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Richard Torman
torm9912@bears.unco.edu

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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

ANESTHESIA PREOPERATIVE INCLUSION CRITERIA FOR TOTAL
KNEE REPLACEMENT IN AMBULATORY SURGERY
CENTERS: A CLINICAL PRACTICE GUIDELINE

A Scholarly Research Project Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Nursing Practice

Richard Christopher Torman

College of Natural and Health Sciences
School of Nursing
Nursing Practice

May 2020

This Scholarly Project by: Richard Christopher Torman

Entitled: *Anesthesia Preoperative Inclusion Criteria for Total Knee Replacement in Ambulatory Surgery Centers: A Clinical Practice Guideline*

has been approved as meeting the requirements for the Degree of Doctor of Nursing Practice in College of Natural and Health Sciences in the School of Nursing, Program of Nursing Practice.

Accepted by the Scholarly Project Research Committee

Carlo G. Parker, Ph.D., Research Advisor

Kathleen N. Dunemmn, Ph.D., Committee Member

James Stimpson, DNP, Committee Member

Accepted by the Graduate School

Cindy Wesley
Interim Associate Provost and Dean
The Graduate School and International Admissions

ABSTRACT

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Traditionally, total knee arthroplasty has been performed in the hospital setting. There has been a trend in healthcare that has moved this invasive procedure to the outpatient setting, in ambulatory surgery centers. In order for anesthesia providers to be prepared for the shift of this special population of patients, a clinical practice guideline was created to fulfill this scholarly project. It was expected that the application of this guideline would result in an increased use of the current evidence and the subsequent readiness of anesthesia providers to accept this patient population into surgery centers. It was also anticipated that the guideline would increase in safety for patients and demonstrate to surgeons and administration that it was appropriate to perform total knee replacement in ambulatory surgery centers.

The scholarly project took place at South Ogden Specialty Surgery Center in Ogden, Utah, and included a thorough literature review, needs assessment, Delphi studies, and a proposed plan of implementation. It was hoped that the utilization of this guideline in the center would improve care and make a difference in the lives of patients.

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TABLE OF CONTENTS

CHAPTER		
I.	INTRODUCTION TO THE STUDY.....	1
	Problem Statement and Purpose	8
	Theoretical Framework.....	10
	Literature Review.....	12
	Summary	15
II.	PURPOSE, OBJECTIVES, AND DESCRIPTION OF THE PROJECT.....	17
	Project Purpose	17
	Project Objectives	18
	Congruence with Organizations Strategic Plan to Project.....	19
	Project Design.....	21
	Evidence-Based Project Plan	21
	Phases of Project Plan.....	22
	Phase one	22
	Phase two	23
	Phase three	24
	Phase four.....	24
	Project Timeline.....	25
	Resources- Personnel, Technology, and Budget.....	26
III.	EVALUATION AND ANALYSIS PLAN.....	28
	Objective One	29
	Objective Two.....	32
	Objective Three.....	33
	Summary	34

CHAPTER		
IV.	RESULTS AND OUTCOMES.....	35
	Needs Assessment and Demographics Survey	36
	Round One of the Delphi Survey.....	39
	Data Collection	40
	Question One	41
	Question Two.....	43
	Question Three.....	45
	Question Four.....	46
	Questions Five	48
	Question Six.....	49
	Question Seven	51
	Objective Two.....	52
	Round Two of the Delphi Survey	52
	Data Collection	52
	Question one	54
	Question two	54
	Question three	55
	Question four	55
	Question five.....	56
	Question six	56
	Question seven	56
	Guideline Development	57
	Objective Three.....	58
	The Future Use of This Guideline	59
	Key Facilitators and Key Barriers to Project Objectives	60
	Facilitators.....	60
	Barriers.....	61
	Unintended Consequences	61

CHAPTER		
V.	RECOMMENDATIONS AND IMPLICATIONS FOR PRACTICE	63
	Recommendation for Guideline Implementation and Evaluation	64
	Recommended Evaluations.....	65
	Application of Project in Other Settings.....	66
	Personal Goals and Contributions.....	67
	American Association of Colleges of Nursing Criteria for Doctor of Nursing Practice	68
	Summary	69
	REFERENCES	71
	APPENDICES	
A.	Institutional Review Board Approval	77
B.	Needs Assessment Questions.....	79
C.	Informed Consent.....	82
D.	American Society Of Anesthesiologists Guide.....	85
E.	Anesthesia Preoperative Evaluation Guideline.....	87

LIST OF TABLES

Table		
1.	Project Timeline.....	25
2.	Number of Providers Aware of Published Guideline	37
3.	Provider Concerns with Performing Total Knee Arthroscopy in Ambulatory Surgery Centers	38
4.	Provider Level of Comfort in Performing Total Knee Arthroplasty in Ambulatory Surgery Centers	39
5.	Top Risk Factors from Experts for Performing Total Knee Arthroplasty in Outpatient Surgery Centers	42
6.	Top Three Risk Factors from Experts for Performing Total Knee Arthroplasty in Ambulatory Surgery Centers	43
7.	American Society of Anesthesiologist Classification System Factors into Performing Total Knee Arthroplasty in Ambulatory Surgery Centers.....	44
8.	Expert Comments that Untreated Sleep Apnea is a Factor in Total Knee Arthroplasty in Ambulatory Surgery Centers	45
9.	Experts Comment that Sleep Apnea is not a Factor in Total Knee Arthroplasty in Ambulatory Surgery Centers	46
10.	Expert Opinion on Body Mass Index and Total Knee Arthroplasty in Ambulatory Surgery Centers	47
11.	Expert Opinion on Postoperative Support and Therapy Necessity for Total Knee Arthroplasty in Ambulatory Surgery Centers	49
12.	The Influence of Orthopedic Surgeons on the Decision to Approve Total Knee Arthroplasty in Outpatient Surgery Centers.....	51

LIST OF FIGURES

Figure		
1.	From Research To Outcomes with Evidence-Based Practice	11
2.	Expert Co-Morbidity Concerns with Total Knee Arthroplasty in Ambulatory Surgery Centers.	50

LIST OF ABBREVIATIONS

ACA	Affordable Care Act
ASC	Ambulatory Surgery Center
CDC	Centers for Disease Control and Prevention
SOSSC	South Ogden Specialty Surgical Center
TKA	Total Knee Arthroplasty

CHAPTER I

INTRODUCTION TO THE STUDY

There has been a steady movement in the United States showing the shift of surgeries traditionally performed in a hospital setting to specialized surgical centers where safety, efficiency, quality, and cost savings have been a priority (Huang, Ryu, & Dervin, 2017, p. 57). Total knee arthroplasty (TKA) is currently exhibiting this shift (Krause et al., 2018) and Certified Registered Nurse Anesthetists (CRNA) should be prepared for this imminent change.

For decades, there has been a common trend in moving surgeries that do not require overnight hospitalization to outpatient facilities. Ambulatory surgery has steadily increased in the United States since 1980 with the increase likely due to improvements in anesthesia care and medical technological advancements (U.S. Department of Health and Human Services, 2018). “The rate of procedures performed in freestanding ambulatory surgery centers increased by 300 percent in the 10-year period from 1996 to 2006” (*NQF-Endorsed Measures for Surgical Procedures, 2015-2017*, 2017, p. 5). Total knee arthroplasty has been one of the surgeries that has been moving from inpatient at the hospital to outpatient at an ambulatory surgery center (ASC).

Total knee arthroplasty (TKA), also known as Total knee replacement, has been a surgical procedure performed to alleviate pathologies of the knee joint commonly caused by severe arthritis, trauma, and joint destruction. The most common diagnosis

code for TKA has been unrelieved arthritis-associated knee pain (U.S. Department of Health and Human Services, 2014).

Total knee arthroplasty has been an intricate procedure requiring removal of diseased bone within the knee joint. An artificial joint has been designed to correct disability, increase activity level, and improve quality of life. “Receipt of TKA is most often associated with improvements in physical functioning, especially in physical function directly related to the knee” (Sloan, George, & Hu, 2013, p. 982). Improvement of physical function could increase the quality of life and improve health for those that suffer from joint pain, especially those in an elderly population.

In 2014, more than 720,000 total knee replacements were performed in the United States (U.S. Department of Health and Human Services, 2017). Demand for TKA has been projected to increase dramatically in the future. Surgery data has revealed that 799,578 TKA were performed in 2015 and that, by 2020, there will be 1,375,574 TKA procedures performed in one year (Kurtz, Ong, Lau, Mowat, & Halpern, 2014). In fact, Maradit Kremers et al. (2015) stated that, in 2010, approximately “7 million Americans were living with hip or knee replacement, and consequently, in most cases, are mobile despite advanced arthritis” (p. 1387). The prevalence of joint replacement in the United States “will continue to grow with a projected increase to 11 million individuals by 2030, the high majority being knee replacement” (Maradit Kremers et al., 2015, p. 1393).

The development of TKA began in the 1970s and has evolved into a multibillion-dollar industry. Refinement of prosthetic parts and process has streamlined the replacement of the knee joint. Kolisek, McGrath, Jessup, Monesmith, and Mont (2009) stated that the “duration of hospitalization decreased for patients who underwent TKAs in

the United States from approximately 9 to 4 days” (p. 1438). Since this time, there has been a movement to decrease the inpatient time even more to where the procedure becomes possible by outpatient means. Transitioning a significant portion of patients undergoing TKA to ambulatory surgery centers could be an alternative to an inpatient hospital stay and the costs and possible complications that could follow.

Historically, TKAs has been performed in hospital settings. The hospital has been used due to the invasiveness of the procedure, access to immediate postoperative therapy, and the pain associated with TKA (Barash, 2017). Jaffe, Schmiesing, and Golianu (2014) stated,

An arthroplasty of the knee is performed by replacing the natural knee joint surfaces with metallic and plastic components. The femur, patella, and tibia are exposed: cartilage and minimal bone are excised with a saw. The new components are placed with or without cement. (p. 1443)

Total knee arthroplasty patients could have severe postoperative pain. Effective management of pain through regional analgesia has reduced complications and improved outcomes (Miller et al., 2014). Advances in technique and improvements in postoperative care has decreased the postoperative need for overnight hospital admission.

“Advancements in surgical technique, anesthesia protocol, blood loss management, and rapid rehabilitation, combined with a growing need in a younger, healthy population, has decreased the need for hospitalization following TKA” (Parcells et al., 2016, p. 227).

Total knee replacement has been one of the success stories of modern health care. The procedure has been effective in increasing physical function and mobility. Also, TKA has often resulted in a decrease in pain levels and improvement in the quality of life in populations over 65 (George, Hu, & Sloan, 2014). As surgery volume for this procedure has increased significantly, 127.0% from 1997 to 2014 (U.S. Department of

Health and Human Services, 2014), patient and physician satisfaction has also increased (Sloan et al., 2013). Many individuals with longer life expectancy could benefit from a better quality of life. This has all resulted in a move from inpatient surgery at a hospital for TKA to outpatient surgery at an ASC.

Ambulatory surgery centers are facilities that offer surgical services outside of the hospital setting. Ambulatory surgery centers have provided a significant advantage in cost savings to government-sponsored insurance programs, private insurance plans, third party, and patients (Ambulatory Surgery Center Association, 2014). Ambulatory surgery centers have been commended for their ability to deliver outpatient services that have been inexpensive, timely, and convenient for patients and physicians as opposed to hospitals (Hair, Hussey, & Wynn, 2012). According to Munnich and Parente (2014), “procedures performed in ASCs take 31.8 fewer minutes, a 25 percent difference to the mean procedure time” and “ASCs provide an efficient way to meet the future growth in demand for outpatient surgeries and can help fulfill the Affordable Care Act (ACA) goals of reducing costs while improving the quality of health care delivery” (p. 764).

Studies comparing the quality of care in the ASC and the hospital-based facility measuring the categories of safety, timeliness, efficiency, patient satisfaction, and equitability could help establish and support the increased use of the ASC (Ambulatory Surgery Center Association, 2014). Infection rates and health care cost could also help determine how ASC use should be expanded. The cost of health care in the United States has continued to grow. In 2017, the national healthcare expenditures as a percentage of gross domestic product (GDP) was approximately 17% (Cutler, 2018). This amount was almost 50.0% more than the next-highest spender France, which was 11.6% of GDP and

more than twice the amount spent in the United Kingdom at 8.8% (Office for Economic Cooperation and Development, 2017). With the introduction of the Affordable Care Act in 2010, more individuals have health insurance and are eligible for joint replacement surgery. The Congressional Budget Office (2016) projected that the ACA has increased the number of individuals with health insurance by 25 million with a total of 244 million residence of the United States under age 65 with health insurance in any given month in 2016. With an increase in population that would need TKA, the rise in health costs and the increasing pressure for efficiency, forward-thinking must be used to balance these factors. In addition, the ACA's goals of decreasing costs and improving quality has made it increasingly important to find alternative methods of care delivery that cost less and are more cost effective.

