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## Developing a Total Knee Care Pathway to Reduce Hospital Length of Stay While Maintaining Quality of Care

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Developing a Total Knee Care Pathway to Reduce Hospital Length of Stay While Maintaining  
Quality of Care

Submitted to the Faculty  
Of the Department of Nursing  
College of Nursing and Health Science  
Of Winona State University

By Katie Pace

In Partial Fulfillment of the Requirements  
of the Degree of  
Master of Science: Adult-Gerontology Acute Care Nurse Practitioner

Date: May 2020



Winona State University

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**COMPLETED SCHOLARLY INQUIRY PAPER APPROVAL FORM**

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RE: FACULTY ENDORSEMENT and FINAL REVIEW COMMITTEE

DATE: 5/29/2020

**SCHOLARLY INQUIRY PAPER TITLE:**

Total Knee Arthroplasty: Reducing Hospital Length of Stay While Maintaining Quality of Care

**SCHOLARLY INQUIRY PAPER COMMITTEE:**

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### Abstract

From 2002 to 2013, there was an increase in the number of total joint replacement procedures performed as well as a rise in healthcare costs associated with such procedures. The Affordable Care Act of 2012 leveraged a shift in Medicare reimbursement from a fee-for-model (a payment model where services are paid separately) to a bundled payment method linked to quality of care. Joint replacement surgeries, specifically total knee arthroplasties (TKA), are one of the largest procedural expenditures for Medicare. To reduce costs, care associated with a TKA procedure was bundled to include all aspects of the procedure including post-operative supportive cares. Care pathways have been highly researched across the country as an effective method to reduce healthcare cost without comprising the quality of care. The goal of care pathways is to provide a seamless, structured care process that enhances decreased length of hospital stay, thus decreasing cost, while still maintaining an excellent quality of care. Unfortunately, there is no standard care pathway for a TKA , although medical institutions may develop their own care pathway based on the requirements of Medicare reimbursement and their quality of care standards. The purpose of this scholarly inquiry paper assess for modalities of treatment for a clinical care pathway. Current literature supports the use of care pathways with a focus on structure, process and outcomes of total knee arthroplasty with the intent on reducing cost of care. Future recommendations based on the evidence supports the implementation of standardized care pathways that focuses on preoperative, intraoperative, and postoperative care for TKA procedures that meet a national standard, while maintaining quality care and taking into account the needs of each individual institution.

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## Introduction

Osteoarthritis is a common form of arthritis that causes the projective cartilage which cushions the end of bones to wear down, affecting 54.4 million individuals annually (Center of Disease Control and Prevention, 2018; Mayo Clinic, 2017). Although osteoarthritis (OA) can affect and cause damage to any joint, the wearing of cartilage in the knee that cushions bones can result in a reduction of quality of life. Ambulation can be greatly affected due to pain caused by OA preventing individuals from participating in daily activities. Damage caused by OA can continue to progress despite interventions (i.g: joint injections, physical activity, etc...), thus the only true treatment that is curative is a total joint replacement.

By the year 2030, it is predicted that the increase in the number of individuals who require a total knee arthroplasty (TKA) will rise by 601%, reaching an estimate 3.48 million procedures annually with the most common diagnosis for needing a joint replacement being OA (Feng, Nocikov, Anoushiravani, & Schwarzkopf, 2018). OA can be due to joint injuries, obesity, aging, repeated stress of a joint, and certain metabolic diseases such as diabetes, all of which are on the rise (Mayo Clinic, 2017). Treatment of OA typically begins with conservative measures such as nonsteroidal anti-inflammatory drugs, physical therapy, and corticosteroid injections (Mayo Clinic, 2017). Once an individual has exhausted all methods of conservative management and/or their OA progresses, the next available treatment option would be a total joint replacement.

### Total Joint Procedure

For the purpose of this paper, total knee arthroplasty (TKA) or total knee replacement is the focused procedure for OA. The diagnosis of osteoarthritis of the knee accounts for 90% of all TKA procedures that are performed worldwide (Lohmander, 2013). A TKA involves removing the cartilage and bone that has been affected or damaged by OA beyond repair and replaced

with an artificial joint with the goal to improve function, decrease pain, and improve quality of life (Mayo Clinic, 2017). With any surgical procedure, there are risks that need to be taken into consideration. Risks associated with a TKA can include post-operative infection, complications such as venous thromboembolism or neuropathy secondary to nerve damage. The statistical value is determined by a calculation of a patient's comorbidities. The risk of complication in the United States is less than 2% (Hah et al., 2018). The hardware utilized for the artificial joints during a TKA remains in good status for about 15-20 years, but this can vary based on the amount of wear and strain on the joint (Mayo Clinic 2017). One method to optimize outcomes of TKA procedures is for individuals to maintain a healthy weight as this decreases strain on the joint.

Recovery after a TKA is typically six weeks with limitations on driving, activities such as walking stairs and running, and the need to take a medical leave from their employment for recovery. Most patients undergo physical therapy for at least six weeks to improve strength and range of motion of the new joint. Patients who lack proper movement of joint and/or therapy could develop stiffness of the joint, possibly leading to pain and subsequent procedures (Auyong et al., 2016).

### **Financial Implications**

Healthcare institutions measure many types of outcomes to meet specific metrics for both reimbursement and quality of care. The number of TKA procedures performed in the United States (US) is around 600,000 cases annually (Schwartz, Bozic, & Etzioni, 2018). National Health Expenditure (NHE) is a governmental department which measures healthcare spending in the United States (US). In 2015, the Centers for Medicare and Medicaid Services (CMS) reported that the NHE grew 5.8% to \$3.2 trillion in all healthcare spending with Medicare accounting for 37% of the total NHE funding of all services (Schwartz, Bozic, & Etzioni, 2018).

That represents 17.8% of the total monetary or market value of goods and services produced within the United States. In lay terms, Medicare is a significant funding source for TKAs, most commonly due to the age of the patient population warranting TKA procedures, which is typically those who are 65 years of age or older, as they qualify for Medicare. Given the age of this patient population, Medicare is commonly the primary insurer for this patient population, specifically providing coverage for TKA procedures.

Based on the Medicare reimbursement guidelines, medical institutions are reimbursed up to a specific dollar amount, for specific procedures. Making it paramount for healthcare institutions to provide quality care, which meets both patient and insurance expectations, to allow for full reimbursement from insurers including Medicare. Medicare has a classification system which provides a predetermined, fixed amount for specific procedures that is based on CMS classification system. This classification system, also known as a diagnosis related group, is used as a means to categorize hospital costs whereby Medicare determines the amount of reimbursement to a medical institution. These categorized costs are based on coding used during the patient's procedure and hospitalization.

Many factors can contribute to increased cost of care which are not included as part of Medicare fixed reimbursement. These factors can include prolonged hospital length of stay (LOS) due to complications, additional medication administration, hardware selection, and supportive cares provided by medical staff such as time spent in the patient room by nursing staff which is not accounted for in payment.

### **Care Pathways**

Quality care is a major aspect of every healthcare institution. Following a standardized protocol or care pathway specific to a disease process, in this instance, TKA, allows consistent care to all patients undergoing the same procedure while meeting the requirements for Medicare

reimbursement (Feng et al., 2018). Following a care pathway designed specifically for patients who have undergone a TKA procedure would allow for a standardized process that can decrease the number of supportive or ancillary procedures, thus decreasing overall cost. As medical institutions continue to provide high quality care, interventions have been taken to further prepare patients for upcoming surgical procedures.

A total knee replacement, which normally includes preoperative education classes, the support of a care companion, and enhanced medication management has shown in research to decrease length of stay without compromising care (Didden, Punt, Feczko, & Lenssen, 2019). Preoperative education classes improve patient compliance and outcomes by providing realistic preoperative and postoperative education for patients and their caregivers (Dossett & Chesser, 2017). These education classes allow patients to better understand their upcoming surgical procedure, both preoperatively and to provide realistic expectations postoperatively. Some examples from these education classes include directions for preparing meals prior to their planned procedure, evaluating their home environment, and an exercise routine that will allow for a better recovery (Feng et al., 2018). Educational classes are often led by the instruction of nursing. Nursing plays a critical role in the development and continued care of TKA patients being the care provider who has the most direct contact with them.

A care companion is a caregiver who is required to stay with the patient after discharge from the hospital. This is a pre-arranged part of the procedure and is discussed at clinic appointments weeks prior to the procedure to ensure adequate time to allow the patient to secure a caregiver. A dedicated caregiver decreases the need for patients to discharge to a short-term rehabilitation facility and provides a means of emotional and social support, as well as providing care to allow patients to continue their post-operative care at home (Auyong et al., 2016).

Using a multimodal approach to the management of pain for patients has led to improved patient outcomes with mobility, improved pain control and lead to reduced hospital LOS (Auyong et al., 2016; see also Amundson et al., 2017; Didden, Punt, Feczko, and Lenssen , 2019; and Hertog, Fliesche, Timm, Muhlbauer, and Zebrowski, 2012). Pain management is often divided into three categories of preoperative management, intraoperative management and postoperative management. The preoperative goal is to provide anti-inflammatory medications, Gabapentin, and limit narcotic use by replacing with Acetaminophen (Ellis et al., 2018). Gabapentin is a ligand that attenuates calcium channel influx, which decreases excitatory transmitter release and spinal sensation (Hah et al., 2018). The use of perioperative gabapentin may reduce the incidence and intensity of postoperative pain up to six months after an orthopedic surgery (Hah et al., 2018). A consistent intraoperatively theme from the literature reviewed was to use a short acting spinal anesthesia versus general anesthesia with the addition of a corticosteroid. As discussed in Amundson et al. (2017) and Ellis et al. (2018), the use of a nerve block immediately after surgery improves pain control and reduces the need for narcotic medications postoperatively. Postoperative pain medication regimens vary with each study but a common themes are reduced use of Intravenous (IV) opioids, and continued short term schedules for oxycodone, celecoxib, and gabapentin postoperatively.

Although not one universal care pathway for TKA procedures exist, Medicare initiated a comprehensive care model in 2016 for total joint replacements which includes total hip replacements and total knee replacements. This models focus on the financial model and did not lay out any modalities of treatment for a care pathway. This initiative developed a mandatory bundled payment model for all TKA procedures , including both Medicare and non-Medicare insured individuals (Sibia et al., 2017). A bundled payment model provides a retrospective payment for all care associated with a specific procure and all cares associated with TKA

procedures and up to 90 days following hospital discharge. Due to Medicare initiative, some medical institutions developed care pathways to enable continued service to their patients while providing quality care based on metrics set forth by Medicare to allow for institutional reimbursement. This initiative was made to provide medical institutions with a financial incentive to reduce spending without compromising care (Kee et al., 2017).

### **Length of Stay**

Currently there is a discrepancy between the actual length of stay and expected length of stay based on the Medicare reimbursement requirements for TKA patients (CMS, 2019). For Medicare Part A to cover an inpatient hospital stay, the patient must be hospitalized for at least two midnights. During this time, the patient must meet inpatient criteria to allow for Medicare to provide coverage. Medicare inpatient criteria is a complex and evolving list that could be the subject of another entire paper in itself, however, the main point of inpatient criteria for those with Medicare insurance is that the care provided in the hospital setting would be necessary for ongoing diagnosis and treatment of the patient. (CDC, 2019). In January 2018, Medicare updated their “covered” procedural list to allow for patients undergoing a TKA to be either inpatient status or observational status. Inpatient status means that the patient’s hospital would be at least two midnights, leading to a different form of payment. Observational status is considered less than two midnight stays within the hospital setting which could lead to an earlier dismissal to home or a short-term rehabilitation facility. (CMS,2019). By having these options available, providers need to classify their patients prior to their surgical procedure to allow for appropriate billing and reimbursement. Additionally, these changes and classifications can lead to confusion for patients as they may be instructed that they will have a designated length of hospital stay when, if their procedure is uncomplicated, their stay would be shorter as dictated by Medicare.

Care pathways have been developed to provide education and information regarding care of a specific diagnosis and can be used for patients by healthcare providers. By following a care pathway, patients and healthcare providers are easily aware of the postoperative expectations and goals that need to be met for proper dismissal all while providing the utmost care. Care pathways affect the cost of care by reducing the use of unnecessary supplies, provide greater efficiencies in the operating room and post-operative care, and decreased hospital length of stay, which ultimately reduces the cost burden on hospitals due to the resources required to provide patient care (Schwartz et al., 2018).

Reduction of hospital length of stay can be focused from a multifactorial perspective. Through choice of pain medications, preoperative management to provide patient optimization for surgery (including comorbidity management and surgical education), early mobilization postoperatively, and standardized supplies and equipment can all play a key role for developing a care pathway for a standardized care approach. This then can lead to better patient outcomes while maintaining quality of care all while meeting reimbursement expectations for the Medicare to reimburse the institution at the full billable potential. For the purpose of this paper, the review of the literature and focus aimed at the patient population who undergo a TKA procedure. According to Auyong et al. (2016), an increased hospital LOS can lead to post-operative complications such as infection, delirium, and hemarthrosis. Development of a standardized care pathway can be a beneficial tool for healthcare institutions to allow for quality care, while still meeting the requirements of Medicare. Care pathways are an opportunity to provide a standardized approach to the care of patients undergoing a TKA which all ultimately leads to improved care for the patient. Healthcare institutions also benefit as care pathways can create efficiencies that lower the cost of care required yet allowing healthcare institutions to maximize Medicare reimbursement.



