	(date)
Lt Col. Adeleke Oyemade		<u>11 Apr 2019</u> Senior Mentor & Phase II Site Director
Maj. Julie Petsche		<u>11 Apr 2019</u> Team Mentor

For RNA Students only - add the following additional signature for final verification of project completion:

CDR Kennett Radford		<u>21 APR 2019</u>
RNA Project Director (type name)	(Signature)	(Date)