All of the factors cited above have indicated that the proportion of TKAs occurring in ASCs would be increasing in number. Evidence-based standards are needed to determine which patients would be suitable for outpatient TKA from an anesthesia perspective. When a standard has been established to determine if a specific procedure should or should not be performed at an outpatient surgery center, and the patient qualifies for this, it could be more efficient and safer. Research performed by Trentman, Mueller, Gray, Pockaj, and Simula (2010), suggested that ASCs “demonstrated significantly shorter perioperative time intervals” and “incorporating time-saving practices from outpatient settings could contribute to hospital productivity” (p. 64). When procedures start on time, take less time, and turnover time has been decreased, there would be significant cost savings in an ASC versus a hospital.

Currently, there are approximately 5,300 ambulatory surgery centers in the United States that provide more than 25 million procedures each year (Ambulatory Surgery Center Association, 2013). In the past 30 years, there has been a shift in surgical settings. Today, the majority of surgeries performed in the United States has taken place in outpatient centers (American Hospital Association, 2016). The change in practice has been a gradual shift due to the change in perspective of surgeons, administrators, insurance companies, and the public. That which was once perceived as high risk has now been generally thought of as routine.

The literature has documented the improvement in safety in anesthesia care over time. The consensus in Miller et al. (2014) has been that approximately 28 million patients would have anesthesia and surgery annually in the United States. Many patients have expressed fear of anesthesia, but research has shown that anesthesia-related deaths have decreased significantly in the past 30 years. Barash (2017) stated that, "Mortality rates have decreased from two deaths per 10,000 anesthetics administered to one death per 200,000 to 300,000 anesthetics administered" (p. 98) over 30 years of progress in anesthesia. This increase in safety could justify a continued shift of surgical patients from the hospital setting to an ASC when the resources of a hospital-based facility were not needed and may cost considerably more.

There have been risks associated with moving a TKA from the hospital to an ASC. Ambulatory surgery centers have generally been entirely separated from inpatient and emergency departments so there would be a risk of not being able to manage perioperative complications safely. Careful patient selection and preparation could minimize complications often seen perioperatively. Thus, the CRNA in an ASC setting

clearly has had a need for an evidence-based guideline to select patients carefully for TKA before moving a TKA to an ASC. When postoperative hospitalization has been indicated or likely anticipated, it would be irresponsible to perform the said procedure in an ASC due to the possible requirement to transfer to a hospital for needed interventions. In research performed by De Oliveira et al. (2015), “an analysis of 53,667 patients found that hospital unplanned admission rate following ambulatory surgery was between 1.1-2.5%” (p. 1684). Unexpected admissions have been considered undesirable after surgery due to low admission rates being a sign of quality perioperative screening, proper intraoperative care, and good postoperative recovery.

Surgeons have often preferred taking their patients to ASCs. “By operating in ASCs instead of hospitals, physicians gain increased control over their surgical practice” (Ambulatory Surgery Center Association, 2014, p. 1). The surgeon has often influenced the scheduling of surgeries, assembling of surgical teams, equipment availability, and the design of the facility. In 2010, physicians owned at least part of approximately 90% of ASCs in the United States (Yee, 2011).

Kolisek et al. (2009) proposed that outpatient TKA “may be a safe procedure in certain selected patients” (p. 1440). In their study of inpatient versus outpatient TKA, it was determined that “for selected patients, outpatient TKA was a safe procedure with no perioperative complications and excellent short term outcomes that were similar to a matched cohort of patients who had a conventional inpatient hospital stay” (Kolisek et al., 2009, p. 1441).

Problem Statement and Purpose

As discussed above, a shift from hospital to ASCs has been underway. This has generated a need for an evidence-based process for CRNAs to enable careful preoperative evaluation of TKA patients. This would be needed to ensure patient safety and optimal anesthesia care for patients receiving TKAs on an outpatient basis. Not all patients needing TKA would be candidates for an expedited recovery and discharge to home the same day of surgery. Establishing an anesthesia guideline for CRNA anesthesia care that could filter and qualify patients that could benefit from same day TKA from those requiring advanced care, overnight stay in a hospital, and advanced evaluation or intervention(s) prior to discharge.

In lieu of a PICOT question, it has been determined that a proposal should be established through the use of evidence and the collaboration of experts. This process resulted in a practice guide for screening TKA patients. The purpose of the screen was to determine if the patient was suitable for a TKA at an ASC. The evidence from the literature was used to complete a practice guide. The practice guide was vetted with an expert panel of anesthesia care providers with a Delphi study methodology.

Several variables have existed in the attempt to move patients from the hospital to the outpatient setting. The normal series of steps have been common as patients were advanced through the health care system on their way to TKA.

1. Patient experiences significant knee pain and the problem is addressed with a primary care provider. Initial assessment is completed, and it is determined that the patient be referred to an orthopedic specialist.
2. Through assessment and non-invasive testing, it is determined that the knee has significant disease which is generally caused by osteoarthritis, rheumatoid arthritis, or traumatic arthritis. Knee replacement is presented to the patient as a treatment.

3. The patient is scheduled for surgery by the orthopedic office. The surgeon and their staff could determine the location of the surgery by assessing the following factors:
 - A. The patient's insurance coverage and provider restrictions.
 - B. The patient's health status.
 - C. The patient's ability to recover and perform therapeutic tasks.
4. The surgery is scheduled as the orthopedic office contacts the location of surgery. History and physical, preoperative orders, and general patient information is normally included.
5. A preoperative assessment is completed prior to the day of surgery. If there is a concern with the patient's condition and appropriateness for TKA on an outpatient basis, anesthesia personnel should be notified to assess the patient prior to the day of surgery.
6. On the day of surgery, a final assessment is completed by the anesthesia provider to determine the safety of intraoperative and postoperative care. (American Academy of Orthopedic Surgeons, 2015, paras. 44-58)

Anesthesia providers could use a guideline to assist them in determining if patients qualify for TKA in an ASC. They are the final barrier to balance the surgeon that pushes limits or the patient that slips through the cracks. When a guideline and restrictions have been provided for CRNA practice, and when it was used as a tool for assessment and decision support, the appropriate patient could and should have surgery in the appropriate location.

While there has been an increase in the literature concerning TKA in the outpatient setting, the topic of guidance with regards to anesthesia has not been addressed. There is a need for a special evidence-based clinical practice guideline to be developed for screening TKA patients to determine suitability for outpatient TKA. Anesthesia providers may, therefore, be practicing without the tools they need in order to properly scrutinize patients presenting for TKA. The transfer of a patient to the hospital

following an outpatient procedure has been considered to be a problem with the system and should not happen routinely. An unplanned transfer to a hospital following surgery at an ASC should be a quality measure and should be reported to Medicare for benchmarking (Bourland, 2018).

In summary, the problem has been that there has been a need for a guide for anesthesia providers to screen TKA patients for outpatient surgery at an ASC. The purpose of this project was to provide a useful EBP clinical guide to anesthesia providers in the preoperative assessment of TKA patients for suitability for surgery in ASCs.

Theoretical Framework

The Stetler Model (Stetler, 2001) could be useful for “groups of practitioners given the task of developing common standards, tools, and policies” (p. 273). Figure 1 demonstrates the most current model and demonstrates that evidence-based practice has emphasized the critical thinking process and practitioner application.

The Stetler Model consists of five phases of emphasis.

- Phase I: Preparation which involves the definition of the purpose, contextual assessment and search for sources of evidence. The project proposal, design and Institutional Review Board (IRB) approval will be completed.
- Phase II: Validation of evidence found. A literature review is done to find evidence and its clinical significance, reliability, and applicability. The literature is assessed and practically reviewed for its value in the author’s DNP scholarly project.
- Phase III: Consists of comparative evaluation and decision-making. The evidence is critiqued, synthesized and a decision for use is made. A Delphi survey method will be used to obtain consensus among a panel of experts regarding appropriate components to be included in the preoperative guideline. The expert panel will identify facilitators and obstacles for the implementation of the guideline.

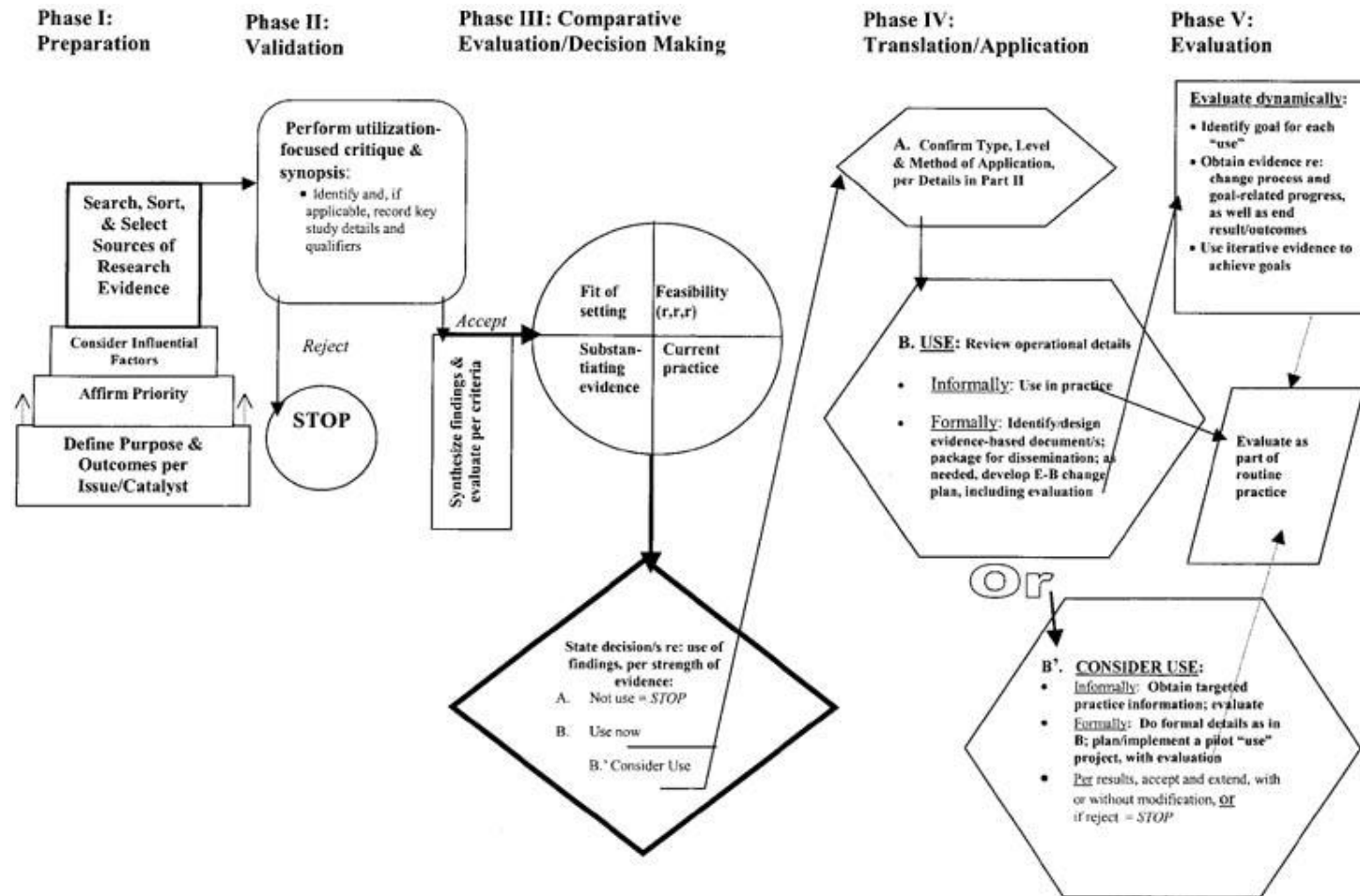


Figure 1. From research to outcomes with evidence-based practice (Stetler, 2001, p. 273).

- Phase IV: Refinements provide implementation and translation for change in practice. The development of the guideline will be based off on literature review and the Delphi survey. Specific methods of implementation at the specific site are determined during this phase. Due to time constraints, this project will not implement the guideline into practice. Instead, it will be used as an educational in-service for the providers and can be considered for future implementation.
- Phase V: The evaluation of outcomes and the amount to which the practice change is realized. A cost-benefit analysis, negative outcome assessment, and other unforeseen outcomes will be analyzed. Modifications, feasibility, and usability are assessed and enhancements will be made. As stated, this scholarly project will not implement evidence into practice and cannot include a post-implementation evaluation. Instead, a pre- and post- survey will be assessed from the educational in-service. (Schaffer, Sandau, & Diedrick, 2012, p. 1205).