## Background

Osteoarthritis, also known as degenerative joint disease, occurs when the protective cartilage that cushions the ends of bones wears down over time (Mayo Clinic, 2017). To alleviate pain and promote physical activity, several conservative strategies may be trialed, however are often only a short-term fix since the damage cannot be reversed. The first approach to treatment often includes patient education regarding low impact exercises, weight loss, physical therapy, medications to relieve pain which can include, nonsteroidal anti-inflammatory drugs, corticosteroid medications, and bracing (Reinikka et al., 2017). However, when those measures fail and patients continue to have pain that affects their quality of life, joint replacement surgery is considered. Joint replacement surgeries, specifically TKA procedures, are proven to significantly restore function and quality of life (Feng et al., 2018).

From 2002 to 2013, the number of total joint replacement procedures performed was 6.4 million, steadily rising each year, and as the years have progressed, the overall cost of healthcare has risen. (Schwartz, Bozic, & Etzioni, 2018). In 2002, the cost for a TKA was \$13,988 and in 2013, rose to \$22,837 (Kee et al., 2017). The Affordable Care Act of 2012 leveraged a shift in Medicare reimbursement from a fee-for-service to a bundled payment linked to quality of care. A bundle payment model is a value-based model that gives incentives to healthcare providers to advance efficiency of care while maintaining high quality care and excellent patient outcomes at a lower cost to healthcare systems (Massachusetts Medical Society, 2018). The criticism of a fee-for-service model is that it provides incentives for providing more services to drive up the cost to patients for a higher reimbursement to healthcare providers. The majority of joint replacement procedures billed to Medicare is TKA or more commonly known as total knee replacement. In 2016, Medicare guidelines used a bundled payment method for hospital reimbursement of TKA procedures. To further complicate reimbursement, in 2018, Medicare

removed TKA procedures from their inpatient only list for billing. Given the rise in healthcare costs and decrease in Medicare reimbursement, there is a push to provide quality care, focusing on shorter hospital LOS with the goal of reducing costs to patients and allowing medical institutions to obtain full reimbursement from insurers (Urish et al., 2018). McCulloch, Cottingham, Christmas, and Pearce (2017) explain in their study that measuring length of stay in hours is a more sensitive unit of measurement for detecting improvement of care as well as cost saving given the amount of resources utilized by patients increases each hour they remain in the hospital, thus increasing their overall cost of the “all-inclusive procedure.” Based on the bundle payment method, services and cares that are included in the bundle are those during the preoperative, perioperative, and postoperative timeframes.

Advancements in care pathways, including preoperative management, perioperative management (including anesthesia), surgical techniques, pain management and early mobility, all contribute to methods to reduce hospital LOS without comprising the quality of care (Auyong et al., 2016). Studies and process improvement projects began to emerge in 2016, after a change in Medicare guidelines, which recommended that medical institutions needed to develop methods to provide high quality care for patients while optimizing cost to meet the standards for Medicare reimbursement. To continue on such a trajectory, standardized care pathways within single healthcare institutions were developed, such as in Auyong et al., (2016) which can be found in Figure 1. Dossett and Chesser (2017) describe in their study that a standardized approach improves efficiency while providing safe care for patients. Nationally, the LOS for TKA in 2002 was 4.06 days and improved to 2.97 days in 2013 by implementing standardizations of care, improved physical therapy, and advancements made in the procedural aspect of the TKA (Feng et al., 2018). Despite an improvement in the overall LOS, additional changes can be made to standardization of care which include the use of standard medications

preoperatively, intraoperatively, and postoperatively, early ambulation of the patient, reduced opioid use, and standardized equipment during surgery . Aspects that should be taken into consideration, some even prior to the patient's procedure, can alleviate the potential for additional hospital days for the patient. One example is having a discussion with a social worker for discharge management. For example, if a patient has a discharge plan to dismiss to a skilled nursing facility, prior to the procedure, by having this process set up prior to the procedure, could save the patient an additional day in the hospital due to the need for specific discharge planning needs. Nurses play a key role in the use of care pathways as they spend a majority of their time with the patient at the bedside providing care, education, and provide firsthand knowledge of any complications which may warrant a variation from the care pathway. Care pathways have been developed for diagnoses such as cerebrovascular accident, congestive heart failure, and spinal surgical procedures. These care pathways, as noted above, are a means to provide evidence based, quality care while meeting the reimbursement standards of Medicare. There has not been a development of a standardized care pathway for TKA patients. Some hospitals have developed their own pathways yet continue to endorsement through regulatory agencies.

### **Purpose**

The purposes of this scholarly inquiry paper are to assess modalities of treatment for those patients who are status post a TKA which can be of benefit in decreasing their overall hospital LOS, additional supportive modalities to support a care path. Typically, when patients undergo a TKA, there is a recommended hospital LOS which has been determined by the Orthopedic surgeon. If the LOS of stay is prolonged due to post-operative complications that transpired, this is beyond the patient's control. An example is patients who receive a spinal block for anesthesia versus general anesthesia, may take longer to sit at the bedside and dangle post operatively. The secondary purpose of this scholarly inquiry paper is to determine

additional modalities of supportive cares, if any, that could reduce the overall cost of a TKA

which could include hospital LOS and/or supportive cares while maintaining quality of the care.

The purpose of the literature review was to determine what modalities are effective for use in a clinical care pathway to TKA patients and the ability to improve patient outcomes while maximizing reimbursement.

### **Clinical Nursing Question**

To guide the literature review for this scholarly inquiry paper, a clinical question was developed:: What are modalities in a clinical care pathway that enhance Medicare reimbursement and improved patient outcomes for patients who have undergone TKA? Clinical care pathways have been developed for several disease processes but there is not standardized pathway for the joint replacement procedures, specifically TKA. Medical institutions may develop their own care pathway to aid in improved patient outcomes while still meeting the standards of Medicare for proper reimbursement.

### **Method of Inquiry and EBP Model**

The method of inquiry was an integrated review of literature to answer the clinical question. The use of an Evidence-Based Practice (EBP) model helps to guide implementation and sustainability of Evidence Based Practice. According to Melnyk and Fineout-Overholt (2015), eight different models of EBP were identified for their strength to facilitate integration of EBP for change improvement. The *Iowa Model of Evidence-Based Practice to Promote Quality Care* was chosen for this particular paper for its ease of use by multidisciplinary healthcare teams. The Iowa Model, Figure 2, is built on problem-solving steps in the scientific process to identify triggers that can help raise the clinical problem. The model was then used to address the clinical question in Table 4 to help the focus on modalities of treatment to develop a care pathway.

### Literature Search

Identifying existing literature surrounding TKA and length of stay was extensive due to an increase in focus around hospital length of stay over the past ten years. The search was limited to available texts and English language. The target timeline was from 2000-2019 with only two studies prior to 2016. The studies used prior to 2016 provided clinical significance by showing how far TKA procedures and pathways have come. Historical data was reviewed to find any initial steps in the development of clinical care pathways for TKA procedures and more recent literature was reviewed to monitor for changes in the care pathways such as Figure 1. Databases searched that yielded relevant results included CINHALL Complete, Google Scholar, and ProQuest. Keywords used to drive the search included: “Reduced length of stay in total joints,” “Reduced length of stay in total joints” AND “improved care,” “Total Joint Replacement Improvements” AND “reduced length of stay” AND “total knee,” and “Total joint replacement improved outcomes” AND “length of stay.” The initial search yielded a total of 26,809 articles. Articles were narrowed down based on title, abstract relevant to the clinical question and patient population/procedure of focus. Although many articles were produced from the search, twenty-three were chosen for the focus of this paper. These 23 articles have the most relevant information related to the clinical question. Details of the literature search can be found in Table 1. The levels of evidence range from level I to VI (Ackley, B.J., Swan, B.A., Ladwig, G., & Tucker, S., 2008) which included two randomized controlled studies, nine randomized controlled pilot studies, six retrospective studies, which accounted for the majority of the studies. There was also one study of each of the following: quasi-experimental, observational, quantitative snowball sampling, literature review, and one meta-analysis study.

### Appraisal of Evidence

The literature reviewed ranged in the level of evidence from level I to level VI. Two of the studies were randomized controlled trials with Amundson et al. (2017) providing the most control, rigor and analysis of research. This study was conducted at Mayo Clinic with an extensive research team and well-designed trial. The study looked at multimodal pain management for TKA patients with a focus on pre-operative and intra-operative medications to enhance the patient's recovery. Studies by Thobhani et al. (2017), Ellis et al. (2018), and Amundson et al. (2017) were easier to quantify results with research surrounding spinal analgesics in TKAs and the studies had commonalities in the research variables. Studies by Auyong et al. (2016), Rasmussen, Kramhoft, Sperling, and Pedersen (2004), and Pamilo et al. (2018) were well-designed case-controlled studies but had randomization attached to the trials. The studies were not blinded due to the nature of the intervention which could have led to bias. Retrospective cohort studies by Sibia, Turcotte, MacDonald, and King (2017) and Kee, Edwards, and Barnes (2017) focused on using clinical care pathways and their impact on the cost of care associated with TKA procedures.

Lilly, Siljander, Koueiter, and Verner (2018), Dossett and Chesser (2017), and Thobhani et al. (2017) provided retrospective studies, however, the aim was at care pathways and their impact on the patient LOS. Lilly et al. (2018) attempted to determine common factors that led to an increased LOS for patients who had undergone a TKA procedure. They focused on the day of the week the surgery occurred to determine if the resource availability differed which could have an impact on the patient outcomes or length of stay. Sibia et al. (2017) focused on a comparison of the hospital length of stay, comparing a short hospital stay, less than two midnights, to the three midnight stay required by Medicare. This study found an increase in overall cost of up to \$1814 dollars if patients had to stay the third night versus those who were dismissed after only two midnights. However, outcomes of this particular study were limited

due to availability of staff resources, rehabilitation facility restrictions for dismissal on weekends, and insurance approval.

Stone, Dunn, MacDonald, and King (2018) and Wynell-Mayow and Zahid Saeed (2018) were two studies that did not directly focus on LOS or clinical care pathways but discussed possible complications of the TKA procedure that can occur and how those complications could impact cost and LOS indirectly. Wynell-Mayow and Zahid Saeed (2018) reviewed tourniquet time (the length a tourniquet is inflated during the procedure to the effected joint to reduce blood flow, allowing for reduced blood loss) in the TKA procedure to determine if there was an impact on LOS. The study found that there was not an impact on how long the tourniquet is inflated and outcomes for the patient, but an interesting unintentional finding was that by standardizing their operational procedure across all orthopedic surgeons to help with the validity of the study, an unintended outcome was greater efficiency in care and cost reduction by creating a care pathway in order to eliminate variables in care. The results of the study focused on tourniquet time in relation to outcomes, but it was noted in the discussion that through the development of a standardized care pathway (to eliminate variables of the study) provided further efficiencies in their practice. Stone, Dunn, MacDonald, and King (2018) looked at when LOS was reduced with TKA patients, was their adverse outcomes. The concluded that only 4.5% of patients had emergency room visits and 3.3% had readmission to the hospital within the first 90 days postoperatively (Stone et al., 2018).

Thobhani et al. (2017) was very similar to Amundson et al. (2017) with a focus on types of anesthesia used for TKA procedures, however, they did not conduct a clinical trial. This was a retrospective chart review to determine if there was a difference in pain control and physical therapy performance in patients who received novel regional block of different techniques versus general anesthesia with no regional blocks. The retrospective review did not have the

rigor of a randomized controlled trial; however, this review was not aimed at implementation of an action into clinical practice but to determine the difference between two different interventions.

The study conducted by Gnanakumaran et al. (2017) was a prospective randomized controlled trial that reviewed the effects of early mobility after a TKA procedure. This study was an outlier study as there was no difference in hospital LOS when early mobility was implemented, however, this study did conclude an improvement in pain control. An area that could have been measured during this study would have been patient satisfaction for which the results could have improved outcomes indirectly even though it did not affect LOS. Reinikka et al. (2017) provided quantitative data as well as qualitative interviewing, making it a well-structured trial. The study included total hip replacements which is different than the intended population for this paper however added great insight to a global view of the barriers faced by healthcare institutions in regard to the use of care pathways

### **Intervention and Outcome Themes**

The studies examined focused on interventions that resulted in a decreased hospital length of stay. Some interventions directly affected – what – LOS???? while others were indirect length of stay. For example, patients' improved mobility directly affected their length of stay by allowing them more independence, thus ready for discharge sooner. The reduction in opioid pain medications allowed patients were less nauseated, had a more active role in their care, and remained well controlled with pain, which indirectly reduced length of stay. Amundson et al. (2017), found that femoral and sciatic nerve blocks, ropivacaine-based prearticular injection, and liposomal bupivacaine-based periarticular injections provided better pain control. By enhancing pain control via the femoral or sciatic block form of anesthesia, patients were able to ambulate sooner, use fewer narcotics allowing for active participation in physical therapy, leading to an



earlier hospital discharge. Thobhani et al. (2017) revealed that there was a 35% reduction in length of stay in patients who has a regional analgesia block between the popliteal artery and the capsule of the knee (IPACK). The studies of Thobhani et al. (2017), Amundson et al. (2017), Ellis et al. (2018), and Rasmussen, Kramhoft, Sperling, and Pedersen (2004) all focused on pain management to reduce length of stay. Rasmussen et al. (2004) concluded that the use of an intraarticular block improved flexion of the knee on discharge from 70 degrees in the control group to 110 degrees. This was found to be statistically significant. Amundson et al. (2017) was the first study to compare peripheral nerve blockade to two distinct periarticular injections. While all three blockades provided clinical satisfactory analgesia, peripheral nerve blocks had statistically significant better average pain scores on Post-Operative Day zero (POD 0). For the peripheral nerve block the pain score was zero while the ropivacaine was 8 and liposomal bupivacaine was 15 (Amundson et al. 2017). Both Ellis et al. (2018) and Amundson et al. (2017) used a multimodal analgesia pathway that provided patients with medications preoperatively, intraoperative, and postoperatively (Figure 3). One difference between the two studies was with Ellis et al. (2018) for which Gabapentin was used preoperatively. According to Ellis et al. (2018), a reduction in pain leads to earlier ambulation which can lead to a decrease hospital length of stay and improved patient outcomes. Their study group showed a LOS average of 3.26 days compared to the control group of a LOS average of 3.89 days (Ellis et al., 2018). They also showed that there was a significantly decreased average of postoperative pain from an average score of 3.55 to 3.18. They also had a lower incidence of antiemetic drug administration with 56 patients decreased to 34 with the use of the adductor block (Ellis et al., 2018).