This model was used specifically for this project. It highlighted the synthesis process and focused on concepts of evidence. The most recent Stetler Model stated, “use of research findings can occur informally and routinely at the level of an individual clinician . . . when that individual has relevant competencies and continuously updates his or her knowledge base” (Stetler, 2001. p. 274). The individual practitioner focus of the Stetler Model would provide precise direction for practitioners responsible for EBP.

Literature Review

A literature search using the keywords *total knee arthroplasty, ambulatory surgery center, anesthesia, preoperative evaluation, protocol development, and complications* was conducted in the following search engines: Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed/MEDLINE, and Google Scholar. There was a focus upon high-quality evidence from published from January 2011 through December 2018. Among the journal articles utilized for this review, several of them provided multiple citations that expanded the literature search. Additional resources were sought through examination of

specific peer-reviewed anesthesia journals, which included the Journal of the American Association of Nurse Anesthetists, Anesthesia and Analgesia, and Anesthesiology to supplement the evidence associated with this scholarly project.

Twenty-two articles were systematically reviewed and selected based on the above criteria. Unexpectedly, all were published in the United States. The selected articles were used according to their usefulness in developing the ASC anesthesia protocol for TKA.

The literature for TKA in the hospital setting was well established. Three anesthesia textbooks were reviewed for usefulness and comparison (Barash, 2017; Jaffe et al., 2014; Miller et al., 2014). In the established anesthesia text, general guidelines have been presented without mention of the possibility of the procedure occurring in an outpatient setting. Standard assessment for arthroplasty has often overlapped with similar procedures that generally included:

- Pre-existing conditions and previous anesthesia complications. Potential airway difficulties and considerations with regard to intraoperative positioning.
- The existence of any cardiac symptoms and the history of cardiac disease. Overall, patients undergoing TKA are considered at intermediate risk for cardiac complications perioperatively.
- Rheumatoid arthritis is often associated with orthopedic surgery and systemic manifestations may include pulmonary, cardiac and musculoskeletal involvement.
- The patients' medication history should be reviewed, and patients should be instructed in which medications should be continued until the time of surgery. Special consideration should be given to anti-hypertensives, opioids, anti-reflux, and anticoagulation medications. Medication allergies should be noted.
- Physical examination includes auscultation and airway evaluation. In addition, regional anesthesia placement can be determined and appraised. A baseline neurologic examination should be conducted.
- Testing can also be prescribed which often include, electrocardiogram (EKG) and laboratory sampling (often blood work). If any part of the examination warrants further testing, it should be determined as soon as possible to prevent delays or cancellation. (Barash et al., 2017, p. 1441)

The literature supported the need for an appropriate recommendation for anesthesia perioperative care of the TKA patient that would have a shortened stay. Munnich and Parente (2014) suggested that the rapid growth in the number of surgeries performed at ASCs and the cost saving along with other numerous benefits associated with the shift in surgeries out of hospital settings justified more advanced procedures being performed at ASCs.

In a prognostic study performed by Kolisek et al. (2009), their research demonstrated that an outpatient TKA may be safe for select patients. Further study was indicated for a protocol to minimize major perioperative complications. Part of this protocol called for guidelines in order to establish anesthesia perioperative care. Their study also showed satisfaction scores and outcomes in an excellent range as matched with a cohort of patients following an inpatient protocol.

Parcells et al. (2016) showed in a retrospective review of documentation the clear shift benefits of an increase in the number of TKA at ASCs. “The advance in surgical technique, development of anesthesia protocol, blood loss management, and rapid rehabilitation, combined with a growing need in a younger, healthy population, has decreased the need for hospitalization for TKA” (Parcells et al., 2016, p. 227). They suggested that the use of standalone ASCs for TKA was a “natural progression” and that an ASC setting provided the additional advantage of offering high-quality care at a significantly lower cost.

Krause et al. (2018) published an article that provided the current state of outpatient TKA from an orthopedic perspective. The two articles published provided information regarding the cost reduction of the procedure, patient selection criteria

related to anesthesia, and medical optimization of proposed patients. Krause et al. (2018) stated that “outpatient TKA will likely be considered the gold standard in select patients within the coming years. It is imperative that the adult reconstructive community understands the benefits and pitfalls associated with implementing such procedures, and for which patients the pathway may be amenable” (p. 5). This same literature stated the importance of optimizing all components of the experience, starting with the surgeon’s office and continuing as long as it was needed following discharge. The anesthesia evaluation has been an essential piece to this practice and should be carefully guided.

Additional resources were available and have been well established for best practice in anesthesia care for TKA and have focused on inpatient care. When applicable, these standards would be applied to TKA in ASCs. Topics of these evidence-based practice standards included optimal type of anesthesia, blood loss management, postoperative pain control action, treatment of postoperative complications, and anesthesia discharge criteria/education. The evidence for these topics was presented within the proposed guideline.

Summary

As health care costs have continued to increase and more must be completed with less, ASCs have been increasingly offering the option of safe, cost-effective, convenient, and streamlined surgeries. The shift of many of the total knee arthroplasties away from inpatient care has been decades in the making. Healthy patients with a good support system, a motivated rehabilitation schedule, and effective model in place would meet the needs of a population that insists on remaining active and vibrant. Total knee arthroplasty has been one of the success stories of modern medicine and its potential to transform a

diseased joint into a working, durable, and active solution has been life-altering. With a projected substantial increase in the need for this type of surgery, it has been crucial that we look into the future and make alterations in care to meet future needs.

With this shift of venue has come a need to prepare anesthesia providers for the incoming tide of patients that would present for TKA in an outpatient setting. Anesthesia providers must begin with the end in mind. Not only must a safe anesthetic be delivered, the patient must also have adequate pain control and be able to perform therapeutic tasks at home. Anesthesia could either help obtain these goals or could hinder the progress of patients undergoing this procedure. A successful project would educate and provide guidance for providers preparing to care for TKA in ASCs.

CHAPTER II
PURPOSE, OBJECTIVES, AND DESCRIPTION
OF THE PROJECT

Project Purpose

The literature showed that there was indeed a need for a clinical practice guideline related to anesthesia management of patients undergoing TKA in ASCs. The purpose of the DNP scholarly project was to evaluate empirical evidence and its appropriate use in a guideline. Furthermore, the guideline was developed with the use of experts' consensus. The anticipated benefit of this project was the applied use of evidence-based literature in the care of patients sent to ASCs for TKA. The long-term projected outcome could be plainness in the ability to properly scrutinize patients sent to ASCs by an orthopedic surgeon's office.

The intention of this scholarly project was to establish an initial guideline for anesthesia providers to evaluate patients presented for TKA/TKR in an ASC. Evidence-based standards are needed to determine which patients were suitable for outpatient TKA from an anesthesia perspective. Establishing this guideline would assist the Certified Registered Nurse Anesthetists (CRNAs) or Physician Anesthesiologists in providing high quality, safe, evidence-based anesthesia care for this population of patients in a setting that has not traditionally been used for such an invasive procedure.

After performing the search described in Chapter I, it was determined that no evidence-based formal guideline was currently available specifically for anesthesia

providers. There was currently significant literature from the orthopedic and surgical center standpoint, but anesthesia guidance was lacking. This project could also begin further discussions concerning anesthetic care of this type of patient and this procedure.

With this purpose in mind, the project could develop a process of screening patients to determine if a total knee arthroplasty was possible in an outpatient setting. This project could assist anesthesia providers at a specific surgical site and allow them to determine if a patient had the probability of having the procedure in an ASC versus the hospital from an anesthesia perspective. When specific parameters are met, the patient could be scheduled at the ASC, and further evaluation could be performed. The project gathered data and then made suggestions for anesthesia preoperative evaluation.

Project Objectives

Precise evaluation of surgical patients for a higher risk surgery has been an essential part of the practice of anesthesia. The overall goal of the project was to provide a guideline for suitability for a TKA in an outpatient setting from an anesthesia care perspective. The expectation was that this type of guideline might prevent patients that should have the procedure completed in the hospital from having the procedure at the surgical center. Objectives of this guideline would aid providers at South Ogden Specialty Surgical Center (SOSSC) in South Ogden, Utah, in proper filtering of patients who present for TKA. Particular objectives of this scholarly project were:

1. Acquire the current standard and knowledge for patients having TKA.
 - Survey of present providers and their practice at SOSSC (the organization).

- Obtain and evaluate the current recommendations for practice and applicability to the population in the practice organization.
 - Use the Delphi method of communication to survey a panel of experts. Obtain knowledge and opinion regarding the preoperative evaluation of patients scheduled for TKA in ASCs.
2. To develop a guideline to be used by anesthesia providers to evaluate appropriateness of patients scheduled to have a TKA in an outpatient setting.
- To develop a checklist type algorithm for selection of patients that could or could not have a TKA performed in an ASC.
 - The guideline would include but would not be limited to: patient selection, evaluation, tools, ability to discharge same-day, and anticipated complications.
3. Present the preoperative guideline, checklist, or algorithm to anesthesia providers at South Ogden Specialty Surgical Center or other facilities that may be potentially providing this service. It was predicted that the guideline would not be instigated into clinical practice for this scholarly project due to time limitations.
- An evaluation of the anesthesia providers learning would be conducted using a pre- and post-test.

Congruence with Organizations Strategic Plan to Project

The project took place at an outpatient surgical center in Ogden, Utah. The general focus of the center was orthopedic and podiatry surgery and other specialties of

surgery that also used the facility. South Ogden Specialty Surgical Center (SOSSC) is independently owned by a group of physicians and podiatrists. The facility opened in June of 2014 and has two operating suites. There were 11 full-time registered nurses employed by the center that covered the preoperative, operative, and postoperative areas. The office staff included 4 full-time individuals including the center's administrator. The mission of SOSSC was: "A commitment to deliver superior patient care and efficient outpatient surgical services which are performed by specially trained, highly skilled professionals." The organization prided itself on quality care and cost savings to patients. The vision of the organization was: "An organization which is committed to creating a center of excellence by using innovation and the latest developments in health care. We do this by exceeding clinical quality, customer service and cost performance expectations of our patients." The organization also listed its values as:

1. Every decision is guided first and foremost by its effect on patient safety and providing the very best patient care possible.
2. We treat each patient and their family with understanding, empathy and compassion.
3. We work together in a spirit of teamwork and mutual respect.
4. We strive for excellence in all we do.
5. We conduct our business fairly, ethically and efficiently.

This scholarly project had the intent of helping providers efficiently and safely evaluate patients as they present for surgery that was shifting from an inpatient setting to an outpatient setting for a certain population. As the organization has moved forward with its strategic plan, the scholarly project would work with it to reflect the

organizations' vision, mission and values. The vision of innovation and development was harmonious with the process of this scholarly paper. The value of patient safety and quality care could be seen as a guideline was developed for ensuring the correct patients were selected for this modern development in ASCs.

Project Design

Evidence-Based Project Plan

The evaluation of the literature showed a lack of direction and evidence and the need for a guideline in this setting. The development of a guideline could aid providers by clearly defining the inclusion or exclusion criteria for this type of surgery. This scholarly translated the highest quality evidence into practice through the creation of a guideline and checklist. The existing literature and the experience of a panel of experts included a combination of CRNAs, anesthesiologists, and orthopedic surgeons to contribute to the creation of this guideline. The Delphi survey method was chosen to serve as a consensus tool to determine expert opinion. The guideline that was developed was then provided to the anesthesia providers at South Ogden Specialty Surgical Center at an educational conference that would be held on the first Tuesday of every other month (odd months).

Survey and data collection were used to gather expert opinion and achieve consensus for use in this project. The Delphi survey technique "is a group facilitation technique, which is an iterative multistage process, designed to transform opinion into group consensus" (Hasson, Keeney, & McKenna, 2000, p. 1008). This form of collaboration to practice has been useful in areas where there was insufficient or conflicting knowledge.

In this method, the research problem was clearly defined. There was a rationale for the topic and justification for research. A literature review was completed to understand the current state of knowledge. Experts were not randomly selected but were carefully chosen. Rounds of questions and expert samples were collected. Data analysis was completed with the presentation of results. An issue of consensus was obtained, and interpretation of consensus was gained/not gained (Hasson et al., 2000).