Typically, ambulation does not occur until the first day after surgery. Current studies focused on ambulation on day of surgery once the patient had sensation of their lower extremities after receiving spinal anesthesia. With the focus on improving care, decreasing cost

and improving outcomes, all treatment modalities may impact length of stay accordingly. In the clinical trial by Labraca et al. (2011), there was a significant shorter hospital stay when patients had physical therapy services initiated within 24 hours of surgery. Early mobilization led to reduced pain, improved range of motion and muscle strength, and a shorter recovery phase. Early ambulation led patients to achieving autonomy, normal gait and balance sooner. Hertog, Fliesche, Timm, Muhlbauer, and Zebrowski (2012) had a similar conclusion but termed their program a “fast-tracked rehabilitation pathway.” This care pathway compared patients who had group physical therapy on the day of surgery versus one on one physical therapy the first day after surgery. Patients on the fast-track rehabilitation program had a reduced LOS of 7.75 days from 13.20 days. This study was conducted in Germany which has a higher average length of stay compared to the United States on average 7 to 10 days sooner, although still proved a short LOS with early therapy interventions. There was little discussed in the article surrounding group physical therapy vs individual physical therapy, which is an area for further study. Logically, group therapy reduces the number of staff needed to work with patients and patients have the benefit of a “team” approach during their therapy sessions. McCulloch et al. (2017) looked at early mobilization and pain management on a more sensitive scale of measuring LOS in hours as opposed to days. This allowed for detecting improvement on a higher level as well through their observational study. Pamilo et al. (2018) also developed a pathway which was termed “fast track.” Their fast track pathway involved standardized care of preoperative education to the patient regarding the surgery, spinal anesthesia, physical therapy on POD 0, and the lack of catheters or drains. From this standardized approach, the LOS decreased from 5 days to 3 days. They also showed statistical significance of patients discharged home at TKA, from 66% to 75% (Pamilo et al., 2018). The average length of stay per Medicare guidelines for payment is two midnights (three days), however literature shows that patients should only

require one or two midnights (up to two days) stay with better outcomes. Auyong et al.

(2016), as shown in Figure 1, was the only study that reviewed the entire surgical pathway including preoperative, intraoperative, and postoperative to determine if there was a decrease in hospital length of stay. By developing a standardized approach, which was not in place prior, use of spinal block anesthesia, required TKA education classes, and physical therapy on the day of surgery, LOS was reduced from 76.6 hours to 56.1 hours. In Featherall et al. (2018) concluded that the use of a care pathway that increased the rates of discharge to home and reduced LOS lead to a \$5.3 million-dollar system level cost saving from a payer-perspective.

One common theme that emerged while reviewing all studies was that one modality of change implemented alone would not be substantial or sustainable. Didden, Punt, Feczko, and Lenssen (2019) which is also one of the most currently released studies concluded that financial effectiveness depended on a multidisciplinary model as crucial to the success of a care pathway. In their study with the use of a new care pathway their LOS reduced from seven days to four days. All modalities have the ability to play off each other to allow for other aspects to be more successful, which is optimal in a clinical care pathway. For example, if the patient has better pain control through anesthetic block, they may require less post-operative narcotic medication, have fewer side effects from narcotics such as nausea and constipation which can impede physical therapy performance and are able to ambulate with therapy staff sooner as the patient is feeling well. If physical therapy was started on POD 0 as opposed to POD 1, patients may improve their mobility sooner, have better pain control, and be prepared for dismissal sooner (Dossett & Chesser, 2017).

The research from Amundson et al. (2017), Rasmussen et al. (2004), and Thobhani et al. (2017) all agree that the use of an anesthesia block and/or multimodal analgesia provides the best pain relief after a TKA compared to a general anesthesia with oral narcotics postoperatively.

Further evidence is needed to determine a superior anesthetic block but there is limited data due to newer combinations of drugs. Femoral and sciatic nerve blocks with ropivacaine-based periarticular infections and liposomal bupivacaine-based periarticular infections are currently leading the way. Using an anesthetic block allows for patients to be free of Intravenous (IV) lines and the ability to be mobile sooner given the short acting anesthetic block. The patient then requires less narcotics, which can cause further sedation of the patient, preventing nursing from being able to ambulate the patient safely. With less narcotics the patient experience less side effects of narcotic medications such as nausea and constipation. This reduces the use of further medications that would be required to help eliminate possible side effects. This allows nurses to provide more direct care to the patient, such as assisting with ambulation instead of further medicating the patient. Nausea and constipation can also lead to decreased appetite and overall reduce the patient's ability to be an active participate in their recovery.

Education is imperative to medical providers, support staff, and patients, regarding the TKA procedure and care pathways. A successful care pathway cannot be implemented without a multi-disciplinary team approach as explained by Pamilo et al. (2018). The care of a patient undergoing a TKA does not land on one discipline but by a multitude of team members. Nursing is a key member within the care team having the most contact with the patient. They help as a liaison between other care team members and also relay important information from their assessment.

Lilly et al. (2018) determined that patients that had surgery on a Monday or Tuesday had a shorter hospital LOS as compared to a Thursday surgical patient. Boylan et al. (2017) concluded that mean LOS was significantly higher for surgeries performed on Wednesday, Thursday, and Friday. From this study, it was found that the cost of the surgery was higher towards the end of the week. The mean difference of cost for TKAs was \$259 Wednesday, \$495

for Thursday and \$309 for Friday. The cost difference was associated with decreased availability of ancillary resources on the weekends to help with the coordination of patient discharges and physical therapy services. Those patients who had a TKA procedure early in the week had access to more healthcare associated resources than those later in the week. A patient who had surgery on Thursday would require care extending into the weekend which the study showed less staff were available to perform physical therapy exercises, restrictions on facilities accepting new patients if they needed short-term rehabilitation and decreased weakened insurance approval on the weekends. This study focused on patients that went to a transitional care facility following their acute stay and that most facilities are unable to take admissions on weekends. However, this can be taken a step further to look at patients who anticipate discharging to home may have a longer length of stay when surgery is performed on a Friday due to decreased hospital resources on the weekend.

### **Summary**

After review of the literature, clinical care pathways have three main areas of focus; pre-operative, intra-operative, and post-operative care. Analgesia management, early physical therapy, patient education and communication were the main themes of care pathway models. With the use of standardized care there was a decrease in length of stay, improved mobility, and decrease in cost.

### **Conclusion, Implications, and Recommendations**

#### **Introduction**

The purpose of this paper was to determine what modalities of treatment in clinical care pathway enhance Medicare reimbursement and improved patient outcomes for patients who have undergone TKA procedures. Clinical care pathways have been developed but there lacks a universal care pathway for the above-mentioned diagnosis. Nursing plays a crucial role in the

multidisciplinary team to help improve patient outcomes. They are the closest to the bedside to address patient needs for pain management as well as be a key liaison for communication amongst the team. As Reinikka et al. (2017) concluded, awareness of the care pathway and communication improves patient outcomes and adherence. Recommendations are for all healthcare facilities in developing a standardized care pathway for TKA procedures to improve LOS and patient outcomes. The Iowa Model of Evidence Based Practice to Promote Quality Care was used in Table 4 to a design to help develop the purposed care pathway in Figure 4. As Didden et al. (2019) concluded in their results, clinical care pathways could be implemented across all orthopedic wards or facilities, with adjustments to be made to meet the individual needs or logistics within each practice.

### **Implications for Nursing**

Orthopedic nurses play an instrumental role in patient success and outcomes post operatively. Nurses are essential as they provide pre-operative education which includes providing the patient with an understanding of their expectations throughout the TKA process. Working closely with the patients, nurses are able to identify barriers that could be addressed prior to their procedure. An earlier example was having discussions about dismissal plans prior to having to the TKA procedure to allow for appropriate dismissal disposition in a timely manner. Additionally, follow up appointments can be routinely scheduled prior to dismissal as part of the care plan to allow the patient appropriate transportation to and from appointments.

Key themes to decrease length of stay are driven through nursing interventions. Pain management is a multimodal approach which starts with the interventions of nursing. Nurses address the patient's pain; if not adequately controlled, the patient will likely not participate in physical therapy exercises. Post-operative pain can vary greatly for each patient; pain management via analgesia will likely differ from patient to patient as well. Nurses must use their

assessment skills and clinical judgement to allow them to assist the patient when analgesia is warranted post operatively. In this multi-modal approach, the nurse may determine pharmacological and non-pharmacological options to reduce a patient's pain. The pain should also be reassessed by nursing to determine the effectiveness of their intervention. Without this, the patient may continue to have uncontrolled pain or end up on the other end of the spectrum of not being able to participate due to their level of consciousness. Early mobilization is multifactorial and the key to an overall success status post a TKA procedure. If a patient cannot ambulate, they will not recover, and they will need additional procedures and interventions to return to their lifestyle. For a patient to be considered eligible to discharge, they must be ambulating independently or would require an increased length of stay at a rehabilitation facility. Nurses also have a large role that is often thought to be owned by physical therapy, however, the patient will sit at the side of the bed and stand, first with the assistance of nursing. Nurses provide care for patients 24 hours per day while hospitalized, thus allowing them to know the patient, develop rapport, and plan of care based on a clinical pathway to keep the patient on track for a timely dismissal. While physical therapy plays an essential role in the daytime physical therapy and mobility of the patient, it is imperative that the nurse continues to assist the patient with ambulation ongoing during different times of the day. Boylan et al. (2017) concluded that weekday surgeries also allow patients more access to physical therapy staff. When patients are there over the weekend there is less physical therapy staff, requiring nursing staff to also perform additional duties that usually are done by physical therapy during the weekdays.

Communication is the cornerstone for the entire system to be successful . If there are additional needs of the patient, the nurse is the main advocate for the patient to ensure all of their needs are being met. In addition to being a patient advocate, nurses provide patients with encouragement and motivation. All patients have different levels of self-motivation which

ultimately can affect a patient's ability to participate in their care. Without their participation, the care process can break down and become ineffective. Nurses may not be able to determine a level of motivation of the patient, but they can continue to provide encouragement and intervention to continue to promote successful outcomes.

### **Recommendations**

The primary purpose and question of this scholarly inquiry paper was to synthesize the evidence and identify modalities of treatment for a TKA clinical care pathway with the intended outcomes of decreasing cost of care without reducing the quality of care to patients. The key themes represented in Figure 4 could be used as the starting path to develop a TKA clinical care pathway. This could be done through a practice optimization and acceleration work group which focuses on the care of patients undergoing a total joint replacement procedure with the use of the Iowa Model of Evidence-Based Practice as the blueprint to start the project as laid out in Figure 2. A practice optimization and acceleration work group could use quality improvement methods, such as the "Six Sigma" or "Plan Do Study Act" to develop an approach that best address all concerns of the multidisciplinary work group in the most effective way to meet the needs of the patient. One area identified, with supporting research, was early ambulation on day of surgery. The research reviewed supports ambulation as the largest factor that would decrease length of stay, however there are many contributing modalities that could affect the ability of a patient to ambulate.

### **Future Needs**

One area of future research would be to review the need to have physical therapy staff present for longer periods of time to assist with ambulation and early implementation of therapy and to see if this would mount in a cost savings benefit. Research by Pamilo et al. (2018) supports that early ambulation is effective in reducing length of stay but there has been no



research that designates the “sweet spot” within the 24-hour window of ambulation and results with the patients. There is also no research that discusses the distance in detail of how much ambulation should be done within that 24 hours or long term affects that may result post hospital stay. On the same line, one cannot be done without the other, as it is a cascading affect. Table 4 gives a detailed description applying the clinical problem in this project within the model as a possible starting point for the development of a care pathway through evidence-based steps. Figure 4 is purposed clinical care pathway based on the literature reviewed. The simplicity of the tool and format aligned with the goals and focus of the project.

### Summary

As we continue to age as a population, more and more patients will require a TKA. Patients are becoming more and more educated on patient outcomes and finding the best facility for their procedure. To rise to the top, healthcare facilities need to find a way to reduce the patient’s length of stay, while lowering the cost of such procedure while continuing to provide quality care. The longer a patient’s hospital stay, the greater the risk they have for further infection, complication, and increased cost (Featherall, Brigati, Faour, Messner, & Higuera, 2018). After an extensive literature review the common themes for success in patients who undergo a total knee replacement were determined. This was represented in Figure 4 and Table 4. After review of all literature, there is strong evidence to suggest that a clinical care pathway for patients undergoing a TKA procedure that includes analgesia management, early physical therapy, and a multidisciplinary approach can yield a decreased length of stay.

Nursing staff have the potential to decrease hospital length of stay in patients undergoing a TKA procedure by being the drivers of patient care and enforcing early ambulation on the day of surgery. Research fully supports modalities that lead to early ambulation with a decreased hospital length of stay for patients. However, determining the criteria for the TKA pathway has

not been fully explored and requires further research to develop a unified clinical care pathway

that can be used across health systems.

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Table 1  
Database search

Date of Search	Row ID	Database/ Source Used	Key Words	Restrictions	Dates Included in Search	Number of Hits		
						Listed	Reviewed	Used
2/19/19	1	CINAHL Complete	Reduced hospital stay in total joints		1995-2018	61	5	3
2/19/19	2	ProQuest	Reduced length of stay in total joints AND improved care		2008-18	7,127	4	2
2/19/19	3	Google Scholar	Total Joint Replacement Improvements AND reduced length of stay AND total knee		2008-18	17,600	10	1
3/14/19	4	CINAHL Complete	Total joint replacement AND nursing care		1985-2018	160	3	0
3/14/19	5	Mayo Library	Total joint replacement improved outcomes AND length of stay		2008-2018	1861	5	2



Date of Search	Row ID	Database/ Source Used	Key Words	Restrictions	Dates Included in Search	Number of Hits		
						Listed	Reviewed	Used
8/13/19	6	Winona Library One Search	Improved total joint length of stay		2010-2019	5,016	12	3
8/13/19	7	CINAHL Complete	Reducing length of stay in total knee patients		2010-2019	68	15	2
9/20/19	8	Google Scholar	Total joint replacement cost savers		2018-2019	13,832	2	1
9/20/19	9	Google Scholar	reduced length of stay in total joints		2019	14,400	2	2
9/20/19	10	CINAHL Complete	Cost reduction in total joints		2019	5	1	1
4/25/2020	11	CINAHL Complete	Total knee replacement improved care		2000-2019	259	10	5

Table 2

*Levels of evidence*

Level of evidence (LOE)	Description
Level I	Evidence from a systematic review or meta-analysis of all relevant RCTs (randomized controlled trial) or evidence-based clinical practice guidelines based on systematic reviews of RCTs or three or more RCTs of good quality that have similar results.
Level II	Evidence obtained from at least one well-designed RCT (e.g. large multi-site RCT).
Level III	Evidence obtained from well-designed controlled trials without randomization (i.e. quasi-experimental).
Level IV	Evidence from well-designed case-control or cohort studies.
Level V	Evidence from systematic reviews of descriptive and qualitative studies (meta-synthesis).
Level VI	Evidence from a single descriptive or qualitative study.
Level VII	Evidence from the opinion of authorities and/or reports of expert committees.

Table is based on: Ackley, B.J., Swan, B.A., Ladwig, G., & Tucker, S. (2008). Evidence-based nursing care guidelines: Medical-surgical interventions. (p.7). St. Louis, MO: Mosby Elsevier.

Table 3

*Literature Table for reducing length of stay in total knee replacement patients*

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Amundson, A. W., Johnson, R. L., Abdel, M. P., Mantilla, C. B., Panchamia, J. K., Taunton, M. J.,...Kopp, S. L. (2017). A three-arm randomized clinical trial comparing continuous femoral plus single-injection sciatic peripheral nerve blocks versus periarticular injection with ropivacaine or liposomal bupivacaine for patients undergoing total knee arthroplasty. <i>Anesthesiology</i> , 126, 1139-1150.	To determine the role of regional techniques in total knee arthroplasty patients in relation to their outcomes.  Compare pain control and long-term pain outcomes between a combination of peripheral nerve blocks and two different solutions for periarticular injections.	Mayo Clinic Rochester Patients  Adult patients undergoing elective, unilateral primary total knee arthroplasty  From October 2014-December 2015 at a single site. 165 participants.  Exclusion criteria: patients with documented chronic pain syndrome, history of long-term use of daily opioids with oral morphine equivalent to greater than 5mg/day, body mass greater than 45kg/m <sup>2</sup> , allergies to study medications, impaired cognitive function, contraindications to regional anesthesia, major systemic illnesses (Amundson et al., 2017, p. 1140)	RCT: Three-arm, parallel, outcome adjudicator-blinded, superiority, randomized-controlled clinical trial.  Intervention: patient to receive (1) femoral catheter plus sciatic nerve blocks, (2) ropivacaine-based periarticular injection, or (3) liposomal bupivacaine-based periarticular injection.  Measure: measuring pain during the first post-operative morning using a 0-10 NRS pain scale in all three groups.	After post anesthesia care unit discharge, postoperative day 0 median maximal and average pain scores were significantly lower for peripheral nerve block compared to both periarticular injections (ropivacaine: maximal -2 [-3 to -1]; $p < 0.001$ ; average -0.8 [-1.3 to -0.2]; $p = 0.003$ ; and liposomal bupivacaine: maximal -3 [-4 to -2]; $p < 0.001$ ; average -1.4 [-2.0 to -0.8]; $p < 0.001$ ). (Amundson et al., 2017, p. 1139)	<b>Strengths/Implications</b> -sample size of 50 patient per group was statistical powerful.  -conducted as real practice that occurs at a high-volume, large academic orthopedic center. -powered to detect not only a difference in the primary outcome but also NRS pain scores and opioid consumption at other time periods as well. -all surgeons had a consistent and uniform surgical and periarticular injection techniques.  <b>Limitations:</b> - inability to mask participants and providers to the comparison between peripheral nerve blockade and periarticular injection within the pathway. Could lead to bias	First study of its kind to compare the type of injections.  Would help with patients to get out of bed sooner, nurses able to work with patients sooner if pain is well controlled.  Excellent graphs to support work.  Suggests importance of using video-based education in practice.  Allows for generalizability and real-world assessment of the perioperative management of total knee arthroplasty.  Wouldn't need vascular access in the postoperative period, less medical interventions and decreased restrictions on mobility.	Level II

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidenc e
Auyong, D. B., Allen, C. J., Pahang, J. A., Clabeaux, J. J., Macdonald, K. M., & Hanson, N. A. (2016). Reduced length of hospitalization in primary total knee arthroplasty patients using an updated enhanced recovery after orthopedic surgery (ERAS) pathway. <i>The Journal of Arthroplasty</i> , 30, 1705-1709. Retrieved from <a href="http://dx.doi.org/10.1016/j.art.2015.05.007">http://dx.doi.org/10.1016/j.art.2015.05.007</a>	To evaluate an enhanced care pathway would improve patient length of stay measures.	All patients who had undergone primary TKA at one hospital from January 2012 to July 2012.  Inclusion criteria- patient undergone surgery with a standardized care pathway that included femoral nerve block with updated ERAS pathway.  Exclusion: patients who has shown opioid dependence prior to surgery  252 patients were divided into two cohorts based on the use of ERAS. 126 pre/126 post.	Retrospectively correlation cohort study.  Primary outcome measured was hospital length of stay.  Demographic and baseline clinical characteristics were compared using the t-test or the chi-square test as appropriate.  Primary analysis was the non-parametric comparison of the length of hospital stay.	The primary outcome of this investigation was hospital LOS. Median LOS was 76.6 hours in the pre-pathway cohort (interquartile range [IQR]: 74.2, 80.6) compared to 56.1 hours in the post-pathway cohort (IQR: 53.3, 76.5, $P < 0.001$ ). (Auyong et al., 2016, p. 1705)	<b>Strengths/Implications</b> -more than 100 patients were necessary in each arm to have a greater than 80% power.  -reduced length of stay did not show increase in readmission  <b>Limitations:</b> -many changes were made to the pathway, hard to determine what was the most effective.  -left out a lot of information that would be important to know, where this occurred, more about the credibility.	Interventions from this are more feasible for project. Align with nursing better.  Further studies can help to determine which areas to narrow in on and cost and affect changes.  Would be beneficial if looked at the further cascade effect of the study on patient care.	Level V

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Boylan, M. R., Perfetti, D. C., Naziri, Q., Maheshwari, A. V., Paulino, C. B., & Mont, M. A. (2017). Is day of surgery associated with adverse clinical and economic outcomes following primary total knee arthroplasty? <i>The Journal of Arthroplasty</i> , 32, 2339-2346.	To determine the relationship between the day of the week that a patient receives his or her TKA and the subsequent clinical outcomes	143,195 admissions between January 1, 2009 and December 31, 2013  procedure code for primary TKA (81.54). Identified 115,053 patients who underwent primary TKA on a weekday between 2009 and 2013 in New York State.  Exclusion criteria were charts that included missing information.	Retrospective cohort-controlled study.  Mixed effects regression models to compare length of stay (LOS), 90-day readmission, and cost according to the day of TKA.	Mean LOS was significantly higher for surgeries performed on Wednesday (P < .001), Thursday (P < .001), and Friday (P < .001).  Mean cost was significantly higher for surgeries performed on Wednesday (P < .001), Thursday (P < .001), and Friday (P < .001). When LOS was held constant across every day of the week, the mean cost of TKA decreased by \$247 for Wednesday, \$627 for Thursday, and \$394 for Friday (Boylan et al., 2017, p. 2343)	<b>Strength:</b> At hospitals performing less than 50 TKA cases per year, the mean cost of TKA decreased by \$553 for Wednesday, \$1689 for Thursday, and \$938 for Friday.  <b>Limitations:</b> The SPARCS database does not contain information on patient that could ultimately affect the outcomes of the patients.	Primary TKA performed later in the week is associated with an increased LOS and increased costs of admission, but a similar risk of 90-day readmission. Preferential scheduling of primary TKA cases early in the week, as well as the development of standardized clinical care pathways with appropriate weekend staffing of social work and rehabilitation services, could help to decrease the daily variation in LOS and increase the value of TKA episodes.  For patients, a faster return home equals decreased exposure to hospital-associated infections, sleep deprivation, malnutrition, and immobility. For hospitals and providers, decreased costs of admission will increase the likelihood of receiving bonus reconciliation payments from insurers.	Level III

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Cavill, S., McKenzie, K., Munro, A., McKeever, J., Whelan, L., Biggs, L.,...Haines, T. P. (2016). The effect of pre-habilitation on the range of motion and functional outcomes in patients following the total knee or hip arthroplasty: A pilot randomized trial. <i>Physiotherapy Theory and Practice</i> , 32(4), 262-270.	Determine if pre-habilitation had any effect on the quality of life and function in patients having total knee replacement or total hip replacements	<p>Sixty-four people who underwent elective lower limb arthroplasty were included.</p> <p>Completed in Australia. All subjects were recruited from orthopedic surgical review clinics with a risk assessment and prediction tool. Then the trial was conducted at a single healthcare network from 2010 to 2012</p> <p>Exclusion criteria included patients living outside the catchment area, having surgery less than 4 weeks from the clinic appointment and patients who were unable to mobilize without a wheelchair.</p>	<p>A pilot randomized controlled trial with concealed allocation, assessor blinding, and intention-to-treat analysis was conducted.</p> <p>Pre-habilitation included one-hour twice-weekly sessions for at least three and a maximum of four weeks prior to surgery. Control participants did not complete any pre-surgical programs. Health utility and quality of life as measured by the EQ-5D-3L and the patient-specific functional scale were the primary outcomes measured before allocation and eight weeks post-operatively</p> <p>Groups were compared using linear regression adjusted for baseline values of the outcome variable and the number of days since surgery.</p>	<p>No between-group differences were evident in health utility (main effect of the group <math>-0.04</math> (95% Confidence Interval [CI] <math>-0.16</math> to <math>0.08</math>, <math>p = 0.50</math>) or patient-specific functional scale (main effect of the group <math>-0.59</math> (95% CI <math>-1.8</math> to <math>0.6</math>, <math>p = 0.73</math>), but the group-by-joint interaction effects for the timed up and go (TUG) (<math>7.6</math> (95% CI <math>-0.9</math> to <math>16.1</math>, <math>p = 0.08</math>)) and the EQ-5D VAS (<math>-18.3</math> (95% CI <math>-41.1</math> to <math>4.5</math>), <math>p = 0.11</math>) were larger. Pre-habilitation participants' knee flexion improved by <math>12.6</math> degrees (95% CI <math>5.2-20</math>, <math>p = 0.001</math>) (Cavill et al., 2016, p. 262)</p>	<p><b>Strengths/Implications:</b></p> <p>Very detailed study. Measurement was done with 6 secondary outcomes.</p> <p>Randomization was still able to be completed to help the strength of the trial.</p> <p><b>Limitations:</b></p> <p>Trial size, 60 patients was a small sample size.</p> <p>Unfunded study.</p> <p>Those who recruited patients at the preadmission clinic were responsible for inpatient care.</p>	<p>Pre-habilitation improved knee flexion however this did not translate into improved functional mobility or quality of life.</p> <p>This could lead to another study to include the role of knee flexion and outcomes or how to better utilize it.</p> <p>CONSORT diagram of patient flow through the study was very easy to read</p> <p>They study looked at patients who were likely to go home to begin with which could have resulted in patients who were already healthier which limited the comorbidity factor of affecting the outcomes.</p>	Level II