For this project, two rounds of questions were conducted to reach consensus, but an additional third round of questioning may be needed to reach 70.0% harmony. In the initial questionnaire, an anonymous qualitative response was established. It allowed a quasi-anonymous sampling to be acquired. From the first round of responses, the researcher analyzed, consolidated, and summarized information. Central tendencies were calculated to determine collected opinions and participants could see how their answers compared to the group's responses. A second round of questions was then compiled and distributed to participants with central tendencies. Quantitative data from the second round were collected by the researcher and consensus opinions are determined. When a 70.0% agreement level was achieved, a consensus was complete (Hasson et al., 2000). For this project, each participant in the Delphi survey technique had significant prior experience in caring for patients that have had TKA and substantial experience in an outpatient setting. All participants were either a CRNA or MD anesthesiologist licensed to practice anesthesia in the State of Utah.

Phases of Project Plan

Phase one. Phase one involved a comprehensive literature review, a needs assessment, and the development of this proposal. The literature review was completed

along with the proposal of the project which were the first three chapters. The next phase of the project was:

- Approval from the institutional review board (IRB, see Appendix A)
- Coordination with stakeholders at SOSSC
- Needs assessment to determine current practices at SOSSC
- Identification and coordination with the professionals on the expert panel

The needs assessment was completed by assessing the current practices at SOSSC by using a simple survey method. A small sample group of 10 anesthesia providers received a questionnaire with open-ended questions. The current practices were then analyzed and compared to the recommendations of the literature. Similarities and differences were then explained.

Phase two. Phase two involved the development of the guideline. Using the Delphi method, expert consensus was reached as described above. The expert opinion on the necessary components of the guideline created practitioner buy-in and united the group in this cause. Applicable information from the literature review related to practice at SOSSC was used to form the first round of Delphi survey questions. Answers from the first round of inquiring formulated the questions for the second round and an anticipated expert consensus level of 70% was achieved. If necessary, a third round was completed to reach consensus. The components of the guideline included but was not limited to:

- Ability to safely anesthetize the patient presenting for TKA
 - Risk for perioperative blood loss
 - Risk for postoperative infection
 - Ability to control pain for effective postoperative therapy

- Likelihood that the patient will need the additional care of a hospital setting
- Ability of the patient to safely recover at home with minimal stay at the ASC
- Availability for therapy to continue after the patient leaves the ASC

The expert opinions obtained through the survey were taken from Certified Registered Nurse Anesthetists and Physician Anesthesiologists. All of these individuals practiced independently and without supervision at the site, South Ogden Specialty Surgical Center. Each of these professionals was expected to care for this population of patient. All would benefit from a consensus that would be presented from this project.

Phase three. Phase three was the plan for making the project work at the clinical site. The guideline was composed and presented to the anesthesia providers and stakeholders at South Ogden Specialty Surgical Center in the clinical anesthesia meeting held to coordinate providers. This meeting was held bi-monthly (odd months) on the first Tuesday. A pre- and post-test was given to evaluate the knowledge gained and consensus of care regarding TKA in the ASC. Methods used in the meeting included handouts and Keynote presentation.

Phase four. The final phase was the analysis of the providers. If and when the guideline was to be used in the future, phase four would include plans to distribute and evaluate its use at SOSSC. The anesthesia providers could report on the use of the guideline and recommend amendments for its continued evolution of life. A detailed pilot study could also be implemented to determine its usefulness. Due to time and resource limitations, this did not transpire in this scholarly project.

Project Timeline

Table 1 presents the sequence for the development and completion of this scholarly project. The evolution of this timeline became adaptable over time.

Table 1

Project Timeline

Date	Activity
2017	<ul style="list-style-type: none"> • Approval of Phenomenon of Interest
October 2019	<ul style="list-style-type: none"> • Defense of Chapters 1-3 of Scholarly Project Proposal
November 2019	<ul style="list-style-type: none"> • IRB approval from University of Northern Colorado and SOSSC • Coordination with stakeholders at SOSSC and Expert Panel members • Needs Assessment completed • Initial round of Delphi Survey was sent to Panel of Experts
January 2019	<ul style="list-style-type: none"> • Evaluate, analyze, and summarize literature and panel of Experts' opinions
February 2019	<ul style="list-style-type: none"> • Second round of Delphi survey sent to panel of experts to determine consensus • Development of Clinical Practice Guideline
March 2019	<ul style="list-style-type: none"> • Development of Plan for Implementation for educational in-service • Educational In-service took place • Analysis of results of pre- and post-tests
April 2019	<ul style="list-style-type: none"> • Submission of Scholarly Project to University of Northern Colorado • Final Defense of Scholarly Project • Gratitude letters sent to participants containing summary of results.

Resources- Personnel, Technology, and Budget

The DNP student contributed the work and effort for this project. The main project expense for the guideline creation was personnel time for Delphi expert consensus study and individual input from multidisciplinary groups.

The contributed time of the student was realized as the project was produced, in the coordination with anesthesia providers and stakeholders, the survey methods, analyzing of the data, and the development of the guideline for use. The use of computer technology, printing, and the accumulation of research was vital and minimal in expense. The approval from the medical staff and leadership at South Ogden Specialty Surgical Center was completed with a statement of mutual agreement. The DNP student, clinical site administrator, and the DNP scholarly project chair signed the agreement.

The financial burden was not significant for this scholarly project. The methods used required little economic resource. The Delphi method was electronically administered and did not involve fiscal need. The time invested in the project was priceless but did not require a monetary budget. Time was used to synthesize data, determine consensus, and show the applicability of the guideline.

The guideline was presented at a meeting that was commonly held at a restaurant. The administration of the anesthesia group normally covered the cost of the meal. The in-service was presented at this time when the group gathered together. The student provided a presentation (free) and printed material (minimal expense). Time for the pre- and post-tests was not onerous and could be completed electronically. Multiple technologies were used during the completion of this project but were already in place.

It was determined that a market analysis, strategic analysis, and marketing/operations plan were not needed for this project. It was not naturally evident that a strategy for feasibility and sustainability would fit into the format of this scholarly project.

CHAPTER III

EVALUATION AND ANALYSIS PLAN

The purpose of this project was to establish a guideline for anesthesia practitioners to reference for perioperative planning and implementation of an anesthesia plan for TKA in an outpatient surgery setting. After searching extensively, no evidence-based proper recommendation was currently available for this particular scenario. It was established that there was considerable data in the literature that could be applied to this situation with no specific detail and methodical organization for this setting and situation.

The outcome of the project was the production of a practice guideline for outpatient TKA based on current literature and EBP for inpatient TKA. Review and modification to the outpatient TKA guideline was validated through the use of the Delphi method.

Evidence was added by surveying practicing experts involved in the perioperative process using the Delphi technique. Through the use of the Delphi method, a group judgment determined the direction for the guideline due to the lack of specific evidence-based research in this specific area. The panel of experts were limited to those individual anesthesia providers that would be using the guideline. By sampling those that would be using the guideline, there would be a natural “buy-in” for the project. This ensured that the evidence could be translated into practice by gaining group consensus. The guideline reached a 70.0% consensus at conclusion of the third round. If a consensus was reached before the third round, the result was accepted.

The beauty of this project was the fact that it could be directly used at the agency site, South Ogden Specialty Surgical Center. The anesthesia providers at this site were experienced practitioners and were open to added direction when caring for and determining if patients should have this type of procedure at this outpatient facility. When anesthesia providers have a guideline to refer to, questions about the appropriateness of surgery could be explained and providers could be united in their care for patients. To be clear, the project was a modification of current clinical practice guideline based on input from a Delphi panel. The combination of evidence with expert opinion established a strong guideline (the best of both worlds).

Objective One

The initial objective of this project was to establish the current knowledge and practice for this type of procedure. This was accomplished by the following methods:

1. A needs simple assessment will be done at the clinical site
2. The literature will be carefully evaluated for evidence-based knowledge
3. Using the Delphi survey method, experts will assist in defining the best practices for this particular site

The survey contained Likert-like scaling range statements (Sullivan & Artino, 2013) and interpretation of data was scaled. Examples of the pre-test and post-test statements included:

1. The guideline will improve patient care from an anesthesia standpoint
2. The guideline will be used in your practice
3. The guideline is comprehensive enough to be useful

The answer choices included a scale ranging including:

Very likely	Likely	Neutral	Not likely	Very unlikely
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Because the agency did not have a current guideline for preoperative selection of patients presenting for TKA in ASCs in place, a simple electronic survey asked Likert-like questions proposed by the scholarly project author to evaluate the knowledge and practice of anesthesia providers at SOSSC related to TKA in the outpatient setting. Analysis of the replies showed both differences and consistencies in the anesthesia providers practice. The responses were then be matched with the current literature and practice. When the literature and current practitioner practices were compared, areas of need were clarified and a useful plan for the establishment of a guideline was recognized.

The initial round of Delphi survey method was then distributed to collect expert opinion on the needed elements of the guideline. The literature review helped as a guide for the questions to be included in the survey. Through literature review, it had also been established that there was a lack of direction in this matter. The Stetler (2001) model of research utilization was employed to evaluate the evidence and utilization of the evidence found into the anesthesia guideline

This model focused on a sequence of judgments and steps concerning appropriateness, desirability, feasibility, and use of research results in an individual or group practice. Five phases would facilitate critical thinking and practical application of research. The result of the evaluation was the use of evidence in the context of daily practice.

Phase one of the Stetler model urged practitioners to contemplate internal and external factors that could affect the literature search for evidence. This included a review of external influence such as empirical research or sponsor influence and internal influence such as personal viewpoints. These factors influenced the literature selection process.

Phase two of the Stetler model examined relevant clinical findings. Utilization review tables were used to evaluate the evidence. This included the critique of findings upon the hierarchy of scientific evidence (i.e., systematic reviews to case reports).

Phase three included a synthesis of the accumulated findings and decision making. The evidence was evaluated to determine whether it could be used in practice. This included the culmination of empirical evidence, expert consensus, clinician experience, and patient preference. The Delphi questionnaire was guided and written by synthesis of the literature.

In phase four of the Stetler model, the evidence was translated into the application. This resulted in changing individual behavior, policy, or protocol. This process helped shape the guideline. This phase should involve deliberate consideration for methods of actively disseminating the information (i.e., printed materials, meetings, or collaboration).

Phase five was the formal or informal evaluation. This process could enhance the credibility of the data. Stetler proposed a dynamic evaluation that constantly advanced and cultivated the use of the finest available evidence. Formative data (intent of the findings) and summative data (assessment outcome) was analyzed to evaluate the guideline for usefulness and effectiveness.

The Delphi survey method was then developed and administered for this project to form an expert consensus. The first round of the Delphi study focused on expert opinions and the necessary components of the guideline. Due to the unique needs of this project, the author developed the questions used in the Delphi survey method. The initial round of questions allowed for insight into the anesthesia providers personal care and evaluation of the patient presenting for TKA at South Ogden Specialty Surgical Center. The contents of the guideline focused on the pertinent and individual needs of this specific facility in this specific population of patients.

After responses were collected and analyzed, the reactions from the first round of the Delphi method was used to achieve harmony among the experts. A second round of the Delphi survey method was used to form a consensus with a level of 70.0% as a target to be obtained. An additional round could be needed if the consensus in not met. Final results were used to form a guideline and checklist. Prior to the final formation of the guideline, results were compared to evidence-based literature from the review. Evaluation, comparison, and analysis was then combined for the full creation of the guideline.

Objective Two

The second objective was to develop the guideline for anesthesia providers from the data collected. This was completed by collecting the generated data from the needs assessment, literature review, and the Delphi survey method. The guideline could address vital components of the preoperative assessment for TKA and could include:

1. Exclusion criteria for outpatient TKA
2. Inclusion criteria for outpatient TKA

3. Checklist of special considerations

4. Tools for assessment

The generated algorithm presented these components for the use by the anesthesia provider when a preoperative assessment was needed. The guideline could begin to be used when patients present for preoperative evaluation and concluded use when the decision was made to approve anesthesia care for the patient or suggest the surgery be completed in a hospital setting or when the patient was in a more optimal state.

Objective Three

The final objective of this scholarly project was the presentation and education on the anesthesia guideline and algorithm to anesthesia providers and administration. A test was given before a presenting the guideline at a monthly educational and information gathering. The doctoral student developed the questions that included multiple-choice and true/false possibilities. The questions evaluated the providers' knowledge before the presentation of the guideline and after the guideline was given. These questions evaluated pre- and post-knowledge of the care for outpatient TKA patients. It could include criteria for inclusion/exclusion, checklists for special considerations, and tools for assessment. The examination was compared with other individual answers to evaluate knowledge gained during the educational gathering.

This implementation of this guideline was not executed during this scholarly project but was planned for implementation in the future. If the surgical center and anesthesia group decided to implement this guideline in the future, it could be beneficial as the volume of this surgery continued to move from the inpatient setting. A pilot study could also be beneficial in evaluating the pros and cons of this guideline. In addition, it

would be possible to perform a retrospective review of surgeries and compare practices and outcomes before and after the guideline was proposed. This could be done in the future, as this scholarly project did not involve the collection of new data for this phase of the project.