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Didden, A. G., Punt, I. M., Feczko, P. Z., &amp; Lensen, A. F. (2019). Enhanced recovery in usual health care improves functional recovery after total knee arthroplasty. <i>International Journal of Orthopaedic and Trauma Nursing</i>, 34, 9-15.</p>	<p>Evaluate the effectiveness of a new clinical care pathway</p>	<p>At Maastricht University Medical Center, the Netherlands.</p> <p>Between April 2016 and November 2016</p> <p>Data from before implementation was from February 2015 to June 2015</p> <p>170 patients were used.</p> <p>No patient exclusion listed</p>	<p>Pilot randomized controlled study.</p> <p>Data derived from physical therapy reports and LOS were compared between the old (n = 85) and the new (n = 85) clinical care pathways for time to functional recovery (using the modified Iowa Level of Assistance Scale), LOS and joint-related readmission. Group differences were evaluated using Mann-Whitney and Chi-Square tests. The clinical care pathway was redesigned using LSS-methods.</p> <p>Data on functional recovery and LOS were collected before and after the implementation of the LSS project.</p>	<p>After implementation of the new pathway, median time to functional recovery improved from 4 (2-5) to 2 days (1-8)(P &lt; 0.001) and LOS from 7 (5-11) to 4 days (3-12)(P &lt; 0.001), joint-related readmission declined (3.5-2.4%)(P = 0.65). (Didden et al., 2019, p. 9)</p>	<p><b>Strengths/Implications:</b></p> <p>Both the old and new clinical pathways explained.</p> <p>This study was to focus on a more appropriate main outcome measure: inpatient functional recovery after TKA, which indicates the ability of inpatients to ambulate and transfer independently.</p> <p>8-month study period</p> <p>Well defined protocol including a time frame of mobilization within 4 hours of surgery</p> <p>health care reform was carried out in regular practice, indicating that our new clinical care pathway could also be implemented at other orthopedic wards</p> <p><b>Limitations:</b></p> <p>170 patients are not a large patient population</p>	<p>Future research should focus on having multiple discharge moments per day which might encourage patients to achieve functional recovery as soon as possible</p> <p>clinical effectiveness depends on many factors, nursing staff and other caregivers are crucial to the success of enhanced recovery protocols</p> <p>This development is very similar to the care pathway protocol and timeline developed by my own institution</p>	<p>Level II</p>

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Dossett, H. G., &amp; Chesser, M. (2017). Improving care and reducing length of stay in patients undergoing total knee replacement. <i>Federal Practitioner</i>, 10(34), 38-41.</p>	<p>To look at the patient care provided to total knee replacement surgery patients and identify the methods that had an impact readmission and shortened length of stay.</p>	<p>Two year look at patients who underwent a total knee replacement at Phoenix VA Health Care System.</p>	<p>Retrospective cohort study</p> <p>Set a goal of reducing the metrics of 10% for LOS and readmissions.</p> <p>Measurement of patients LOS and Readmission were conducted based on the care plan of preoperative, intraoperative and postoperative management through a pathway.</p>	<p>Pre data showed 164 knee replacements with a 4.9-day VA national LOS and 3.5-day PVAHCS LOS. Post study the VA national LOS for TKR was 4.8 days, and at PVAHCS it was 2.8 days.</p> <p>The 30-day readmission rate was 8.4% nationally and 7.9% at PVAHCS. After implementation, the national 30-day readmission rate was 7.1%, while the PVAHCS rate dropped to less than half the national rate: 3.4%.</p> <p>(Dossett &amp; Chesser, 2017, p. 40)</p>	<p><b>Strengths/Implications:</b></p> <p>Significant improvement in the data to support a change in plan of care.</p> <p>Data were consistently used through the NSQIP data base.</p> <p><b>Limitations:</b></p> <p>With it being a retrospective look, the process used came from a surgeon consensus to adopt the process during the study period.</p>	<p>Themes that were identified were preoperative optimization, education, reducing blood loss, DVT prophylaxis, pain control, infection control, physical therapy, pain and nausea management, and hospitalist co-management.</p> <p>A team approach to process improvement can allow for increased efficiency while providing safer care for patients</p>	<p>Level III</p>



Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Ellis, T. A., Hammoud, H., Del Merced, P., Nooli, N. P., Ghoddoussi, F., Kong, J., & Krishnan, S. H. (2018). Multimodal clinical pathway with adductor canal block decreases hospital length of stay, improves pain control, and reduces opioid consumption in total knee arthroplasty patients: A retrospective review. <i>The Journal of Arthroplasty</i> , 33, 2440-2448.	Developing a clinical pathway to facilitate early ambulation will decrease costs and resource utilization	<p>The medical records of 338 patients undergoing primary TKA were retrospectively reviewed. Patient records were selected by the date of surgery for 3 sequential cohorts during the phased implementation of the MCP guiding their hospitalization.</p> <p>A total of 43 patients were excluded from the initial records screened. T</p> <p>Patient demographics including age, gender, body mass index, and ASA classification were collected for all patients, and the cohorts were analyzed to ensure similitude. Patients with chronic pain and those with chronic opioid dependence were included in the study as they were equally distributed among the cohorts</p>	<p>Cohort controlled study.</p> <p>Sequential before-and-after study of total knee arthroplasty patients after a phased implementation of a clinical pathway that includes multimodal oral analgesic protocols, adductor canal nerve block, and standardized ambulation protocols. Primary outcomes measured were hospital length of stay, total opioid consumption, total antiemetic use, and perioperative pain scores. (Ellis et al., 2018, p. 2441)</p> <p>Two hundred ninety-five patients were divided into 3 sequential cohorts</p> <p>Demographic data were analyzed using t tests, chi-square tests, and Fisher exact tests, as appropriate.</p>	<p>Cohort 3 had significantly reduced hospital length of stay. “comparisons (LSD) revealed that the length of stay was significantly decreased (<math>p &lt; .001</math>) for cohort 2 (M 1/4 3.26, SD 1/4 0.58) when compared to cohort 1 (M 1/4 3.89, SD 1/4 0.38). The length of stay was significantly decreased for cohort 3 (M 1/4 2.12, SD 1/4 0.44) in comparison to both cohort 1 (<math>p &lt; .001</math>) and cohort 2 (<math>p &lt; .001</math>).” (Ellis et al., 2018, p. 2441)</p> <p>Cohorts 2 and 3 had significantly less opioid consumption.</p>	<p><b>Strengths/Implications:</b> demonstrate a significant opportunity for cost savings and system resource utilization reduction that may offer important benefit to the health-care systems as the massive increase in TKA volume burdens the system of the future</p> <p><b>Limitations:</b> investigators noted during the study was the inconsistency in collection of VAS data.</p> <p>Wide variation in the total number of assessment scores documented between patients for pain scores.</p>	<p>Clinical pathways designed to facilitate early ambulation can reduce hospital length of stay, reduce opioid consumption, reduce antiemetic use, and improve pain control.</p> <p>Postoperative pain poses an obstacle to rehabilitation efforts and hospital discharge, leading to increased costs</p>	Level IV

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Featherall, J., Brigati, D. P., Faour, M., Messner, W., & Carlos, H. (2018). Implementation of a total hip arthroplasty care pathway at a high-volume health system: Effect on Length of stay, discharge, disposition, and 90-day complications. <i>The Journal of Arthroplasty</i> , 33, 1675-1680.	The need to improve quality of THA nationally to reduce cost of care.	All patients undergoing primary THA at a large health system from January 1, 2013, through December 31, 2015.  6090 total patients.  These cases were distributed across the main campus and 10 diverse hospital locations in 2 states, in both rural and suburban environments.	Quasi-experimental study.  All patients receiving THA in 2013 (pre-protocol, historical control), 2014 (transition), and 2015 (full protocol implementation) were included in the analysis.  Multivariable regression assessed the relationship of the care pathway to 90-day postoperative complications, LOS, and discharge disposition. Cost savings were estimated using previously published post arthroplasty episode and per diem hospital costs. (Featherall et al., 2018, p. 1676)	decrease in LOS (mean ratio, 0.747; 95% confidence interval [CI; 0.727, 0.767]) and an increase in discharges to home (odds ratio, 2.079; 95% CI [1.762, 2.456]). Payer-perspective-calculated theoretical cost savings, including both index admission and post discharge costs, were \$2533 per patient. (Featherall et al., 2018, p. 1677)  In the unadjusted analysis, the pre-protocol cohort demonstrated a mean LOS of 3.21 days, which decreased to 2.80 days during transition, and, finally, to 2.55 days in the full protocol implementation cohort ( $p < .01$ ). (Featherall et al., 2018, p. 1677)	<b>Strengths/Implications:</b> An extensive literature review was done prior.  Developed by a multidisciplinary team.  Large sample population of 6,090 patients  Redcap database used for data collection (national database)  <b>Limitations:</b> Limited data on adherence to preoperative comorbidities such as diabetes  cost estimation is not derived from original financial data.  Did not have a robust patient reported outcome data collection. Would like this in the future.	This was a study looking at total hips, which is not the purpose or focus of my paper, but the concepts are very similar and can be mirrored in many aspects.  A point they made that wasn't commonly addressed in other studies was that they were able to discharge patients more frequently to home over short term rehab.  That this was used across a health system from rural to suburb hospitals.  Divided the pathway into procedures for preoperative assessment, intraoperative and postoperative.  Cost saving of \$2533 per patient.  An American study which would represent our healthcare system best.  Brought up that leadership engagement is important  Lead to higher performance	Level III

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Gnanakumaran, S., Li, F., White, M., Shiel, N., Walker, P., &amp; Rappo, T. (2017). The effect of early mobility in patients after total knee replacement on hospital length of stay, pain and function: A randomized control trial. <i>Physiotherapy Practice and Search</i>, 38, 121-125. doi:10.3233/PPR-170093</p>	<p>Evaluate the effect of an early mobilization program for patients after a total knee replacement.</p>	<p>Patients admitted for primary TKR surgery under a single surgeon.</p> <p>Over a 6-month period were randomly allocated to either the early mobilization group (early mobilization 4–6 hours after operation) or the control group (usual mobilization within 24 hours after surgery).</p> <p>40 patients, 20 in the experiment group and 20 in the control.</p> <p>Carried out at Concord Repatriation General Hospital, Sydney</p>	<p>Prospective randomized controlled study.</p> <p>Two patient groups. An early mobilization group who mobilized within 4–6 hours after surgery and another control group who followed a standard protocol of mobilizing within the 24 hours after the surgery.</p> <p>Primary outcome measures were the length of hospital stay and pain scores. Secondary outcomes were the active knee range and the timed up and go (TUG) test as a functional measure.</p>	<p>Pain in the both groups decreased throughout the period however there was no statistically significant difference between groups (<math>p = 0.614</math>). In addition, no significant change in length of stay was noticed between the groups (<math>p = 0.34</math>). (Gnanakumaran et al., 2017, p. 123)</p>	<p><b>Strengths/Implications:</b> Had several physical therapy measurements and true patient objective measurements to determine if improved range of motion.</p> <p><b>Limitations:</b> Excluded patients over the age of 80 which is a large number of patients. Length of stay is also affected by factors not looked at like social situations, support, and patient experience.</p> <p>Did not look at the post-operative anesthesia which several other studies did.</p> <p>Very small sample size</p>	<p>This study was done in Australia which started with a very high length of stay. Their study sample size was extremely small and had no difference in outcomes with the control vs the study group. This was very limited in nature and could be contributed to many factors not discussed in the study.</p> <p>There was little information regarding the total joint protocol which makes it a limited study. It is the first study saying early mobilization doesn't affect outcomes that I have researched.</p>	<p>Level III</p>

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Hertog, A., Fliesche, K., Timm, J., Muhlbauer, B., &amp; Zebrowski, S. (2012). Pathway-controlled fast-track rehabilitation after total knee arthroplasty: A randomized prospective clinical study evaluating the recovery pattern, drug consumption and length of stay. <i>Arch Orthop Trauma Surg</i>, (132), 1153-1163.</p>	<p>To investigate fast-track rehabilitation concept in early recovery after a TKA</p>	<p>The inclusion criteria were male and female patients (age range 40–85 years), admitted for elective TKA.</p> <p>The exclusion criteria were missing informed consent, lack of cooperation capability, American Society of Anesthesiologists (ASA) score [3, rheumatoid arthritis, cancer co-morbidity, alcohol or drug abuse, previous major surgery on the affected joint, neurologic or psychiatric disease, pregnancy, and participation in other clinical studies.</p> <p>Total patients 74 in study and 73 in control.</p> <p>Took place at an orthopedic specialized hospital in north-west Germany.</p>	<p>prospective, randomized, case control design.</p> <p>The study consisted of a standard rehabilitation group and fast-track rehabilitation group. Patient monitoring was scheduled for 5 visits (V) over 3 months as follows: V0 the day prior to surgery, V1: 5–7 days, V2: 15–23 days, V3: 6 weeks, V4: 3 months postoperatively (Hertog et al., 2012, p. 1154)</p> <p>The secondary evaluation variables were demographic data, co-morbidities, WOMAC index score, LOS, and analgesic drug consumption.</p>	<p>After TKA, patients in the fast-track rehabilitation group showed enhanced recovery compared with the standard rehabilitation group, as based on the differences between the groups for the cumulative AKSS (American Knee Society Score) (<math>p = 0.0003</math>), reduced LOS (6.75 vs. 13.20 days, <math>p &lt; 0.0001</math>), and lower number of adverse events. (Hertog et al., 2012, p. 1157)</p>	<p><b>Strengths/Implications:</b></p> <p>For all patients in the study, one specialized surgical team performed the TKA (one surgeon, two anesthetists, and a team of five operating room nurses). All patients were treated with the same surgical technique. All patients received combined spinal analgesia during the procedure with bupivacaine 0.5 % and patient-controlled epidural analgesia with a solution of ropivacaine 0.15 %, fentanyl 0.1 %, and clonidine 0.02 % in NaCl for 48 h postoperatively.</p> <p><b>Limitations:</b></p> <p>lack of a standardized pain management is a methodological weakness of the study</p>	<p>Clinical pathway treatment in TKA is recognized as a team-approach tool that can achieve better medical outcome and economic performance than standard care, while minimizing complications and optimizing patient-centered care</p>	<p>Level II</p>

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Kee, R. J., Edwards, P. K., & Barnes, C. L. (2017). Effect of risk acceptance for bundled care payment on clinical outcomes in a high-volume total joint arthroplasty practice after implementation of standardized clinical pathway. <i>The Journal of Arthroplasty</i> , 32, 2332-2338.	To determine the benefits on clinical outcomes when a care pathway is implemented.	<p>Developed phases to look at: preoperative admission team, intraoperative team, acute postoperative team, discharge team and the quality measure team at one single hospital.</p> <p>From April 2013 to April 2015. Total of 889 THA and 937 TKA. TKA were further divided as 186 in first 6 month, 254 in the second and 270 in the third and 227 in the fourth.</p>	<p>Retrospective cohort-controlled study</p> <p>Developed phases to look at: preoperative admission, intraoperative, acute postoperative, discharge and the quality measure phases of the patients care.</p>	<p>After TKA, discharge on POD 1 was 46.2% in the first 6 months, 90.9% in the second, 92.2% in the third, and 92.1% in the last 6 months. Discharge on either POD 1 or 2 was 96.2% in the first 6 months, 97.6% in the second, 98.9% in the third, and 96.0% in the fourth. <math>p &lt; .01</math>. (Kee et al., 2017, p. 2337)</p> <p>This showed that there was a reduction in LOS after the first 6 months of the program.</p>	<p><b>Strengths/Implications:</b> Wilcoxon survival analysis was used which is more sensitive to differences in the early survival curve.</p> <p><b>Limitations:</b> Not a very clear direction of the study or the design. Does not example the time or the number of people included in the study.</p> <p>In hospital complication rates were not looked at.</p> <p>Functional and satisfaction scores were not looked at but a possibility for a future study.</p>	<p>Bundle for care practice had a decrease in rates of discharge to home opposed to the fee for service model.</p> <p>Showed significant improvement in the length of stay for total knees</p> <p>Management of patient and family expectations for LOS and discharge disposition are key to improving those outcomes.</p> <p>Age can be a factor in the payment options for bundle vs not which doesn't account for the patient's comorbidities that increase with age and can affect outcomes.</p>	Level III

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Labraca, N. S., Castro-Sanchez, A. M., Mataran-Penarrocha, G. A., Arroyo-Morales, M., Sanchez-Joya, M., &amp; Moreno-Lorenzo, C. (2011). Benefits of starting rehabilitation within 24 hours of primary total knee arthroplasty: Randomized clinical trial. <i>Clinical Rehabilitation</i>, 25(6), 557-566.</p>	<p>To determine significance of ambulation with 24 hours of surgery compared to 48 hours to 72 hours.</p>	<p>Experimental clinical trial. Control and experimental group each had 153 participants.</p> <p>Patients undergoing primary total knee arthroplasty for osteoarthritis randomly assigned to a group.</p> <p>Hospital in southern Spain from January 15<sup>th</sup>, 2005 to May 31<sup>st</sup>, 2007.</p> <p>Inclusion criteria: ages between 50-75 and recipient of elective knee joint replacement surgery due to unilateral osteoarthritis</p> <p>Exclusion: related to significant health comorbidities,</p>	<p>Baseline measurements were also recorded based on autonomy, joint range of motion, muscle strength, pain, gait and balance.</p> <p>After completion of the rehabilitation therapy, the same variables as gathered at baseline were recorded, as well as the length of hospital stay (in days) and number of rehabilitation sessions received by the patient.</p> <p>Primary outcome measures were range of motion, muscle strength and pain.</p> <p>First group received treatment within 24 hours and the control between 48 and 72 hours</p>	<p>In comparison with the controls, the experimental group showed significantly shorter hospital stay (by (mean standard deviation) 2.09 1.45 days; <math>p &lt; 0.001</math>), fewer rehabilitation sessions until medical discharge (by 4.95 2.34; <math>p &lt; 0.001</math>), lesser pain (by 2.36 2.47 points; <math>p &lt; 0.027</math>), greater joint range of motion. (Labraca et al., 2011, p. 561)</p> <p>Early mobilization showered to reduce LOS , reduce pain and improve range of motion.</p>	<p><b>Strengths/Implications:</b></p> <ul style="list-style-type: none"> <li>- Therapy staff increase pressure to increase throughput and achieve earlier discharges and demands to reduce the length of stay</li> <li>-having the same staff doing the therapy with each patient.</li> </ul> <p><b>Limitation:</b></p> <ul style="list-style-type: none"> <li>-limit on analyzing the health costs for these patients due to restrictions data by the public health authority</li> </ul>	<p>Hospital staff identified patients who met criteria &amp; asked if interested in study.</p> <p>Early initiation of physical recovery in patients subjected to knee arthroplasty improves patients' outcomes- would need to consider hospital cost for staffing.</p> <p>Increase in intensity or amount of therapy in one day does not show an increase in outcomes.</p>	<p>Level II</p>

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Lilly, R., Siljander, M., Koueiter, D., & Verner, J. (2018). Day of surgery affects length of hospitalization for patients undergoing total joint arthroplasty discharged to extended care facilities. <i>Blue</i> , 41(2), 82-86.	To determine the effect of surgical day of the week on hospital LOS among patients discharged to an extended care facility.	<p>Single-high volume hospital who underwent TKA and THA between January 2013 and December 2016</p> <p>2184 patients were divided into 5 groups based on the day of the week surgery.</p> <p>Inclusion criteria: age older than 50 years old, surgery Monday through Friday, and discharge to extended care facility 184 patients met criteria</p> <p>Exclusion criteria: younger than 50 years, had a revision procedure, has an emergent case, had a simultaneous bilateral procedure, or were discharged home.</p>	<p>Randomized Controlled pilot study.</p> <p>Major variable was day of the week patient had surgery.</p> <p>A one -way analysis of variance test was used to assess differences in normal, continuous variables based on the day of surgery</p> <p>A Kruskal-Wallis test was used to assess difference in nonparametric variables across days of the week, with a Dun-Bonferroni test used for pairwise comparisons.</p> <p>A chi-square test was used to analysis difference in categorical variables.</p>	<p>The LOS varied significantly by the day of the week (<math>p&lt;.001</math>). Thursday varied significantly from every other day of the week (<math>p&lt;.001</math>), with the greatest LOS (mean, <math>3.56\pm 0.84</math> days) and the highest percentage of patients discharged (27.8%) compared with all other days. Tuesday had the shortest LOS (mean, <math>3.25\pm 0.70</math> days) and differed significantly from Thursday and Friday (<math>p&lt;.05</math>). Patients discharged to an ECF after primary TKA and THA have an increased mean hospital LOS when their surgery falls on a Thursday. (Lilly et al., 2018, pp. 83-84)</p>	<p><b>Strengths/Implications:</b></p> <p>-larger than previously conducted studies, which allowed for statistically significance between LOS based on the day of surgery to an ECF.</p> <p><b>Limitations:</b></p> <p>-a retrospective chart review, which is an inherently weaker design</p> <p>-conducted at a single hospital with institutional biases.</p> <p>-the cohort included both THA and TKA.</p>	<p>Patients discharged to an ECT after a TKA have an increased mean hospital LOS when their surgery is on a Thursday due to discharge falling on a weekend. Look to move to earlier in the week surgeries. -feasible for this EBP study.</p> <p>Number of patients included was significant to show a large impact. -builds support for surgery date affecting disposition.</p> <p>Decreasing the length of stay decreases the total cost. Improvements in post op pain management, early mobilization, improved patient education all contributed to decrease length of stay. -makes it hard to determine what is the biggest bang for the buck for this project.</p> <p>Prescreening patients can help to schedule surgeries better but are not used routinely. -can be easy modification that has big results.</p>	Level II

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>McCulloch, R., Cottingham, P., Christmas, B., &amp; Pearce, O. (2017). Is it time we changed how we measure length of stay for hip and knee arthroplasty? <i>Journal of the American Academy of Orthopaedic Surgeons</i>, 1, 1-6. doi:10.5435/JA AOSGlobal-D-17-00032</p>	<p>Use of a rapid recovery program with effect on LOS while measuring the outcome in hours rather than days.</p>	<p>1,128 patients in the study. From January 2013 to March 2015.</p>	<p>Cohort controlled study</p> <p>Between January 2013 and December 2015, patient LOS for primary hip and knee replacement was collected in 1,168 patients. There were two groups: pre- and post-institution of the Rapid Recovery Program.</p>	<p>Statistical analysis confirmed a significant reduction in LOS between the Enhanced Recovery Program and Rapid Recovery Program (p, 0.001).</p> <p>LOS in hours in the knee joint group showed that 0.2% of patients were discharged , 24 hours, 2.1% , 36 hours, 1.7% , 48 hours, and 96% . 48 hours after surgery. (McCulloch et al., 2017, p. 4)</p>	<p><b>Strengths/Implications:</b></p> <p>Large group for a patient sample over a 2-year period.</p> <p>Looked at many aspects of potential delays.</p> <p>The authors had extensive knowledge of the content.</p> <p>Significant statistical analysis was completed with Chi-square tests, Mann-Whitney U tests and Kaplan-Meier curves.</p> <p><b>Limitations:</b> Was not fully discussed in the study.</p> <p>Did not discuss the variables that could have occurred in patients.</p>	<p>Utilization of enhanced recovery pathways has been shown to have several advantages</p> <p>A reduction in patient length of stay by only a few hours has been shown to provide a significant cost benefit.</p> <p>Regarding the unit of measurement for LOS , hours is a more sensitive unit of measurement for detecting an improvement.</p> <p>Looked at early mobilization and pain control measures.</p>	<p>Level II</p>



Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Pamilo, K. J., Torkki, P., Peltola, M., Pesola, M., Remes, V., & Paloneva, J. (2018). Fast- tracking for total knee replacement reduces use of institutional care without compromising quality. <i>Acta Orthopaedica Scandinavica</i> , 89(2), 184-189.	To evaluate the influence of the fast- track concept on the length of uninterrupted institutional care (LUIC) and other outcomes after TKR.	4,256 TKRs performed in 4 hospitals between 2009–2010 and 2012–2013 were identified from the Finnish Hospital Discharge Register and the Finnish Arthroplasty Register.  Hospitals were classified as fast track (Hospital A) and non- fast track (Hospitals B, C and D).  Inclusion: patients from the FHDR who had ICD 10 code M17.0/M17.1 for primary osteoarthritis of the knee.  Exclusion: revisions, connective tissue disorder, rheumatoid arthritis and required dialysis.	Randomized Pilot controlled study.  Analyzed length of uninterrupted institutional care (LUIC), LOS, discharge destination, readmission, revision, manipulation under anesthesia (MUA) and mortality rate in each hospital. (Pamilo et al., 2018, p. 184)  compared outcomes for TKRs performed in Hospital A before and after fast-track implementation and with the other hospitals that were non fast track.	After fast-track implementation, median LOS in Hospital A fell from 5 to 3 days ( $p < 0.001$ ) and (median) LUIC from 7 to 3 ( $p < 0.001$ ) days. These reductions in LOS and LUIC were accompanied by an increase in the discharge rate to home ( $p = 0.01$ ). Fast- tracking in Hospital A led to no increase in 14- and 42-day readmissions, MUA, revision or mortality compared with the rates before fast- tracking, or with those in the other hospitals. Of the 4 hospitals, LOS and LUIC were most reduced in Hospital A. (Pamilo et al., 2018, p. 186)	<b>Strengths/Implications:</b> -covered all hospitals in Finland, public and private which allowed for a wide range of patients to look at.  <b>Limitations:</b> -Only one hospital had done the fast track protocol prior to the study.  -other variables not identified could have contributed to the outcomes.	Fast-tracking protocols reduce LUIC and LOS-this is very vague and doesn't go into detail on qualifications of fast track.  With only one hospital implementing this, what are the other limitations that prevent hospitals from being able to do so, not explained in the article.	Level II