Summary

The design of this scholarly project was based upon the evidence gained by blending empirical evidence, expert opinion from individuals that had buy-in in seeing the guideline succeed, and the evaluation of the guideline after it was in place. Anesthesia providers could use the guideline to clarify concerns before TKA was scheduled. Patient safety was improved as risk was decreased and fewer cases would be cancelled on the day of surgery due to the filtering process. The streamlined process could benefit all in the use of time, resources, and improvement in patient safety and satisfaction.

CHAPTER IV

RESULTS AND OUTCOMES

The goal of this DNP scholarly project was to create an anesthesia guideline for the preoperative evaluation of patients presenting for total knee arthroplasty in an outpatient surgery center. The purpose of this guideline was to ensure that patients who intended to have their TKA in an outpatient surgery center were medically suitable for TKA in the outpatient setting. The literature review conducted for this scholarly project demonstrated that there was not a specific guideline such as this available for anesthesia providers specifically. Producing a guideline to aid in the surgical center setting institutes uniformity and confirmed observance to evidence-based practices and should increase patient safety and improve patient outcomes.

To assess current practices in TKA, data were collected by means of a survey of topic experts that were actively practicing anesthesia providers. The data and results were collected from these providers at South Ogden Specialty Surgical Center (SOSSC). The outcomes of the opinion and practice of these experts were compiled for this scholarly project to gain insight into current practice. A survey of experts was also conducted for the purpose of needs assessment and to establish the necessity for this guideline. Once the this Needs Assessment was complete, a series of Delphi Surveys utilizing questions developed from the literature and expert opinion from the online survey was conducted. The questions were developed and focused by a practicing provider of anesthesia (the

author) in order to gain specific expert opinion regarding the contents and use of an anesthesia guideline for TKA in the outpatient setting.

The emphasis of this project was to bring expert opinion together into an organized guideline with the focus on results. Design of this guideline attempted to simplify the process of identifying patients that could safely have a TKA in an outpatient surgery center and filter those that should be done in a hospital setting.

Needs Assessment and Demographics Survey

The use of this survey focused on: (a) The demographics of the participants in order to confirm expert participation. (b) The development of proper questions for the first round of the Delphi Survey. (c) To establish that there was not a similar guideline available to providers. It fulfilled the goals of Objective One with the literature review. The assessment also allowed the author to determine provider characteristics in practice and how they matched with the present published literature. The survey was sent to participants via email using the online survey platform Survey Monkey®. Consent was confirmed in the opening statement of the survey. Completion of the survey consisted of consent per the approved Institutional Review Board (IRB) protocol.

Seven questions in the needs assessment of 12 ($n = 12$) practitioners were presented in order to gain insight into qualitative and descriptive data (Appendix B). The questions were directed at the practice, comfort, existing knowledge, education, and experience of providers. The needs assessment included anesthesia providers at SOSSC in Ogden, UT. Twelve providers were invited and encouraged to respond with 9 (75.0%) responding within 10 days. Of the 9 responses, 1 was female (11.1%), and 8 were male (88.9%). Those that were invited to participate were CRNAs (75.0%) and physician

anesthesiologists (25.0%) with 8 CRNAs responding (88.9%) and 1 physician anesthesiologist (11.1%) within 10 days.

The range of experience in the field of anesthesia was 11-25 years with a mean of 15.4 years of practice. The age range of respondents was from 30-59 years old. Eight out of nine (88.9%) individuals that responded to the survey stated that they had taken care of patients having TKA in the past year with 5 (55.6%) stating that they had cared for 20 or more patients having TKA in the past 12 months. Three of the questions were directed at needs assessment. Table 2 shows participants' awareness of a published guideline for preoperative anesthesia. Table 3 indicates the principle anesthesia concerns with performing a TKA in an ASC.

Table 2

Number of Providers Aware of Published Guideline

# of Responses	Response
Question One: Are you aware of a current published guideline written and used by anesthesia providers for patients having TKA in ASCs? Please reference articles if possible.	
5	No
1	I am not aware
1	Not in particular
2	No response

Table 3

Provider Concerns with Performing Total Knee Arthroscopy in Ambulatory Surgery Centers

Respondent	Answer
Question Two: In your expert opinion, what is (are) the principal anesthesia concern(s) as you evaluate a patient presenting to an ambulatory surgery center (ASC) for TKA?	
1	Obesity, co-morbidities, airway
2	Cardiac function, Post op pain control
3	Pain Control
4	Co-morbidities, safety, outcome
5	Elevated BMI, cardiac history, respiratory status
6	Coagulopathies, cardiopulmonary issues, chronic pain, frailty and BMI
7	Untreated obstructive sleep apnea
8	Obesity, heart health
9	Heart Disease, lung Disease

The third question focused on the anesthesia providers' general comfort level in providing anesthesia to a patient having TKA in an outpatient setting prior to the development of this guideline. The question asked: What is your level of comfort in providing anesthesia for patients having TKA in an outpatient setting? In Table 4, there were no responses to the option of *not so comfortable* or *very uncomfortable*. Therefore, the needs assessment confirmed that, in general, all providers responding (100.0%) were confident in taking care of the TKA patients in the ASC setting.

Table 4

Provider Level of Comfort in Performing Total Knee Arthroplasty in Ambulatory Surgery Centers

Answer Choices	# of Responses	Percent
Question Three: What is your level of comfort in providing anesthesia for patients having TKA in an outpatient setting?		
Extremely comfortable	4	44.4
Very comfortable	3	33.3
Comfortable	2	22.2
Not so comfortable	0	
Very uncomfortable	0	

Round One of the Delphi Survey

The first Delphi Survey was conducted to gain the consensus of expert opinion regarding the components for the guideline that would direct providers in the preoperative evaluation of patients in the ASC scheduled for TKA. The Delphi Survey method has been used to gain consensus among professionals in areas of insufficient or conflicting information (Hasson et al., 2000). The first round of this survey involved the collection of qualitative elements to assist in building the guideline. The early questions were established by the author by using evidence-based information gained from the needs assessment survey as well as thorough the literature review that was conducted in the early stages of this scholarly project. Anesthesia care for TKA in the hospital setting was also used to assist in the formulation of these questions.

Data Collection

This first round of the Delphi survey was made available to 12 participants ($n = 12$) through the use of the online SurveyMonkey® platform. The author of this scholarly project developed the questions to determine expert opinion in the following:

- 1 Determine the top three risk factors that would exclude a patient from having a TKA at an ASC.
- 2 Determine if ASA status factors in to whether or not a patient should have TKA in an ASC.
- 3 Determine if obstructive sleep apnea factor in to whether or not a patient should have TKA in an ASC.
- 4 Determine if BMI should be a factor in whether or not a patient should have TKA in an ASC.
- 5 Determine if a patient's ability to participate in physical therapy should factor into if a TKA should take place in an ASC.
- 6 Ranking of a list of preoperative concerns when evaluating a patient having TKA in an ASC.
- 7 Determine the influence that a surgeon has in the decision making of anesthesia providers.

Twelve individuals were asked to take part in the survey with 11 (91.7%) responding to the first round of questions. Of the 12 that were asked to participate, 3 were physician anesthesiologists and 9 were certified registered nurse anesthetists (CRNAs). Of the 11 that took part in the survey, 2 (18.2%) were physician anesthesiologists and 9 (81.8%) were CRNAs. All were deemed experts in the field of anesthesia through the use of the needs assessment with significant clinical experience (see Questions One through Four of Needs Assessment) with respondents having an average of 15.4 years of practice. The original invitation was sent by email to participants with a reminder sent 6 days later. Informed consent was provided for participants with the first survey (see Appendix C).

Question One

In your expert opinion, what are the top three risk factors that would exclude a patient from a total knee arthroplasty (TKA) at an ambulatory surgery center (ASC)?

Individual responses varied to this question. No information was found in the literature review so expert opinion was necessary for this topic. Of the 11 respondents, 9 specifically mentioned cardiopulmonary concerns, 8 addressed concerns related to obesity/sleep apnea, and 7 stated that coagulopathy would be a concern. Other concerns were addressed and were somewhat related to the top three negative interests that were polled. A summary of the results is presented in Table 5.

In comparing the results from Question One, it was apparent that the top three concerns for patients having TKA in an ASC (see Table 6). Other significant concerns were diabetes, smoking, chronic pain, frailty, lack of family support, and unstable angina. Several of these were addressed with other questions within the Delphi Survey. The top three concerns were definitely a part of any anesthetic delivered but the patient having this specific procedure (TKA) in this specific setting (ASC) displayed added trepidation and vigilance to assessing these comorbidities prior to surgery in an outpatient setting.

Table 5

Top Risk Factors from Experts for Performing Total Knee Arthroplasty in Outpatient Surgery Centers

Respondent	Answer
1	Unstable cardiac or pulmonary disease, central sleep apnea or untreated obstructive sleep apnea, clotting disorder.
2	Cardiovascular disease, uncontrolled diabetes, respiratory issues related to elevated BMI.
3	Obesity, smoking history, and heart disease.
4	Untreated obstructive sleep apnea, coronary artery disease with recent myocardial infarction, pulmonary hypertension and disease.
5	Elevated BMI, poorly controlled illness, coagulopathy.
6	Severe cardiac disease, morbid obesity, severe lung disease.
7	BMI over 50, chronic pain patient, frailty.
8	Obesity, coronary artery disease, age greater than 75.
9	BMI greater than 40, respiratory or cardiac disease, lack of family support.
10	Obesity, cardiac issues, respiratory issues.
11	Unstable angina, recent cardiovascular stent, severe lung disease.

Table 6

Top Three Risk Factors from Experts for Performing Total Knee Arthroplasty in Ambulatory Surgery Centers

	Concern	Percent
1	Cardiopulmonary disease	81.8
2	Obstructive sleep apnea related to Body Mass Index	72.7
3	Coagulopathy	63.6

Question Two

Does American Society of Anesthesiologists status (ASA status) factor in to whether or not a patient should have TKR in an ASC or hospital?

Most responses were against having higher ASA patients scheduled for TKA at ASCs or indifferent regarding this question with several stating something similar to, “it depends.” The following responses were obtained from 11 of the participants (see Table 7). A complete explanation of ASA status from the American Society of Anesthesiologists is provided in Appendix D. The significant message from this question was that ASA status was a considerable factor in approving a patient for TKA in an ASC but should not be the only focus. This correlated with the current literature. In analysis of the responses, 6 (54.5%) stated that ASA was a factor and 5 (45.5%) answer in some form of “it depends.”

Table 7

American Society of Anesthesiologist Classification System Factors into Performing Total Knee Arthroplasty in Ambulatory Surgery Centers

Respondent	Answer
1	ASA III would indicate that patient is not optimized
2	Yes, ASA status is related to potential for intraoperative issues or increased issues immediately post-operative or after discharge.
3	Not really, ASA is based on other more important information. Consider that rather than the ASA status.
4	Depends on the patient.
5	Yes, patients with an increased ASA status of IV should probably be done in the hospital.
6	Not necessarily. ASA 3 patients have a wide range of co-morbidities. Some are suited to ASCs and some are not.
7	Only an ASA 4 should be sent to the hospital. All lower ASA are reasonable.
8	No, it is dependent upon the types of systemic diseases that make a patient an ASA greater than or equal to a 3. Although, a patient with an ASA rating of 4 should definitely not be at an ASC.
9	Yes, you can expect someone with an ASA > 3 to need long term care.
10	Yes, ASA plus other factors could restrict the patient from having surgery in an ASC.
11	No OSA BMI > 40 can still be done at an ASC (this is being done at bariatric centers).

Question Three

Does untreated sleep apnea factor in to whether or not a patient should have TKR in an ASC or hospital?

The responses to this question were quite varied as there was a wide range of understanding and variable subjective data on obstructive sleep apnea. The current literature presented this topic in a nebulous manner, so this was to be expected (Urman, Chung, & Gan, 2019). Six (54.5%) of the participants believed that untreated sleep apnea was a factor with the comments used to support their argument (see Tables 8 and 9). Five (45.5%) of the participants reasoned that untreated sleep apnea should not factor in the decision to approve of TKA at an ASC or have less of an impact on the decision to go forward.

Table 8

Expert Comments that Untreated Sleep Apnea is a Factor in Total Knee Arthroplasty in Ambulatory Surgery Centers

Respondent	Answer
1	Yes, should be observed overnight at least.
2	Yes, related to risk of increased intra-op and post-op issues.
3	Yes, it does. It's riskier, and that risk should be weighed against the ASC's acceptable risk level.
4	Yes, unknown response to narcotics and OSA.
5	Yes, need for narcotic use at home immediately following surgery places these patients at greater risk. Time in the hospital to treat pain while monitored is often helpful.
6	Yes, untreated sleep apnea will likely require overnight observation.