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Rasmussen, S., Kramhoft, M. U., Sperling, K. P., &amp; Pedersen, J. H. (2004). Increased flexion and reduced hospital stay with continuous intraarticular morphine and ropivacaine after primary total knee replacement: Open intervention student of efficacy and safety in 154 patients. <i>Acta Orthopaedica Scandinavica</i>, 75(5), 606-609.</p>	<p>To study the effect of continuous injection of morphine and ropivacaine after TKR and its affects on range of movement and length of hospital stay.</p>	<p>154 consecutive patients, all whom were to be recruited in Copenhagen at Hamlet Private hospital between April 1999 and May 2001</p> <p>Inclusion criteria: had a primary unilateral TKR for osteoarthritis..</p>	<p>Randomized Controlled Study.</p> <p>The intervention was continuous intraarticular injection of morphine 20 mg/mL, 0.5 mL plus ropivacaine 2 mg/mL, 100 mL; bolus 20 mL and 2 mL/hour from 24 to 72 hours postoperatively. Patients were then measured for endpoint range of motion and the number of days until discharge.</p>	<p>At discharge, flexion was 70 degrees (60-100) in group 1, 100 degrees (70-115) in group 2 and 110 degrees (90-130) in group 3. Hospital stay was reduced from 9 (7-11) days in group 1, to 7 (5-10) days in groups 2 and 3. Number of days elapsed until the patient was walking with crutches was reduced from 5 (3-8) to 4 (3-6) and 3 (3-9), respectively. (Rasmussen et al., 2004, p. 606)</p> <p>In the intervention groups, the need for analgesics was reduced during the hospital stay. Deep infection was registered in 1 patient.</p>	<p><b>Strengths/Implications</b> -results significantly better than other studies conducted prior. Could be from the use of the continuous injection.</p> <p><b>Limitations:</b> -Study was not blind or randomized -Risk of some minor complications.</p>	<p>Study was the oldest of the group but allowed for us to look at how far we have come and also go back to the basics if needed.</p> <p>Wanting more extensive randomized studies to be performed. -no mention of cost. Would not apply to this study</p>	<p>Level II</p>

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Reinikka, K. J., Taylor, D., Daniel, S., Burns-Hogan, S., DePass, B., McGill, L.,... Veit, S. (2017). Quality-based procedures for knee replacement, hip replacement, and hip fracture: Physiotherapist s' perceptions of adherence, barriers, and facilitators. <i>Physiotherapy Canada, 69</i> (2), 133-141.	Examined the perceived barriers to and facilitators of implementing best practice guidelines and adhering to quality-based procedures after a total knee, total hip or hip fracture.	Conducted in Ontario hospital and home care physiotherapists working with patients after TKR, THR, or HF completed a Web-based survey. 43 participated in follow-up semi-structured telephone interviews.  Hospital Liaison included 71 hospitals and home care liaison included 24 networks.  93 individual physiotherapists responded to the study	Mixed method study with descriptive qualitative interviewing.  QBPS=Quality based procedures  BPGS= Best-practice guidelines  Phase 1 included a cross-sectional, self-administered, web-based surgery of BPGs for physiotherapy and their implantation after TKR, THR, and HR.  Phase 2 was telephone interviews with 12 of the self-identified, consenting questionnaire participants to explore the facilitators of and barriers to using BPGs and implementing QBPs.	The perception of QBP adherence varied, with self-reported adherence rates across identified practice standards for TKR, THR, and HF reported as 62%, 69%, and 60%, respectively. Only 66% perceived that their institutions met provincial standards.  Qualitative themes included awareness and knowledge, flexibility and funding, communication, and availability of and equitable access to outpatient and community-based physiotherapy services.  (Reinikka et al., 2017, p. 136)  Showed that awareness and knowledge about QPGs and QBPs increased integration to practice	<b>Strengths/Implications:</b> Well researched. The questionnaire was piloted and well vetted prior to being used.  <b>Limitations:</b> Lack of time for providers conducting the interviews and patients filling out survey.  Multiple versions of the QBPs and BPGs for management of patients.	This study included patients that were also hip fractures and total hip replacements which wasn't the focus of my review however it provided me some great insight to a global view of how systems are dealing with the same barriers.  There was a common theme around awareness and knowledge. If the staff were not aware of the BPGs, they were not likely to be done or completed correctly. Having user friendly information is important for staff buy in.  There needs to be active involvement of patients and families for surgery preparation to attend education sessions.	Level VI

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Schwartz, A. J., Bozic, K. J., & Etzioni, D. A. (2018). Value-based total hip and knee arthroplasty: A framework for understanding the literature. <i>American Academy of Orthopaedic Surgeons</i> , 0(0), 1-11. doi:10.5435/JA AOS-D-17-00709	To provide a framework for understanding the rapidly growing quality and cost associated with total joint replacement through a literature review	Table 1: Focus on structure, process, and outcome. 10 studies reviewed between the years of 2016-2017  Table 2: 10 studies Selected recent cost literature regarding THA and TKA according to perspective and temporal relation to surgery. 2016-2017	Meta-analysis	Decreased LOS, readmissions and discharge to inpatient facility compared to prior to bundled implementation.  Discharge to inpatient post-acute care facility associated with higher odds of complications and readmissions.  Higher preoperative expectations predicted greater postoperative improvement in function but not satisfaction.  Cost feedback to surgeons resulted in 9.95% reduction in surgical supply costs.  Discharges on POD 3 correspond to unnecessary extra days in the hospital and could potentially represent \$63 million in annual savings to Medicare.	<b>Strengths/Implications:</b>  Large variety of studies.  Done through research at Mayo Clinic  <b>Limitations:</b> Not discussed.	Research efforts toward quality improvement are likely to be effective when they address the structure, process, and most importantly outcomes.	Level V  Studies included from I-IV

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
Sibia, U. S., Turcotte, J. J., MacDonald, J. H., & King, P. J. (2017). The cost of unnecessary hospital days for Medicare joint arthroplasty patients discharging to skilled nursing facilities. <i>The Journal of Arthroplasty</i> , 32(9), 2655-2657. Retrieved from <a href="https://doi.org/10.1016/j.arth.2017.03.058">https://doi.org/10.1016/j.arth.2017.03.058</a>	The purpose of this study was to extrapolate the financial impact of the 3-night Medicare stay rule which affects TKA patients.	The NSQIP database for all patients who underwent a primary total THA and TKA in 2015  17,274 TJAs (5252 THAs and 12,022 TKAs) which had a 3-night stay.  Exclusion criteria: patients younger than 65 years of age, those with evidence of prior infection or those who needed emergency treatment	Cohort controlled study  Descriptive statistics were used to report the discharge destination for patients after surgery.  The Student <i>t</i> test examined costs for patients discharging on POD #2 and compared those costs with patients discharging on POD #3. A <i>P</i> value less than or equal to .05 was treated as statistically significant. (Sibia et al., 2017, p. 2656)	Hospital costs for THA were \$2014 higher for a 3-day LOS when compared with a 2-day LOS, whereas hospital costs for TKA were \$1814 more for a 3-day LOS when compared with a 2-day LOS ( $p < .001$ ).	<b>Strengths/Implications:</b> -supports repeal of the 3-day Medicare rule by all hospitals.  <b>Limitations:</b> -NSQIP database does not identify insurance type for patients.  -The database is only a sample of all total joints performed nationally.  -the cost of hospital stays varies by location.	Bundle payments can help with the 3-day Medicare rule and decrease length of stay. -shows quality of care is important.  Eliminating the Medicare's 3-day rule could adversely impact healthcare resources if there is an increase in SNF utilization.	Level VI

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Stone, A. H., Dunn, L., MacDonald, J. H., &amp; King, P. J. (2018). Reducing length of stay does not increase emergency room visits or readmissions in patients undergoing primary hip and knee arthroplasties. <i>The Journal of Arthroplasty</i>, 33, 2381-2386.</p>	<p>To examine readmissions of TJA patients and in identify necessary areas of improvement to care pathways through reasons for admission</p>	<p>TKAs (4720 patients) THA (924 patients) THA (1822 patients) charts examined which led to a total of 671 unplanned interventions in the first 90 days postoperatively by 586 patients.</p> <p>There were 380 visits were made to the ER by 336 (4.5%) patients and 250 (3.3%) patients experienced 291 readmission events</p>	<p>This is a retrospective cohort study</p> <p>Unplanned ER visits or readmissions were defined as any return to the hospital within 90 days of the index admission. The primary diagnosis documented in the patient chart was considered to be the reason for the return visit.</p> <p>All patients who returned to this institution via ER or readmission were identified, and a detailed chart review was performed.</p> <p>Pearson's chi-squared tests were used to analyze the differences in categorical variables between groups</p>	<p>Three hundred thirty-six (4.5%) patients had 380 ER visits and 250 (3.3%) patients had 291 readmissions in the first 90 days after TJA.</p> <p>Length of stay decreased over the study period from 2.66 days to 1.63 days, while the number of unplanned interventions remained steady. Pain and swelling were the most common reason for return for ER visits (33.2%) and readmissions (14.1%). (Stone et al., 2018, p. 2382)</p> <p>Found that patients who were readmitted actually had a longer initial LOS.</p>	<p><b>Strengths/Implications:</b></p> <p>Very large study over four years.</p> <p>Several tables to help see the data to make it easier to understand. Because all the data are from one institution, we can confidently state that all patients were subjected to the same protocols preoperatively, during the hospitalization and postoperatively which decreases the risk of some confounding variables.</p> <p><b>Limitations:</b></p> <p>Unable to account for readmissions or ER visits outside of their institution</p> <p>Some many statistics shared that it made it difficult to understand.</p>	<p>Patients who went to rehab were more likely to need readmission. This could be that SNFs have a lower threshold for transferring patients back.</p> <p>The most common time frame for patients to have complications was 4 weeks after surgery, this helps to focus your efforts to this time frame.</p> <p>joint arthroplasty is one of the most common procedures to utilize a bundled payment model, which will include all costs associated with a procedure for the first 90 days, including readmission and ER visits.</p>	<p>Level III</p>

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Thobhani, S., Scalercio, L., Elliot, C. E., Nossaman, B. D., Thomas, L. C., Yuratich, D.,...Patterson, M. E. (2017). Novel regional techniques for total knee arthroplasty promote reduced hospital length of stay: An analysis of 106 patients. <i>Ochsner Journal</i>, 17(3), 233-238.</p>	<p>To compared 3 regional techniques and their impact on pain scores, opioid consumption, performance during physical therapy, and hospital length of stay in patients undergoing TKA.</p>	<p>106 adult patients who underwent a primary unilateral TKA between September 1, 2014, and January 8, 2015.</p>	<p>Cohort study</p> <p>All patients had a continuous perineural infusion, either FNC block or ACB. Patients in the IPACK block groups also received a single injection 30-mL IPACK block of 0.25% ropivacaine. Pain scores and opioid consumption were recorded at post-anesthesia care unit discharge and again at 8-hour intervals for 48 hours. Physical therapy performance was measured on postoperative days (POD) 1 and 2, and hospital length of stay was recorded. (Thobhani et al., 2017, p. 234)</p>	<p>no differences in pain scores between the 3 groups, opioid consumption was significantly reduced in the FNC with IPACK group. Physical therapy performance was significantly better on POD 1 in the ACB with IPACK group compared to the other 2 groups.</p> <p>Hospital length of stay was significantly shorter in the ACB with IPACK group. (Thobhani et al., 2017, p. 235)</p>	<p><b>Strengths/Implications:</b></p> <p>-This study demonstrates that a single-shot IPACK block reduces opioid consumption, improves physical therapy performance and allows earlier hospital discharge.</p> <p>-Allows other investigator groups to validate findings to use with their own sample.</p> <p><b>Limitations:</b></p> <p>-This study lacks a group that received ACB only, which would allow better analysis of the contribution of the IPACK block to an ACB.</p> <p>-Retrospective studies may suffer from assignment bias.</p>	<p>Not a strong study. Was limited on information. However, this could be important to know for nursing. Pain management is the driver for all nursing actions with total joints.</p>	<p>Level VI</p>