Table 9

Experts Comment that Sleep Apnea is not a Factor in Total Knee Arthroplasty in Ambulatory Surgery Centers

Respondent	Answer
7	Not necessarily, if lower narcotic and peripheral regional are done, the patient should do better.
8	No, evidence doesn't support not doing it for these patients. Especially when done under spinal anesthetic.
9	No, not if it is the only risk factor.
10	No, we use a lot of regional anesthesia so we can minimize the effects of sleep apnea.
11	No, OSA without a known difficult airway is not high risk, and multimodal anesthesia can decrease the OSA risk.

The literature supported the participants hesitancy to make OSA a major issue in this decision process. At best, it could be made part of the guideline.

Question Four

Does BMI factor into whether or not a patient should have TKR in an ASC or hospital?

While the answers had slight variations from one another, all of the participants (100.0%) mentioned the need to use BMI as a factor within the guideline. The current literature supported this reaction. The following comments were made in response to this question.

Baker et al. (2012) stated that, “improvements in patient-reported outcome measures experienced by patients following outpatient TKA are similar irrespective of body mass index,” and that “obese patients should not be excluded from total knee arthroplasty, given that their overall improvements were equivalent to those of patients

with a lower body mass index” (p. 1502). In addition to these findings, Kort, Bemelmans, Van der Kuy, Jansen, and Schotanus (2016) stated that, “patients with a high body mass index ($> 40 \text{ m}^2/\text{kg}$) should be considered to be excluded” from TKA in an ASC “due to a greater risk for deep infection and revision surgery” (p. 328).

The current literature along with the Delphi survey pointed the guideline toward creating a definitive exclusion criterion for increased BMI along with taking into consideration other comorbidities. The results of respondents in Table 10 indicated the need to make it a factor with a definite limit.

Table 10

Expert Opinion on Body Mass Index and Total Knee Arthroplasty in Ambulatory Surgery Centers

Respondent	Answer
1	Yes, if it factors into the weight bearing ability in the immediate post-operative period.
2	Yes, I would expect the comorbidities that go along with a BMI > 40 to require overnight observation.
3	Yes, if the BMI is to great additional equipment is needed. We evaluate all patients on an individual basis with an elevated BMI.
4	Yes, BMI > 40 should be evaluated closer to see if they are a candidate.
5	Yes, over 50 carries higher chance of postoperative complications.
6	Yes, ASCs are not usually equipped to deal with these patients.
7	Yes, higher risk for post op, intra op, complications.
8	Yes, but depends on the pt. Absolute cutoff 50.
9	Yes, it does. High BMI means much more risk, and that risk should be weighed against the ASC's acceptable risk level.
10	Increased BMI leads to increased comorbidities and increased intra op and post op concerns.
11	BMI along with co-morbidities should be evaluated.

Questions Five

Should the patient's ability to take part in physical therapy and care for themselves postoperatively determine if a TKA should take place in an ASC?

Of the 11 respondents, 2 (18.2%) were not convinced that the patient's ability to take part in their postoperative therapy was necessary. They deferred to the physical therapy provided by the surgery center and rehabilitation centers.

Nine (81.8%) of the respondents were resolute that the patient should be able and willing to take part in their postoperative therapy in order to have a TKA in an ASC.

Their comments included:

Support at home (partner or relative) during the first days after surgery and a positive home environment would be beneficial to patients discharged early following TKA. Preparing patient's for early discharge prior to the day of surgery and ensuring those that need added support had either resident rehabilitation resources or moving them to a hospital setting could be a valuable part of a preoperative anesthesia guideline.

Preventing patients from slipping through the cracks the day of surgery was optimal.

Table 11 displays the importance of a supportive environment following TKA in an ASC.

Table 11

Expert Opinion on Postoperative Support and Therapy Necessity for Total Knee Arthroplasty in Ambulatory Surgery Centers

Respondent	Answer
1	Yes, therapy in the ASC or not at all.
2	Motivation for recovery should be assessed and considered.
3	Yes, but I think that should be evaluated by the surgeon.
4	Absolutely. Should be part of preop assessment by RN.
5	Yes, patients who are less likely to participate in their own care are not good candidates to release directly to their homes.
6	Yes, frailty (specifically inability to move without assistance) will decrease likelihood of same day discharge. Also, should cause discussion on surgery for such patients to begin with.
7	Yes, a pts ability to be self-mobile should be high on the list of determining if they qualify for ASC TKR.
8	Yes, I would expect the family to take part in patient recovery care
9	Yes, they may need additional days in the hospital for recovery.

Question Six

In your expert opinion, please rank the following in order of highest concern (highest concern = 1) when evaluating a patient having TKA in an ASC.

The options were given in alphabetical order and then sorted with greatest emphasis being placed on the highest ranked concern. Figure 2 displays the highest concern of anesthesia providers when assessing patients presenting to an ASC for TKA.

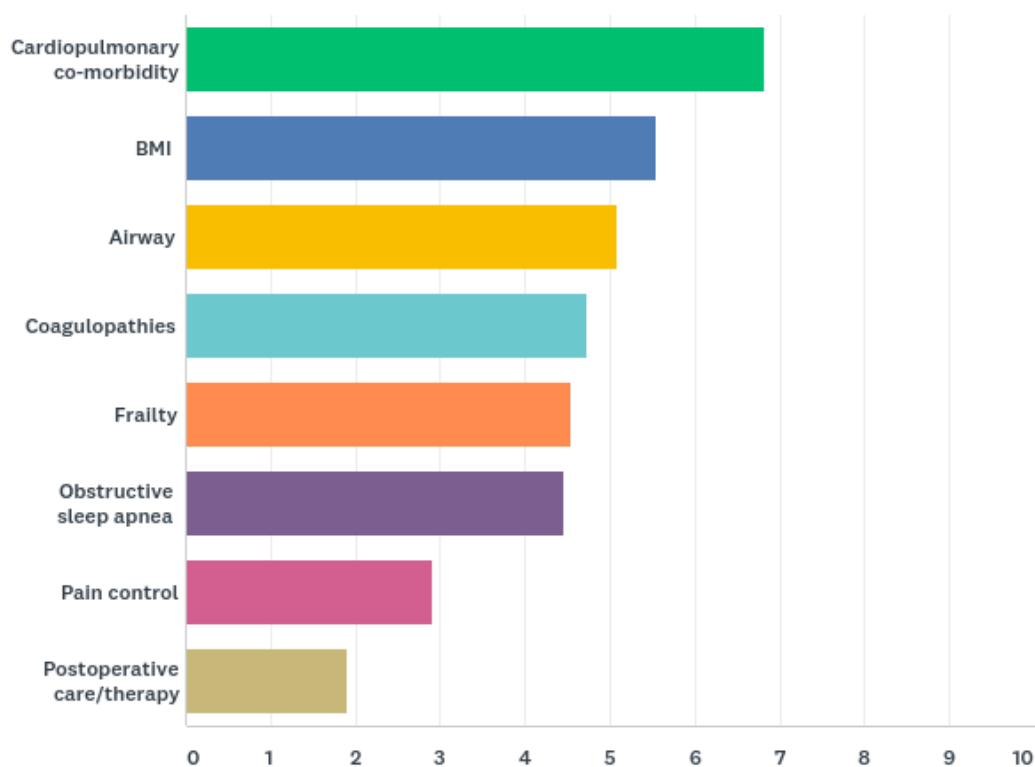


Figure 2. Expert co-morbidity concerns with total knee arthroplasty in ambulatory surgery centers.

As analyzed in the literature review, various co-morbidities and anesthesia concerns were factored into the anesthesia preoperative evaluation. Question Six aimed to determine which would be prioritized by providers. Seven of the participants ranked cardiopulmonary co-morbidity with a number one or two (64.0%). Surprisingly, BMI received a one or two ranking by five (45.5%) of the experts. The third highest ranking was airway with four placing emphasis on this concern in the top two. These results continued to clarify the picture of what the preoperative guideline should include and emphasize.

Question Seven

On a scale of 0 to 10, how would an orthopedic surgeon's pressure to perform TKA in an ASC on a patient that is borderline eligible factor into your decision to approve anesthesia?

Only 10 of the 11 participants that took part in the survey opted to answer this question with one individual preferring to circumvent. The purpose of this question was to gauge how much influence a surgeon had in the decision-making process of the anesthesia provider. If both providers did not agree, it could become a source of contention. See results for this question in Table 12.

Table 12

The Influence of Orthopedic Surgeons on the Decision to Approve Total Knee Arthroplasty in Outpatient Surgery Centers

Scale	Influence	Number	Percent
0 to 3	Little	4	40%
3 to 7	Medium	5	50%
7 to 10	Significant	1	10%

Only one person reasoned that a surgeon had significant influence on their decision-making process. As a rule, the anesthesia provider has the final say in whether or not they could provide a safe anesthetic for each patient. When there was a question of appropriateness, the surgeon and the anesthesia provider consult together in order to come up with a solution that would work best for each individual patient after risks and benefits were calculated.

Objective Two

The second objective of this scholarly project was to develop a preoperative inclusion criteria guideline for clinical practice and specifically for the anesthesia providers at South Ogden Specialty Surgical Center. In this guideline, anesthesia providers would have direction as patients present to ASCs for TKA. A second Delphi Study was conducted to obtain consensus of experts. The author defined consensus as an agreement of 70.0% or greater for each question. The literature was also used in conjunction with the expert opinion to incorporate the two into a broad guideline for clinical use. The Stetler model was also used at this point. Phase IV, which was translation/application, was satisfied with the completion of this part of the project.

Round Two of the Delphi Survey

A second round of Delphi questions was used to determine consensus and various components of the guideline would be developed. Collection for this was quantitative with an expert opinion agreement of 70.0% being the goal. This round of data collection led to the final version of the anesthesia guideline which would then be presented to the providers at South Ogden Specialty Surgical Center.

Data Collection

The second round of the Delphi survey contained seven questions in an agree/disagree format. The expert replied from the first round of Delphi questions guided the development of the questions for the second round of the survey. The same 12 individuals were asked to participate. The second round again generated a 91.7% response rate with 11 of the 12 individuals taking part in the survey. The respondents

consisted of 1 physician anesthesiologist and 10 CRNAs with demographic data being the same as described earlier.

SurveyMonkey® was the platform used once again in order to present and obtain results. The survey was delivered via email to participants with the final responses being collected 5 days later and the survey being closed. No reminder was sent via email, but personal invitations were given to individuals as they were casually met in the clinical setting. Since consent was provided prior, it was carried over to the second round as these were in close sequence to one another, within 2 weeks. The participants were asked the following agree/disagree questions in round two to develop this clinical guideline:

- 1 Considerable risk factors that could exclude a patient from having a total knee arthroplasty (TKA) at an ambulatory surgery center (ASC) are most likely: A. Cardiopulmonary disease B. BMI/Morbid Obesity C. Coagulopathy.
- 2 ASA patient status is a considerable factor in approving a patient for TKA in an ASC.
- 3 When obstructive sleep apnea (OSA) is diagnosed, or a possibility, in a patient having TKA at an ASC, anesthesia clearance is likely with specific technique (example: avoid medications that suppress respiratory function and the use of regional anesthesia).
- 4 As a general rule, a patient with a BMI > 50 should likely be excluded from TKA in an ASC.
- 5 A patient that does not have adequate support at home and does not demonstrate the ability to participate in postoperative physical therapy should not have a TKA at an ASC.
- 6 It is good practice to follow up the next day on a patient having TKA in an ASC to track positive/negative anesthesia outcomes.
- 7 Orthopedic surgeon input has basic influence on the approval of a patient that is borderline eligible for TKA in an ASC. The essential approval of anesthesia should come from the anesthesia provider.

Question one. (Considerable risk factors that could exclude a patient from having a total knee arthroplasty [TKA] at an ambulatory surgery center [ASC] are most likely: A. Cardiopulmonary disease B. BMI/Morbid Obesity C. Coagulopathy.) Assessment of health and risk factors have often been part of an anesthesia preoperative evaluation. Through the use of the Delphi survey combined with the literature, these three should be specifically addressed carefully for this type of surgery in this setting. In the survey, 10 (90.9%) of respondents were in agreement. One comment was made following the question saying, “Though each of these is possible there are many patients with stable disease that are good candidates.”