Citation	Purpose/ Objectives	Study population/ Sample/ Setting	Study Design/Methods/ Major Variables/ Instruments and Measures	Result(s)/ Main Findings	Implications /critique	Comments Themes/additional implications	Level of Evidence
<p>Wynell-Mayow, W., &amp; Zahid Saeed, M. (2018). Much ado about nothing: the effect of tourniquet time on an accelerated rehabilitation programme following total knee replacement (TKR). <i>European Journal of Orthopaedic Surgery &amp; Traumatology</i>, 28, 1177-1182. doi:https://doi.org/10.1007/s00590-018-2177-z</p>	<p>Assess the impact of intraoperative tourniquet time, on Enhanced Recovery after Surgery (ERAS) outcomes following elective TKR</p>	<p>Elective TKRs taking place from July 2015 to October 2017, in a large UK teaching hospital.</p> <p>A total of 123 patients met inclusion criteria for length-of-stay analysis and 109 patients for analgesic analysis</p> <p>All cases included were standardized to receive the same TKR implant (Zimmer NexGen Posterior Stabilized) for treatment of the same underlying pathology—tricompartamental osteoarthritis.</p>	<p>Case controlled study</p> <p>All tourniquets were inflated to the same pressure—300 mmHG. Intraoperative analgesia included general anesthetic (GA) and spinal anesthetic</p> <p>Tourniquet time for each case was recorded prospectively and compared with length-of-stay post-operatively and total opioid analgesia requirement over the next post-operative day. Opioid requirement was not assessed on the day of procedure to reduce bias from the variability of time of surgery and anesthetic choice</p>	<p>Increased tourniquet time was not associated with longer length-of-stay but in fact shorter (<math>p = 0.03199</math>), likely due to this confounding temporal trend. Increased tourniquet time was not associated with increased opioid requirement (<math>p = 0.78591</math>). No association was found between tourniquet time and other complications including DVT and infection.</p> <p>No evidence that reduction in tourniquet time in TKA improved recovery.</p> <p>(Wynell-Mayow &amp; Zahid Saeed, 2018, p. 1179)</p>	<p><b>Strengths/Implications:</b> All patients received the same implant.</p> <p>ERAS outcomes determined that inflating the tourniquet until immediately before knife to skin time.</p> <p><b>Limitations:</b> Small patient population of 123 patients.</p> <p>confounding factors not included that were not addressed were social reasons for prolonged stay and complications unrelated to tourniquet use.</p>	<p>Intraoperative tourniquet usage is still a controversial field within TKR. There are currently no strict national guidelines for the safe limits of tourniquet time in lower limb surgery. Suggestive of 2 hours.</p>	<p>Level III</p>



Trigger	Is this an Organizational priority?	Forming a team to develop, implement and evaluate video-based education	Evidence gathered	Research critiqued and synthesized	Is evidence sufficient?	Pilot change	Evaluate pilot and decide	Widespread implementation and continued monitoring	Dissemination of results
<p><b>Clinical Problem:</b> Increased length of stay for total knee replacement patients leads to increased cost to the hospital, increased risk of complications. Medicare reimbursement for total knee patients continues to decrease.</p> <p><b>New knowledge:</b> Reducing length of stay in total knee patients will reduce cost. By building a strong pathway will allow for bundle payments with Medicare and improve reimbursement.</p>	<p>Yes</p> <p>A hospital marked this as a quality improvement area for the next two years as well as a capital project to reduce cost in orthopedics</p> <p>Goal to improve hospital quality index scores from the 56% to 75% in one year.</p>	<p>Gather stakeholders:</p> <ul style="list-style-type: none"> <li>-Staff nurses</li> <li>-Unit council</li> <li>-Unit nurse manager</li> <li>-Orthopedic surgeons</li> <li>-Physical Medicine and Rehab</li> <li>-Quality improvement committee</li> <li>- Nurse educators</li> <li>-Surgery manager</li> <li>-Social services</li> <li>-Scheduling</li> </ul>	<p>PICO question formed by author.</p> <p>Knowledge-focused trigger completed by author:</p> <p>See Table 3 for details</p>	<p>Completed by author:</p> <p>See Table 3 for details.</p> <p>-review with key stakeholders before implementing new practice changes and if possible for our project.</p>	<p>Upon examination of the literature, there is strong evidence to suggest that early mobilization of patients after a total joint will improve patient outcomes and reduce length of stay.</p>	<p>A hospital with an average size of 30-45-bed which houses the total joint program/the rapy staff/ and surgery staff.</p> <p>The orthopedic clinic will also be a part of the pilot</p>	<p>Decision to adopt or modify early ambulation of 150 feet on POD 0 and attend joint class based on evaluation of data</p>	<p>If evaluation of the data yields positive results, make this clinical change as part of the Total Joint Pathway for hips as well. It then can move from beyond the Mankato site to all Mayo Clinic Health System sites who preform total joint replacements.</p> <p>Continued monitoring of outcomes is essential to promote integration and sustainability</p>	<p><b>Disseminating pilot results:</b></p> <ul style="list-style-type: none"> <li>-Poster presentation</li> <li>-Quality Improvement Committee Meeting</li> <li>-Weekly updates</li> <li>-Grand Round Presentation</li> </ul>

Elements in this table is based on: Gawlinski, A., & Rutledge, D. (2008). Selecting a model for evidence-based practice changes. *AACN Advanced Critical Care, 19*(3). doi: 10.1097/01.AACN.0000330380.417



## Enhanced Recovery after Orthopedic Surgery Pathway (ERAS).

Pre-Updated Pathway	Post-Updated Pathway
<i>Surgery clinic</i>	
Optional TKA education class	Required TKA education class
No specific care companion <sup>a</sup>	Specific identified care companion <sup>a</sup>
<i>Preoperative</i>	
Oral multimodal analgesia <sup>b</sup>	Oral multimodal analgesia <sup>b</sup>
No pre-emptive anti-emetics	Scopolamine patch
Long acting <sup>c</sup> spinal (preferred) or general anesthetic	Short acting <sup>c</sup> Spinal (preferred) or general anesthetic
<i>Intraoperative</i>	
No Standardized steroids	Intravenous dexamethasone
No standardization of IV fluids	2 L of Lactated Ringer's
No anti-fibrinolytics	Tranexamic acid
<i>Postoperative</i>	
Intermittent femoral nerve block (paused prior to physical therapy)	Continuous adductor canal block for 48 hours
Physical therapy beginning on postoperative day 1	Physical therapy session on day of surgery
No standardization of analgesics	Scheduled acetaminophen, NSAIDs, gabapentin. Oxycodone prn

<sup>a</sup> Care companion = pre-identified caregiver that attests to availability upon discharge of patient.

<sup>b</sup> Celebrex, gabapentin, acetaminophen.

<sup>c</sup> Long acting spinal = bupivacaine; short acting spinal = mepivacaine.

Figure 1-Retrieved from Auyong, D. B., Allen, C. J., Pahang, J. A., Clabeaux, J. J., Macdonald, K. M., & Hanson, N. A. (2016). Reduced length of hospitalization in primary total knee arthroplasty patients using an updated enhanced recovery after orthopedic surgery (ERAS) pathway. *The Journal of Arthroplasty*, 30, 1705-1709. Retrieved from <http://dx.doi.org/10.1016/j.arth.2015.05>

## The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

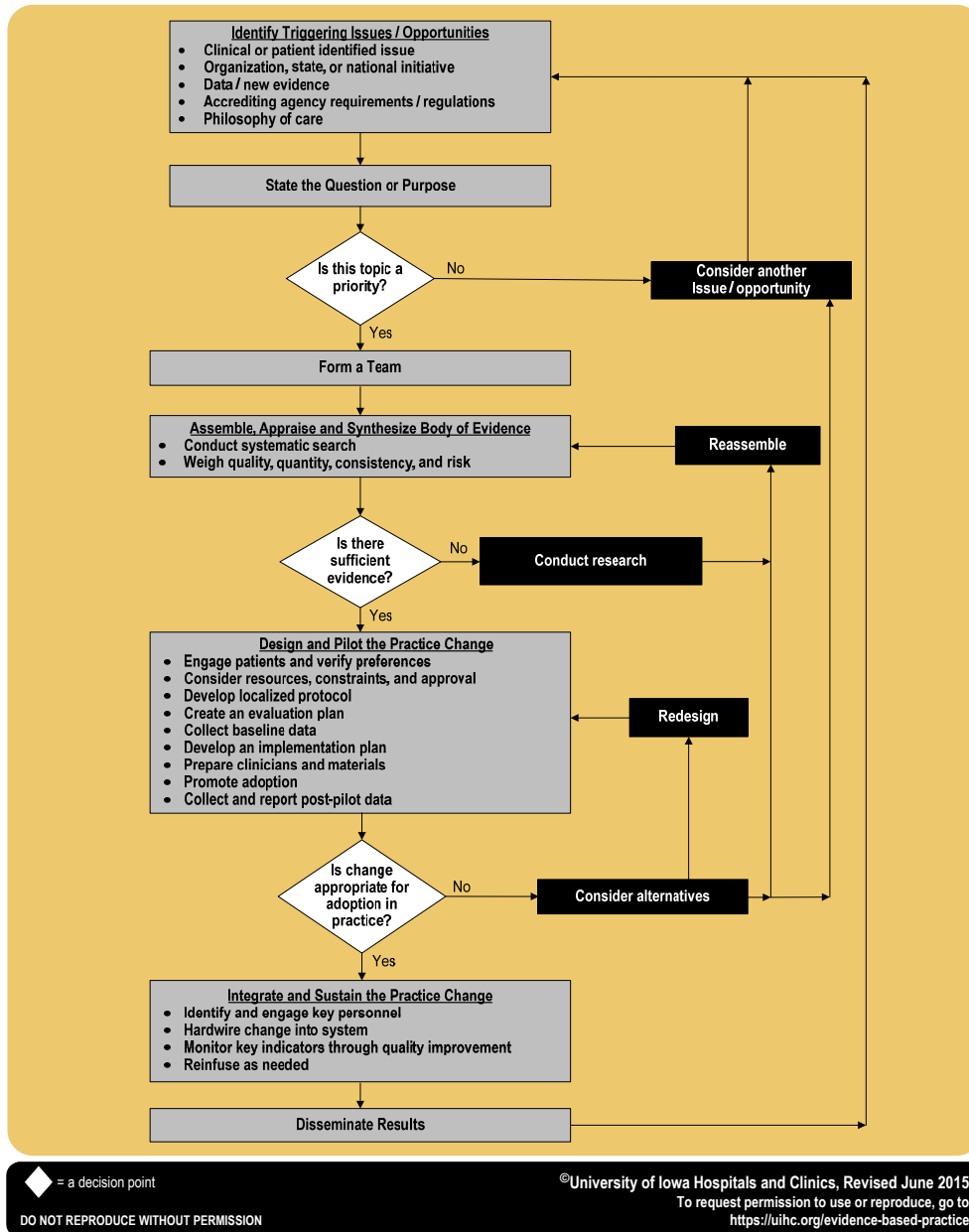


Figure 2 Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing*, 14(3), 175-182. doi:10.1111/wvn.12223

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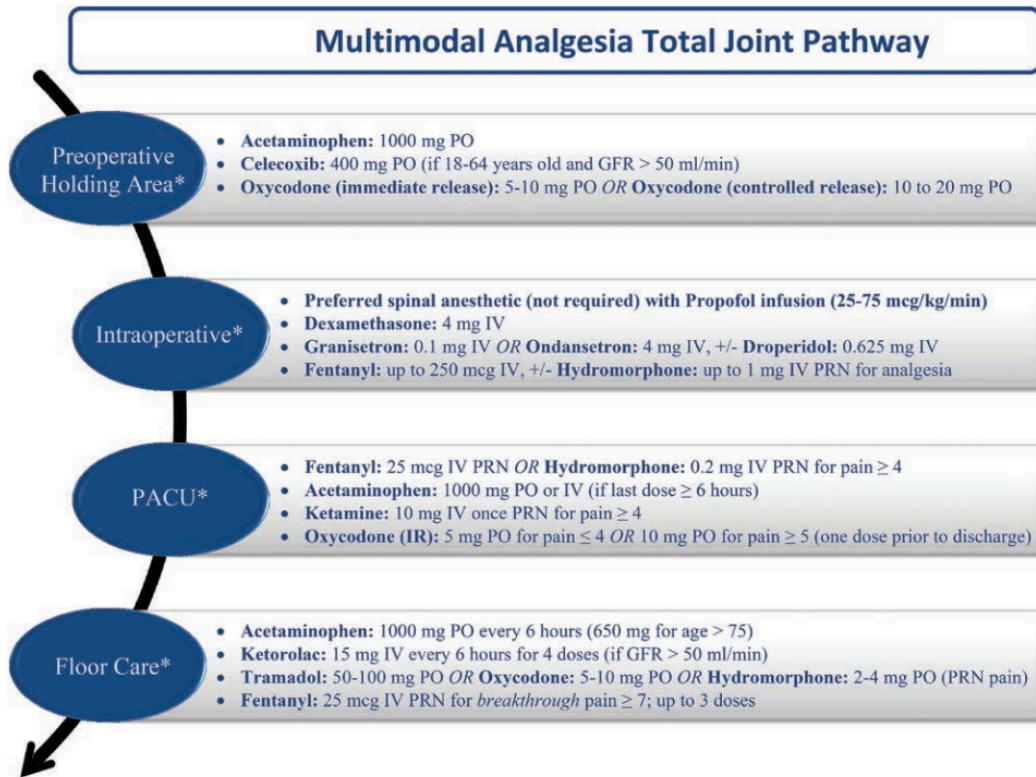


Figure 3- Multimodal analgesia total joint pathway retrieved from Amundson et al. (2017)

# Total Knee Replacement Pathway Proposal Based on Review of Literature

## Pre-Operative

- Patient education provided by an RN to inform patient of expectations of procedure and rehabilitation
  - Discussion around possible discharge needs such as short-term rehabilitation
- Pre-schedule of appointments for post operative care

## Intra-Operative

- Standardization of operative room set ups, supplies and TKA hardware
- Pain control with the use of femoral or sciatic block from anesthesia during surgery
- Short acting spinal over a general anesthetic

## Post-Operative

- Early mobilization on POD 0 within 4 hours of surgery
- Frequent and routine addressing of patient's pain with a multi-modal management to reduce the use of narcotics- scheduled acetaminophen, NSAIDS, gabapentin with the use of oxycodone PRN

Figure 4- Based on literature review from paper purposed by author