Question two. (ASA patient status is a considerable factor in approving a patient for TKA in an ASC.) The literature was variable in the assessment of ASA status and surgical outcome specifically with TKA (Meneghini, Ziembra-Davis, Ishmael, Kuzma, & Caccavallo, 2017). Standard ASA classification guidelines are listed in Appendix D. In the group of expert opinion, 8 (72.7%) of the 11 individuals agreed that ASA status was a considerable factor in approving TKA in an ASC. The following comments accompany this question:

- ASA 3 are usually safe and do well. ASA 4 should be in hospital.
- ASA is certainly a factor but I don't believe it is a considerable factor. ASA 3 patients can have a wide range of issues. Some prohibitive and some not.

- ASA score is not correlated directly with post anesthesia outcome.
- Depends on specific comorbidities.

This classification system was used as a general guide in anesthesia preoperative evaluation. When a TKA was to be performed in an ASC, ASA status could serve as a considerable factor in approving the patient for surgery. The practitioner should be familiar with the details of the classification and when/if an ASA IV was proposed for surgery in an outpatient setting, considerable investigation should be completed with the inclination to move surgery to the hospital. Patients presenting with an ASA III classification could fall in the middle and investigation should determine if the surgery should go forward. The classification of ASA II and below could generally be approved for surgery. The literature and Delphi survey suggested that ASA classification could not be used unaided but could be a considerable factor in the guideline.

Question three. (When obstructive sleep apnea [OSA] is diagnosed, or a possibility, in a patient having TKA at an ASC, anesthesia clearance is likely with specific technique [example: avoid medications that suppress respiratory function & the use of regional anesthesia].) This question aimed to seek clarification regarding OSA and the preoperative approval of anesthesia. Ten (90.9%) participants agreed with the statement on OSA. Two comments were given with this question. One referred to comorbidities and the other stated that this question could be applied to a variety of cases, not just TKA in an ASC. Both statements were valid but did not change this part of the guideline proposal.

Question four. (As a general rule, a patient with a BMI > 50 should likely be excluded from TKA in an ASC.) This question attempted to make clear cutoff regarding

the size of a patient having surgery. All of the participants (100.0%) of the participants agreed with this general rule. The literature demonstrated that there was no statistical difference in complication rates in patients undergoing TKA across BMI categories. In fact, being severely or morbidly obese did not increase complications in TKA. That being said, TKA in the super-obese (BMI > 50 kg/m²) patient indicated inferior outcomes (Eldar & Eldar, 2018). More data should be available before this class of patients was attempted at an ASC. Additional resources at bariatric centers or hospitals may be a suitable solution.

Question five. (A patient that does not have adequate support at home and does not demonstrate the ability to participate in postoperative physical therapy should not have a TKA at an ASC.) This question was presented in order to have postoperative care part of the preoperative guideline. This issue was presented in the needs assessment done prior to the Delphi surveys. In this question, 10 (90.9%) of the 11 participants agreed that adequate support at home was important if this type of surgery was moved from the hospital to the ASC. Inadequate support at home should be a good reason for moving a TKA to the hospital setting where they could be under the care of health care professionals for more than the immediate postoperative time.

Question six. (It is good practice to follow up the next day on a patient having TKA in an ASC to track positive/negative anesthesia outcomes.) All 11 (100.0%) of those surveyed agreed with this statement. This element of the guideline should absolutely be included within the guideline.

Question seven. (Orthopedic surgeon input has basic influence on the approval of a patient that is borderline eligible for TKA in an ASC. The essential approval of

anesthesia should come from the anesthesia provider.) Once again, the agreement with this statement was unanimous with the 11 participants (100.0%). The guideline should address the amount of influence that the orthopedic surgeon had upon the decision to perform the surgery in an outpatient setting. If there was sufficient reasoning to move the surgery to a hospital but the influence of a surgeon kept the surgery at the ASC, this should be addressed to ultimately ensure that the safety of the patient was highest priority. This information was subjective and may vary by anesthesia provider but should be addressed regardless.

Guideline Development

The construction of the guideline (see Appendix E) for use in preoperative evaluation of patients presenting to ASCs for TKA incorporated all of the steps of the Stetler Model framework.

Phase I Preparation

Phase II Validation

Phase III Comparative evaluation/decision making

Phase IV Translation/application

The author of this scholarly project made this guideline by gathering evidence through literature review, incorporating the initial needs survey, and using the Delphi Survey method of expert opinion. Agreement was obtained through a 70.0% (or greater) consensus on the properties of the guideline so additional rounds of the Delphi survey were not needed. Once the guideline was successfully created, application was prepared for a presentation. A PowerPoint presentation was developed for the practitioners at South Ogden Specialty Surgical Center.

Objective Three

Objective Three was achieved with the delivery of an educational in-service to the providers at South Ogden Specialty Surgical Center. The presentation was developed and presented by the author of this scholarly project in the education room at the surgical center. It consisted of a presentation using a PowerPoint format and handouts. The presentation incorporated the review of background information, highlights of the current literature, and the development and distribution of the guideline. All factors of the guideline were discussed, and questions were answered. Five providers were present at this in-service which was average attendance at the monthly meeting. No other specialties or parties of interest were present for the meeting.

Outcomes

At the time of the in-service, the providers were asked to take a pre-test and post-test. This assessment test was given before and after the presentation to determine the providers' knowledge regarding the preoperative evaluation of TKA patients in the ASC and specific components that would be included in the guideline. The author passed out the pre-test before the presentation and collected the responses. The same questions were handed out after the presentation for a post-test assessment, with one extra question being presented on the post-test. The tests consisted of the following questions:

1. Most Total Knee Arthroplasties (TKA) in the United States can be performed in an Ambulatory Surgery Center (ASC): True/False
2. According to expert opinion, what are the top three concerns when assessing a patient having TKA in an ASC?
Answer: _____

3. Risk factor(s) for extended stay following a TKA in an ASC would include: (circle all that apply) (a) Patient with BMI > 50 (b) Patient with OSA (c) Multiple comorbidities (d) Lack of support at home
4. ASA status determines suitability to perform TKA in an ASC: True/False
5. What is the probability of integrating this guideline into your current practice? Likely/Unlikely

There was a 100.0% response rate with the five attendees, both pre- and post-tests were completed. All responses remained anonymous. The results were compared and averaged to the pre- and post-test results. The average score of the pre-test was 76.0% with Question Two the most likely to be missed (only one attendee answered correctly). The average score of the post-test was 96.0% with only one individual missing Question Two. With an increase in the average of 20.0%, the in-service was labeled a success. The author would have liked to have more individuals take part in the in-service, but the attendance was average for the group and schedules were variable for those invited to attend.

The Future Use of This Guideline

The final question on the post-test asked participants to indicate their likelihood of incorporating the presented guideline into their anesthesia practice. The question was: What is the probability of integrating this guideline into your current practice? Likely/unlikely. All (100.0%) participants indicated that they would *likely* use this guideline in their practice.

Key Facilitators and Key Barriers to Project Objectives

Facilitators

Several key individuals helped in the completion and the success of this scholarly project. The initial proposal and the first objective which consisted of the literature review, needs assessment, and the first round of the Delphi study was supported tremendously by the graduate student's committee, the clinicians that took part, and key individuals at South Ogden Specialty Surgical Center. Specifically, the research advisor was a fundamental part of the success of the proposal and the scholarly project. The support of the administrator at South Ogden Specialty Surgical Center was also a key to the success of this project.

Another large part of this project was the support of the clinical staff that took part in the Delphi surveys and other parts of this scholarly project. Their constant encouragement and questions about the progress of this project helped the author remain motivated and on task. The second objective of this project would not have been possible without the help of these providers. The members of the anesthesia group that the project was intended for helped keep the author see the importance of the work that was to be done and the benefit it would be to patients, practitioners, and the surgical center.

The administrator and staff at South Ogden Specialty Surgical Center also facilitated the completion of Objective Three. The scheduling of meetings and help with presentation space was greatly appreciated and assisted by the help of several individuals. Ample space, allocated time, and the use of their technology resources were provided to the author for the success of the presentation with the pre/post testing and evaluation of the providers. The author was deeply grateful for those that freely gave of their time and

talents for success of this project. Many individuals from several specialties were interested in the subject matter and helped keep the author stay motivated to complete the scholarly project.

Barriers

Multiple challenging demands for anesthesia providers' time were often the reason for delayed response to surveys and participation in the guideline presentation with pre/post-test evaluation. In the end, there was a very high participation in the two Delphi surveys because they were delivered through SurveyMonkey and providers could take part at their convenience. With reminders, the participation was eventually satisfactory.

An increase in attendance at the presentation of the guideline would have been optimal for better evaluation of the guideline and the assessment of its likelihood of use. For the most part, barriers were minimal, and the scholarly project was supported by facilities, individuals, and key stakeholders.

Unintended Consequences

Positive unintended consequences of this project included the author's understanding of the complexities of formulating a guideline for clinical practice. The author received strength in their reasoning for the practical recommendations in the use of this guideline in the clinical setting. The uniting of providers behind the use of a guideline was surprising with abundant support in the completion of the scholarly project to help the surgical center. I could see this movement help motivate positive change in other parts of this anesthesia practice and in the environment of the surgical center. Another unintended consequence was the uniting of specialties and the interest in the

development of this guideline by nurses, physician assistants, surgeons, and the administration of the surgical center. There were no apparent negative unintended consequences.

CHAPTER V

RECOMMENDATIONS AND IMPLICATIONS FOR PRACTICE

The lack of consistency and direction due to the absence of a guideline for TKA in the outpatient setting has led to the need, creation, and evolution of this scholarly project. The Needs survey, Delphi studies, and the support of literature review led the author along in the formation of this guideline. A lack of consistency and the deficiency of an evaluation tool could result in the unnecessary cancellation of surgery due to the need to move it to the hospital and the missed opportunity of moving a surgery from a hospital to an ASC. Thus, the recommendations within this guideline could benefit patients, health care systems, and anesthesia providers as they use it in their practice.

The resulting recommendations and implications for practice have pointed to the purpose of this scholarly project which was to translate evidence-based literature into practice in the form of a guideline for anesthesia providers to use as patients present to an outpatient surgery center for TKA. A systematic approach in the form of a guideline was necessary to ensure that various components of this type of surgery in this setting were addressed and these patients were managed properly. The guideline was made to ensure quality and consistency in this patient population. This guideline was a scholarly, inclusive, evidence-based, quality-improving project that used the Stetler Model as a guide to assist practitioners specifically at South Ogden Specialty Surgical Center

(SOSSC) and could be available as a resource and guide to other centers as TKA was moved out of hospitals and into the outpatient setting.

Recommendation for Guideline Implementation and Evaluation

The author believed that this project could continue to be expanded and developed. After this scholarly project was completed, it would be beneficial for the guideline to be further implemented into practice at SOSSC. The results of the pre/post-tests, Delphi surveys, and Needs Assessment indicated the need to continue the implementation of this guideline into practice. The production of this guideline allowed providers to understand and implement evidence-based practices that were validated by experts in the field of anesthesia as well as supported by the current literature.

To implement this guideline into practice successfully, the author of this scholarly project recommends that additional steps occur to fulfill a wider purpose. Initially, the current anesthesia providers at SOSSC should review and approve the presented guideline so that it would be more fully acceptable and usable to the group in this facility. Suggestions to edit the guideline could be presented and considered. Then, consensus among the providers can be obtained as they examine the guideline and agree upon detailed components to include or exclude. The guideline could continue to be customized for the use in this specific group which would further help it become an important part of their practice as more providers have a vested interest.

When approval of the guideline becomes standard, it could then be included with each individual packet specific for TKA in SOSSC. Having the guideline integrated into this packet would place the information in front of the anesthesia provider each time a surgery for TKA was scheduled and could increase its consistent use.

The stated vision of SOSSC was, “An organization which is committed to creating a center of excellence by using innovation and the latest developments in health care” (southogdensc.com). This project and its continued use could help to fulfill this vision by ensuring that the anesthesia providers have a systematic approach for this population of patient in this setting. Additionally, raising the awareness that this guideline was in place could remind surgeons and those that decide where a surgery would take place that the anesthesia care was organized with a system in place to carefully evaluate patients. Providers could be informed, united, and confident in their preoperative evaluation and urge orthopedic surgeons, which may be wary of moving this population to the ASC, to see the benefits of bringing TKA to an ASC.

Recommended Evaluations

A post-implementation assessment could take place after the pilot study had been concluded. The author of this scholarly project advises that the guideline be evaluated for at least four months in order to adequately determine its usefulness. At the conclusion of this pilot study:

1. A retrospective chart review could be examined to determine the usage or noncompliance of the guideline.
2. A survey of anesthesia providers could be completed to measure the providers perception of usefulness of the guideline.

These evaluations could determine utility, advantages, disadvantages, and barriers to implementation. The author suggested that all TKAs at the surgery center be evaluated over this time period and all providers used in the previous surveys be included in the pilot study. The post-implementation assessment could be completed in the same fashion

as prior surveys. This assessment could include questions regarding perceived barriers, proposed needed changes, and adjustments to the guideline. Together the chart review and post-implementation questionnaire could give a clear view of the usefulness of this guideline.

Application of Project in Other Settings

When the pilot study has been completed and evaluated successfully, SOSSC may choose to apply the guideline for long-term practice. It could also be used at its associated ACS in Salt Lake City, Utah, where they have been considering beginning TKA. This scenario has continued to be evolving in the domain of surgery and anesthesia. For this purpose, the author would authorize the use of this guideline in other facilities.

Implementation of an anesthesia guideline to facilitate the preoperative evaluation of the TKA patient in ASCs could contribute to the well-being and consideration of this special population of patients as well as prepare the providers for the shift of this type of surgery to an outpatient setting.

It has also been suggested that the development and implementation of the guideline be presented at the annual meeting of the Utah Association of Nurse Anesthetists held in January of 2021. The leadership of the state organization has suggested that it be part of the presentations on clinical research in the main meeting. This would allow the work completed by the student for SOSSC to be looked at and possibly utilized in other parts of the State of Utah by practitioners seeking guidance with preoperative evaluation of the TKA patient in ASCs.

Westminster College in Salt Lake City, Utah, was a liberal arts college with a Master of Science in Nurse Anesthesia (MSNA) graduate program serving the anesthesia

health care needs of Utah and the intermountain west. It was the only CRNA program in Utah and one of only several programs in the western United States. The author of this scholarly project would be delighted to present the contents of this project as well as the journey of a DNP student to the students at the college. Due to the authors' connection at the college with a history as a professor in the MSNA program, it would be proper to present this information for educational purposes.

Personal Goals and Contributions

One of the specific goals of the author was to positively incorporate the knowledge and understanding learned through this DNP program into this scholarly project. Applying quality of care and evidence-based practice to a broader community of patients rather than an individual has been a learning experience. This process has permitted the author to excel as a leader and translate current literature combined with the use of expert knowledge and experience into evidence-based practice in an area where there was a recognized deficiency of organization and knowledge. Through adversity, the author needed to take the role of a leader with sureness and readiness into the role of a Doctor of Nursing Practice.

Another goal of the author was to seek to be a resource to ambulatory surgery centers and anesthesia groups in the establishment of TKA programs in ASCs. Through the use of social media, the work of a DNP can be broadcasted to many in a short amount of time. There has already been an interest in the guideline by groups that have contacted the author through social media. The author wishes to be a resource to any interested group that would be looking to improve patient care and organization in this area.

American Association of Colleges of Nursing Criteria for Doctor of Nursing Practice

The role of a DNP prepared individual requires essential competencies and fundamentals. The American Association of Colleges of Nursing provides direction in criteria that can evaluate a DNP project. “The project should address a complex practice, process, or systems problem in the practice setting, and use evidence to improve practice (Waldrop, Caruso, Fuchs, & Hypes, 2014, p. 301). Five principles proposed by the AACN are denoted by acronym AC as PIE (E = Enhances; C = Culmination; P = Partnerships; I = Implements; E = Evaluates). The EC a PIE criterion was met as described in the following:

Enhances. This criterion for assessment is displayed in how the scholarly project has the potential to improve the organization and flow of care at South Ogden Specialty Surgical Center. The focus of a guideline for preoperative assessment where direction is not available upon a new situation has the potential to improve patient care. The use of evidence-based practice through literature review and Delphi Study lead to the production of a guideline. This guideline could assist practitioners in the decision-making process of approving TKA in the outpatient setting. Implementation of this guideline can potentially improve patient outcomes and care.

Culmination. As the DNP student committed to the research and progress of this guideline, developing a solution to this specific problem culminated in the advanced knowledge that comes from committed progress and completion of the project. The knowledge became practical and applicable to the real-world setting. The guideline has been produced at a time when it can be useful as TKA continues to shift to ASCs.

Partnerships. Developing relationships and collaborations are vital in bring together interdisciplinary and professional groups. When professional groups work together for the improvement of patient care more stakeholders have a buy-in. As the DNP student worked with the facility and its practitioners there was a significant movement that took place in the enhancement of patient care. One project can lead to other improvements and new concepts in other disciplines. In addition, the panel of experts gave valuable feedback for enhancing the guideline and this group of anesthesia providers was able to come together for a worthy reason leading to strong bonds.

Implements. When the evidence is applied into practice, the project becomes meaningful and more comprehensive. The systematic development of the guideline and its positive acceptance by clinical practitioners made the guideline more valuable. This was evaluated in the pre/post-test in-service and the guideline was warmly accepted by those present. Its usefulness was evaluated with positive feedback and will continue to evolve into a valuable tool.

Evaluates. The feedback from experts in the final in-service was mostly positive. The guideline helped them see the holes in the preoperative evaluation for TKA in the outpatient setting. At the time of the in-service, there were no changes to the guideline that were proposed but ongoing evaluation may result in updated versions as continued evaluation of the guideline is anticipated outside the researcher's scholarly project.

Summary

The development of this guideline for the preoperative assessment of the TKA patient in the outpatient setting was an important health-care development. Recommendations for the perpetuation, development, and evaluation of this scholarly

project have been described. The use of this guideline would ensure providers have a valuable resource to help patients in this special circumstance. As TKA in the outpatient setting continues to evolve and increase, the work completed with this project would only become more relevant.

Much effort was given and many steps taken to produce a guideline that was supported by the literature, produced by expert opinion, and applicable to anesthesia practice. The scholarly project identified a need and produced valuable evidence-based information utilizing literature review, needs assessment survey, Delphi survey, a pre/post-test educational in-service, and a proposed evaluation of the guideline at a future date. If application of the guideline proves to be successful as indicated by its use and resulted benefit in patient care, this guideline might also be piloted in other specialized surgeries that seek to be moved to outpatient setting such as total hip arthroplasty, thyroidectomy, and discectomy/laminectomy.

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APPENDIX A
INSTITUTIONAL REVIEW BOARD APPROVAL



Institutional Review Board

DATE: December 18, 2019

TO: Richard Torman, DNP
FROM: University of Northern Colorado (UNCO) IRB

PROJECT TITLE: [1519281-1] Anesthesia Preoperative Inclusion Criteria for Total Knee Replacement in Ambulatory Surgery Centers: A Clinical Practice Guideline

SUBMISSION TYPE: New Project

ACTION: APPROVAL/VERIFICATION OF EXEMPT STATUS

DECISION DATE: December 18, 2019

EXPIRATION DATE: December 18, 2023

Thank you for your submission of New Project materials for this project. The University of Northern Colorado (UNCO) IRB approves this project and verifies its status as EXEMPT according to federal IRB regulations.

We will retain a copy of this correspondence within our records for a duration of 4 years.

If you have any questions, please contact Nicole Morse at 970-351-1910 or nicole.morse@unco.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.

APPENDIX B
NEEDS ASSESSMENT QUESTIONS

Needs Assessment & Demographics TKA in the ASC

1. Which category below includes your age?

- 21-29
- 30-39
- 40-49
- Other (please specify)
- 50-59
- 60 or older

2. How many years have you been an anesthesia provider?

3. What is the highest level of education you have completed or the highest degree you have received?

- Bachelor degree
- Graduate degree
- Doctorate degree
- Other (please specify)
- Doctor of medicine
- Doctor of osteopathic medicine
- PhD

4. In the past year, approximately how many patients have you provided anesthesia for during total knee arthroplasty (TKA)?

- Zero
- 1-10
- 11-20
- Other (please specify)
- 21-30
- More than 30

5. In your opinion, what is(are) the principal anesthesia concern(s) as you evaluate a patient presenting to an ambulatory surgery center (ASC) for TKA?

6. Are you aware of a current published guideline written and used by anesthesia providers for patients having TKA in ASC's? Please reference articles in comment box.

7. What is your level of comfort in providing anesthesia for patients having TKA in an outpatient setting?

- Extremely comfortable
- Very comfortable
- Comfortable
- Other (please specify)
- Not so comfortable
- Very uncomfortable

APPENDIX C
INFORMED CONSENT



CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF NORTHERN COLORADO

Project Title: Anesthesia Preoperative Inclusion Criteria for Total Knee Replacement in Ambulatory Surgery Centers: A Clinical Practice Guideline.
Researcher: R. Chris Torman, School of Nursing (DNP)
Phone Number: (xx) xxx-xxx
e-mail: torm9912@bears.unco.edu

I am researching inclusion criteria for total knee arthroplasty for a doctorate degree in nursing practice. As a participant in this research, you will be asked to take a preliminary survey followed by two to three short Delphi questionnaires. These will be delivered to you electronically. The questionnaires will consist of open-ended and/or multiple-choice questions and will assess your experience and opinion concerning total knee replacement (TKR) in outpatient surgery centers. The survey and questionnaires should take approximately 10-20 minutes to complete. At the end of this scholarly project, you will be asked to provide some feedback about the compiled guideline.

For the survey and questionnaires, you will not provide your name, but will be asked to provide information about your experience and comfort caring for patients having TKR. Your responses will be anonymous. Only the researcher and the other course instructors will examine individual responses. Survey and questionnaire responses will be made examined, common practices sought, and the consensus of expert opinion will be studied. Results of the project will be presented in group form only (e.g., averages) and all original information will be secured on a password encrypted laptop computer

Risks to you are minimal. The taking of this survey and questionnaire will have no bearing on your practice of anesthesia. This study and can help you understand the current evidence-based practice and expert consensus in this specialty. Other benefits could be that taking part in a scholarly project can help other providers in their practices.

Participation is voluntary. You may decide not to participate in this study, or you may begin participation and decide to stop or withdraw at any time. Your decision will be respected. Please take your time to read and thoroughly review this document and decide whether you would like to participate in this scholarly project. If you decide to participate, your completion of the research procedures indicates your consent. Please keep or print this form for your records. If you have any concerns about your selection or treatment as a research participant, please contact Nicole Morse, Office of Research, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-1910; nicole.morse@unco.edu.

Participant's Full Name/Signature

Date

Researcher's Full Name/Signature

Date

APPENDIX D
AMERICAN SOCIETY OF ANESTHESIOLOGISTS GUIDE

ASA PHYSICAL STATUS CLASSIFICATION SYSTEM

Last approved by the ASA House of Delegates on October 15, 2014

Table 1: Current definitions (NO CHANGE) and Examples (NEW)

ASA PS Classification	Definition	Examples, including, but not limited to:
ASA I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30<BMI<40), well-controlled DM/HTN, mild lung disease
ASA III	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to): recent (<3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis
ASA V	A moribund patient who is not expected to survive without the operation	Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes	

*The addition of "E" denotes Emergency surgery:
 (An emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or body part)

APPENDIX E
ANESTHESIA PREOPERATIVE EVALUATION
GUIDELINE

Patient Sticker

Patient Height in meters (m):

Patient Weight in kilograms (kg):

I. Cardiopulmonary Status

Does the patient have a cardiac history?

Yes- Resolve with cardiac questions
 No- Proceed to next question

If yes, seek cardiac clearance.

Date of cardiac clearance:

Cardiologist:

Cardiac clearance placed in chart Yes/No

Notes: _____

Does the patient have a pulmonary history?

Yes- Resolve with pulmonary questions
 No- Proceed to next question

If yes, seek pulmonary clearance.

Date of pulmonary clearance:

Pulmonologist:

Pulmonary clearance placed in chart Yes/No

Notes: _____

II. Body Mass Index (BMI)

Patient BMI: _____ (kg/m²)

BMI > 40.0 see BMI table
 BMI < 39.9 Proceed to next question

BMI table	BMI (kg/m ²)	
Morbid Obesity	40.0 - 49.9	Consider moving to hospital with additional comorbidities
Super Obesity	> 50	Move to hospital setting

Notes:

III. Coagulopathy

Is the patient taking an anticoagulant or blood thinner?

Yes- Resolve with coagulation questions
No- Proceed to next question

Anticoagulant taken:

Dosage:

Date last taken:

Notes: _____

IV. ASA Status

Patient ASA Status:

ASA 1-2: Proceed to next question
ASA > 2: Resolve with ASA questions

Reason for ASA > 2 : _____

Considering comorbidities, can TKA be safely performed in surgery center? Yes/No

Do these comorbidities warrant transfer of procedure to hospital? Yes/No

Notes: _____

V. Obstructive Sleep Apnea (OSA)

Does the patient have OSA or do you suspect untreated OSA?

Yes- Resolve with OSA questions
No- Proceed to next question

Is this a postoperative concern?

Can alternate technique be used?

Notes:

