SURGICAL MANAGEMENT OF OSTEOARTHRITIS OF THE KNEE

EVIDENCE-BASED CLINICAL PRACTICE GUIDELINE

Adopted by the American Academy of Orthopaedic Surgeons Board of Directors 
12.4.15

Endorsed by:
Disclaimer

This Clinical Practice Guideline was developed by an AAOS physician volunteer Guideline development group based on a systematic review of the current scientific and clinical information and accepted approaches to treatment and/or diagnosis. This Clinical Practice Guideline is not intended to be a fixed protocol, as some patients may require more or less treatment or different means of diagnosis. Clinical patients may not necessarily be the same as those found in a clinical trial. Patient care and treatment should always be based on a clinician’s independent medical judgment, given the individual patient’s clinical circumstances.

Disclosure Requirement
In accordance with AAOS policy, all individuals whose names appear as authors or contributors to Clinical Practice Guideline filed a disclosure statement as part of the submission process. All panel members provided full disclosure of potential conflicts of interest prior to voting on the recommendations contained within this Clinical Practice Guidelines.

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SUMMARY OF RECOMMENDATIONS

The following is a summary of the recommendations of the AAOS Clinical Practice Guideline on the Surgical Management of Osteoarthritis of the Knee. All readers of this summary are strongly urged to consult the full guideline and evidence report for this information. We are confident that those who read the full guideline and evidence report will see that the recommendations were developed using systematic evidence-based processes designed to combat bias, enhance transparency, and promote reproducibility.

This summary of recommendations is not intended to stand alone. Treatment decisions should be made in light of all circumstances presented by the patient. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician, and other healthcare practitioners.

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BMI AS A RISK FACTOR
Strong evidence supports that obese patients have less improvement in outcomes with total knee arthroplasty (TKA).

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

DIABETES AS A RISK FACTOR
Moderate evidence supports that patients with diabetes are at higher risk for complications with total knee arthroplasty (TKA).

Strength of Recommendation: Moderate Evidence ★★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

CHRONIC PAIN AS A RISK FACTOR
Moderate evidence supports that patients with select chronic pain conditions have less improvement in patient reported outcomes with TKA.

Strength of Recommendation: Moderate Evidence ★★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

DEPRESSION/ANXIETY AS A RISK FACTOR
Limited evidence supports that patients with depression and/or anxiety symptoms have less improvement in patient reported outcomes with total knee arthroplasty (TKA).

Strength of Recommendation: Limited Evidence ★★★☆☆

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.
CIRRHOSIS/HEPATITIS C AS A RISK FACTOR

Limited evidence supports that patients with cirrhosis or hepatitis C are at higher risk for complications with total knee arthroplasty (TKA).

Strength of Recommendation: Limited Evidence

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

PREOPERATIVE PHYSICAL THERAPY

Limited evidence supports that supervised exercise before total knee arthroplasty (TKA) might improve pain and physical function after surgery.

Strength of Recommendation: Limited Evidence

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

DELAY TKA

Moderate evidence supports that an eight month delay to total knee arthroplasty (TKA) does not worsen outcomes.

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

PERIARTICULAR LOCAL ANESTHETIC INFILTRATION

Strong evidence supports the use of peri-articular local anesthetic infiltration compared to placebo in total knee arthroplasty (TKA) to decrease pain and opioid use.

Strength of Recommendation: Strong Evidence

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
PERIPHERAL NERVE Blockade

Strong evidence supports that peripheral nerve blockade for total knee arthroplasty (TKA) decreases postoperative pain and opioid requirements.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

NEURAXIAL ANESTHESIA

Moderate evidence supports that neuraxial anesthesia could be used in total knee arthroplasty (TKA) to improve select perioperative outcomes and complication rates compared to general anesthesia.

Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

TOURNIQUET: BLOOD LOSS REDUCTION

Moderate evidence supports that the use of a tourniquet in total knee arthroplasty (TKA) decreases intraoperative blood loss.

Strength of Recommendation: Moderate Evidence ★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

TOURNIQUET: POSTOPERATIVE PAIN REDUCTION

Strong evidence supports that tourniquet use in total knee arthroplasty (TKA) increases short term post-operative pain.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
TOURNIQUET: POSTOPERATIVE FUNCTION

Limited evidence supports that tourniquet use in total knee arthroplasty (TKA) decreases short term post-operative function.

Strength of Recommendation: Limited Evidence ★★★★

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

TRANEXAMIC ACID

Strong evidence supports that, in patients with no known contraindications, treatment with tranexamic acid decreases postoperative blood loss and reduces the necessity of postoperative transfusions following total knee arthroplasty (TKA).

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

ANTIBIOTIC BONE CEMENT

Limited evidence does not support the routine use of antibiotics in the cement for primary total knee arthroplasty (TKA).

Strength of Recommendation: Limited Evidence ★★★★

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

CRUCIATE RETAINING ARTHROPLASTY

Strong evidence supports no difference in outcomes or complications between posterior stabilized and posterior cruciate retaining arthroplasty designs.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
POLYETHYLENE TIBIAL COMPONENT

Strong evidence supports use of either all-polyethylene or modular tibial components in knee arthroplasty (KA) because of no difference in outcomes.

Strength of Recommendation: Strong Evidence ★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

PATELLAR RESURFACING: PAIN AND FUNCTION

Strong evidence supports no difference in pain or function with or without patellar resurfacing in total knee arthroplasty.

Strength of Recommendation: Strong Evidence ★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

PATELLAR RESURFACING: REOPERATIONS

Moderate evidence supports that patellar resurfacing in total knee arthroplasty (TKA) could decrease cumulative reoperations after 5 years when compared to no patellar resurfacing in total knee arthroplasty (TKA).

Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

CEMENTED TIBIAL COMPONENTS VERSUS CEMENTLESS TIBIAL COMPONENTS

Strong evidence supports the use of tibial component fixation that is cemented or cementless in total knee arthroplasty due to similar functional outcomes and rates of complications and reoperations.

Strength of Recommendation: Strong Evidence ★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
CEMENTED FEMORAL & TIBIAL COMPONENTS VERSUS CEMENTLESS FEMORAL & TIBIAL COMPONENTS

Moderate evidence supports the use of either cemented femoral and tibial components or cementless femoral and tibial components in knee arthroplasty due to similar rates of complications and reoperations.

Strength of Recommendation: Moderate Evidence 🌟🌟🌟

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

ALL CEMENTED COMPONENTS VERSUS HYBRID FIXATION (CEMENTLESS FEMORAL COMPONENT)

Moderate evidence supports the use of either cementing all components or hybrid fixation (cementless femur) in total knee arthroplasty due to similar functional outcomes and rates of complications and reoperations.

Strength of Recommendation: Moderate Evidence 🌟🌟🌟

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

ALL CEMENTLESS COMPONENTS VERSUS HYBRID FIXATION (CEMENTLESS FEMORAL COMPONENT)

Limited evidence supports the use of either all cementless components or hybrid fixation (cementless femur) in total knee arthroplasty due to similar rates of complications and reoperations.

Strength of Recommendation: Limited Evidence 🌟🌟🌟🌟

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.
**BILATERAL TKA**

Limited evidence supports simultaneous bilateral total knee arthroplasty (TKA) for patients aged 70 or younger or ASA status 1-2, because there are no increased complications.

Strength of Recommendation: Limited Evidence ★★★

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

**UKA: REVISIONS**

Moderate evidence supports that total knee arthroplasty (TKA) could be used to decrease revision surgery risk compared to unicompartmental knee arthroplasty (UKA) for medial compartment osteoarthritis.

Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

**UKA: DVT & MANIPULATION UNDER ANESTHESIA**

Limited evidence supports that unicompartmental knee arthroplasty might be used to decrease the risk of deep vein thrombosis (DVT) and manipulation under anesthesia compared to total knee arthroplasty (TKA) for medial compartment osteoarthritis.

Strength of Recommendation: Limited Evidence ★★★

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

**UKA VERSUS OSTEOTOMY**

Moderate evidence supports no difference between unicompartmental knee arthroplasty (UKA) or valgus-producing proximal tibial osteotomy in outcomes and complications in patients with medial compartment knee osteoarthritis.

Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.
SURGICAL NAVIGATION
Strong evidence supports not using intraoperative navigation in total knee arthroplasty (TKA) because there is no difference in outcomes or complications.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

PATIENT SPECIFIC INSTRUMENTATION: PAIN AND FUNCTION
Strong evidence supports not using patient specific instrumentation compared to conventional instrumentation for total knee arthroplasty (TKA) because there is no difference in pain or functional outcomes.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

PATIENT SPECIFIC INSTRUMENTATION: TRANSFUSIONS AND COMPLICATIONS
Moderate evidence supports not using patient specific instrumentation compared to conventional instrumentation for total knee arthroplasty (TKA) because there is no difference in transfusions or complications.

Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

DRAINS
Strong evidence supports not using a drain with total knee arthroplasty (TKA) because there is no difference in complications or outcomes.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
CRYOTHERAPY DEVICES
Moderate evidence supports that cryotherapy devices after knee arthroplasty (KA) do not improve outcomes.

Strength of Recommendation: Moderate Evidence ★★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

CONTINUOUS PASSIVE MOTION
Strong evidence supports that CPM after knee arthroplasty (KA) does not improve outcomes.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

POSTOPERATIVE MOBILIZATION: LENGTH OF STAY
Strong evidence supports that rehabilitation started on the day of the total knee arthroplasty (TKA) reduces length of hospital stay.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

POSTOPERATIVE MOBILIZATION: PAIN AND FUNCTION
Moderate evidence supports that rehabilitation started on day of total knee arthroplasty (TKA) compared to rehabilitation started on postop day 1 reduces pain and improves function.

Strength of Recommendation: Moderate Evidence ★★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.
EARLY STAGE SUPERVISED EXERCISE PROGRAM: FUNCTION
Moderate evidence supports that a supervised exercise program during the first two months after total knee arthroplasty (TKA) improves physical function.

Strength of Recommendation: Moderate Evidence 🌟🌟🌟

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

EARLY STAGE SUPERVISED EXERCISE PROGRAM: PAIN
Limited evidence supports that a supervised exercise program during the first two months after total knee arthroplasty (TKA) decreases pain.

Strength of Recommendation: Limited Evidence 🌟🌟🌟

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

LATE STAGE POSTOPERATIVE SUPERVISED EXERCISE PROGRAM: FUNCTION
Limited evidence supports that selected patients might be referred to an intensive supervised exercise program during late stage post total knee arthroplasty (TKA) to improve physical function.

Strength of Recommendation: Limited Evidence 🌟🌟🌟

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.
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# Introduction

This section provides an overview of the topic, setting the stage for the subsequent sections that focus on specific aspects of risk factors and recommendations. It includes:

- Overview
- Goals and Rationale
- Intended Users
- Patient Population
- Burden of Disease
- Etiology
- Incidence and Prevalence
- Risk Factors
- Emotional and Physical Impact
- Potential Benefits, Harms, and Contraindications
- Future Research

## Methods

This section outlines the methods used in the guideline development process, including:

- Formulating PICO Questions
- Study Selection Criteria
- Best Evidence Synthesis
- Minimally Clinically Important Improvement
- Literature Searches
- Methods for Evaluating Evidence
- Defining the Strength of the Recommendations
- Wording of the Final Recommendations
- Applying the Recommendations to Clinical Practice
- Voting on the Recommendations
- Statistical Methods
- Peer Review
- Public Commentary
- The AAOS Guideline Approval Process
- Revision Plans
- Guideline Dissemination Plans

## Recommendations

This section details the recommendations made by the guideline committee, including:

- Overview of Articles by Recommendation
- Risk Stratification Recommendations
- BMI as A Risk Factor
- Diabetes as a Risk Factor
- Chronic Pain as a Risk Factor
- Depression/Anxiety as a Risk Factor
- Cirrhosis/Hepatitis C as a Risk Factor

### Rationales

Each recommendation is supported by a rationale, which provides the evidence and reasoning behind the recommendation. They include:

- Rationale: BMI as a Risk Factor
- Rationale: Diabetes as a Risk Factor
- Rationale: Chronic Pain as a Risk Factor
- Rationale: Depression/Anxiety as a Risk Factor
- Rationale: Cirrhosis/Hepatitis C as a Risk Factor

### Future Research

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INTRODUCTION

OVERVIEW
This clinical practice guideline is based on a systematic review of peer-reviewed articles published from 1966 to January 27th, 2015 with regard to the surgical management of osteoarthritis of the knee in patients over the age of 18 years. The guideline development group opted to include more contemporary literature to make our conclusions as relevant as possible to the current practice of orthopaedic surgeons. In addition to providing practice recommendations, this guideline also highlights limitations in the literature and areas that require future research.

This guideline is intended to be used by all qualified and appropriately trained physicians and surgeons involved in the management of surgical management of osteoarthritis of the knee. It is also intended to serve as an information resource for decision makers and developers of practice guidelines and recommendations.

GOALS AND RATIONALE
The purpose of this clinical practice guideline is to help improve treatment based on the current best evidence. Current evidence-based medicine (EBM) standards demand that physicians use the best available evidence in their clinical decision making. To assist them, this clinical practice guideline consists of a systematic review of the available literature regarding the management of surgical management of knee osteoarthritis in adults. The systematic review detailed herein was conducted between April 2013 and September 2015 and demonstrates where there is good evidence, where evidence is lacking, and what topics future research must target in order to improve the management of adult patients (defined as age 18 years or older) with osteoarthritis of the knee. AAOS staff and the physician work group systematically reviewed the available literature and subsequently wrote the following recommendations based on a rigorous, standardized process.

Musculoskeletal care is provided in many different settings by many different providers. We created this guideline as an educational tool to guide qualified physicians through a series of treatment decisions in an effort to improve the quality and efficiency of care. This guideline should not be construed as including all proper methods of care or excluding methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific procedure or treatment must be made in light of all circumstances presented by the patient and the needs and resources particular to the locality or institution.

INTENDED USERS
This guideline is intended to be used by orthopaedic surgeons and physicians managing adult patients with osteoarthritis of the knee. Typically, orthopaedic surgeons will have completed medical training, a qualified residency in orthopaedic surgery, and some may have completed additional sub-specialty training. Anesthesiologists, rheumatologists, physiatrists, adult primary care physicians, geriatricians, hospital based adult medicine specialists, physical therapists, occupational therapists, nurse practitioners, physician assistants, emergency physicians, and other healthcare professionals who routinely see this type of patient in various practice settings may also benefit from this guideline. This guideline is not intended for use as a benefits determination document. Making these determinations involves many factors not considered in
the present document, including available resources, business and ethical considerations, and need.

Knee osteoarthritis management is based on the assumption that decisions are predicated on the patient and/or the patient’s qualified health care advocate having communication with the physician about available treatments and procedures applicable to the individual patient. Once the patient and or their advocate have been informed of available therapies and have discussed these options with his/her physician, an informed decision can be made. Clinician input based on experience with conservative management and the clinician’s surgical experience and skills increases the probability of identifying patients who will benefit from specific treatment options.

PATIENT POPULATION
This document addresses the management osteoarthritis of the knee in adult patients defined as those 18 years of age and older. It is not intended to address management of pediatric patients with osteoarthritis or patients with inflammatory arthritis of the knee.

BURDEN OF DISEASE
The burden of osteoarthritis (OA) of the knee is largely attributable to the effects of disability, comorbid disease, and the expense of treatment. OA is the most frequent cause of disability among adults in the United States (US), and the burden is increasing both as the prevalence of OA increases and also as patient expectations for treatment rise. Twenty seven million adults (more than 10 percent) of the US adult population had clinical osteoarthritis (OA) in 2005, and in 2009 OA was the fourth most common cause of hospitalization (Murphy & Helmick, 2012).

OA is the leading indication for joint replacement surgery; 905,000 knee and hip replacements were performed in 2009 at a cost of 42.3 billion dollars (Murphy & Helmick, 2012).

Costs to be considered include:
1. Direct Medical Cost
2. Long-term Medical Cost
3. Home Modification Costs
4. Nursing Home Costs

ETIOLOGY
Patients who require surgical treatment for osteoarthritis of the knee have developed the condition naturally over time due to a variety of risk factors or in an accelerated fashion due to prior trauma about the knee. Osteoarthritis is the imbalance of breakdown and repair of tissues within a synovial joint. The etiology of osteoarthritis is varied and includes genetic factors, trauma, prior meniscectomy, overuse, and infection.

INCIDENCE AND PREVALENCE
Twenty seven million adults (more than 10 percent) of the US adult population had clinical osteoarthritis (OA) in 2005, and in 2009 OA was the fourth most common cause of hospitalization (Murphy & Helmick, 2012). The incidence of knee osteoarthritis is estimated to affect 240 persons per 100,000/year. It is estimated that 9.9 million adults had symptomatic osteoarthritis of the knee in 2010.
With rising life expectancy, it is estimated that the prevalence of knee osteoarthritis will continue to increase. The number of people older than age 65 years is expected to increase from 37.1 million to 77.2 million by the year 2040.

**RISK FACTORS**

Factors that increase the risk for developing osteoarthritis of the knee such that surgical treatment is required include joint degeneration over time due to hereditary vulnerability, large body mass, certain occupations, past trauma affecting the joint or subchondral bone adjacent to the joint, or prior intraarticular damage (meniscal tear or removal, anterior cruciate ligament tear). For information regarding the evidence base behind various risk factors, please refer to the recommendations within this document regarding risk stratification.

**EMOTIONAL AND PHYSICAL IMPACT**

Older adults with self-reported osteoarthritis of the knee visit their physicians more frequently and experience greater functional limitations than others in the same age group. Patients who have moderate to severe osteoarthritis of the knee requiring surgery experience:

1. Inability to return to prior living circumstances
2. Need for increased level of care and supervision
3. Decreased quality of life
4. Decreased level of mobility and ambulation

**POTENTIAL BENEFITS, HARMs, AND CONTRAINDICATIONS**

The benefits of surgical treatment of osteoarthritis of the knee include relief of pain and improved function. Most invasive operative treatments, primarily arthroplasty, are associated with known risks.

Early postoperative complications include prosthetic infection, venous thromboembolic disease, arthrofibrosis, and pain. Late postoperative complications include infection, prosthetic aseptic loosening, and pain. All can lead to a need for revision arthroplasty.

Contraindications are relative and require an in depth discussion with the patient and physician (surgeon, anesthesiologist) about their individual risk factors. Additional factors, such as the individual’s co-morbidities, and/or specific patient characteristics may affect the physician’s choice of treatment. Clinician input based on experience increases the probability of identifying patients who will benefit from specific treatment options. The individual patient and/or their decision surrogate dynamic will also influence treatment decisions, therefore, discussion of available treatments and procedures applicable to the individual patient rely on mutual communication between the patient and/or decision surrogate and physician, weighing the potential risks and benefits for that patient. Once the patient and/or their decision surrogate have been informed of available therapies and have discussed these options with the patient’s physician, an informed decision can be made.
FUTURE RESEARCH
Consideration for future research is provided for each recommendation within this document.

METHODS
The methods used to perform this systematic review were employed to minimize bias and enhance transparency in the selection, appraisal, and analysis of the available evidence. These processes are vital to the development of reliable, transparent, and accurate clinical recommendations for treating osteoarthritis of the knee.

This clinical practice guideline and the systematic review upon which it is based evaluate the effectiveness of surgical treatments for osteoarthritis of the knee. This section describes the methods used to prepare this guideline and systematic review, including search strategies used to identify literature, criteria for selecting eligible articles, determining the strength of the evidence, data extraction, methods of statistical analysis, and the review and approval of the guideline. The AAOS approach incorporates practicing physicians (clinical experts) and methodologists who are free of potential conflicts of interest as recommended by guideline development experts.

The AAOS understands that only high-quality guidelines are credible, and we go to great lengths to ensure the integrity of our evidence analyses. The AAOS addresses bias beginning with the selection of guideline development group members. Applicants with financial conflicts of interest (COI) related to the guideline topic cannot participate if the conflict occurred within one year of the start date of the guideline’s development or if an immediate family member has, or has had, a relevant financial conflict. Additionally, all guideline development group members sign an attestation form agreeing to remain free of relevant financial conflicts for one year following the publication of the guideline.

This guideline and systematic review were prepared by the AAOS Surgical Management of Osteoarthritis of the Knee guideline physician guideline development group (clinical experts) with the assistance of the AAOS Evidence-Based Medicine (EBM) Unit in the Department of Research and Scientific Affairs (methodologists) at the AAOS. To develop this guideline, the guideline development group held an introductory meeting on August 16, 2013 to establish the scope of the guideline and the systematic reviews. As the physician experts, the guideline development group defined the scope of the guideline by creating PICO Questions (i.e. population, intervention, comparison, and outcome) that directed the literature search. The original PICO questions developed at the introductory meeting can be viewed in Appendix III. When necessary, these clinical experts also provided content help, search terms and additional clarification for the AAOS Medical Librarian. The Medical Librarian created and executed the search(es). The supporting group of methodologists (AAOS EBM Unit) reviewed all abstracts, recalled pertinent full-text articles for review and evaluated the quality of studies meeting the inclusion criteria. They also abstracted, analyzed, interpreted, and/or summarized the relevant data for each recommendation and prepared the initial draft for the final meeting. Upon completion of the systematic reviews, the physician guideline development group participated in a three-day recommendation meeting on April 10-12, 2015. At this meeting, the physician experts and methodologists evaluated and integrated all material to develop the final recommendations. The final recommendations and rationales were edited, written and voted on at the final meeting. Additional edits to the rationales were approved by the guideline experts.
development group on webinars after the meeting. The draft guideline recommendations and rationales received final review by the methodologists to ensure that these recommendations and rationales were consistent with the data. The draft was then completed and submitted for peer review on July 6, 2015.

The resulting draft guidelines were then peer-reviewed, edited in response to that review and subsequently distributed for public commentary. Thereafter, the draft guideline was sequentially approved by the AAOS Committee on Evidence-Based Quality and Value, AAOS Council on Research and Quality, and the AAOS Board of Directors (see Appendix II for a description of the AAOS bodies involved in the approval process). All AAOS guidelines are reviewed and updated or retired every five years in accordance with the criteria of the National Guideline Clearinghouse.

Thus the process of AAOS guideline development incorporates the benefits from clinical physician expertise as well as the statistical knowledge and interpretation of non-conflicted methodologists. The process also includes an extensive review process offering the opportunity for over 200 clinical physician experts to provide input into the draft prior to publication. This process provides a sound basis for minimizing bias, enhancing transparency and ensuring the highest level of accuracy for interpretation of the evidence.

**FORMULATING PICO QUESTIONS**
The guideline development group began work on this guideline by constructing a set of PICO questions. These questions specify the patient population of interest (P), the intervention of interest (I), the comparisons of interest (C), and the patient-oriented outcomes of interest (O). They function as questions for the systematic review, not as final recommendations or conclusions. A full list of the original PICO questions can be viewed in Appendix III. Once established, these *a priori* PICO questions cannot be modified until the final guideline development group meeting.

**STUDY SELECTION CRITERIA**
We developed *a priori* article inclusion criteria for our review. These criteria are our “rules of evidence” and articles that did not meet them are, for the purposes of this guideline, not evidence.

To be included in our systematic reviews (and hence, in this guideline) an article had to meet the following criteria:

**Work Group Defined Criteria**
1. Study must be of an osteoarthritis-related injury or prevention thereof and at least 90% of patient population should have osteoarthritis.
2. Study must be published in or after 1966 for surgical treatment, rehabilitation, bracing, prevention and MRI
3. Study must be published in or after 1966 for x rays and nonoperative treatment
4. Study must be published in or after 1966 for all others non specified
5. Study should have 10 or more patients per group
For surgical treatment a minimum of N days/months/year (refer to PICO questions for detailed follow up duration) For nonoperative treatment a minimum of N days/months/year (refer to PICO questions for detailed follow up duration)

6. For prevention studies a minimum of N days/months/year (refer to PICO questions for detailed follow up duration)

**Standard Criteria for all CPGs**

- Article must be a full article report of a clinical study.
- Retrospective non-comparative case series, medical records review, meeting abstracts, meta-analyses, systematic reviews, historical articles, editorials, letters, and commentaries are **excluded**. Bibliographies of meta-analyses and systematic reviews will be examined to ensure inclusion of all relevant literature.
- Confounded studies (i.e. studies that give patients the treatment of interest AND another treatment) are **excluded**.
- Case series studies that have non-consecutive enrollment of patients are **excluded**.
- Controlled trials in which patients were not stochastically assigned to groups AND in which there was either a difference in patient characteristics or outcomes at baseline AND where the authors did not statistically adjust for these differences when analyzing the results are **excluded**. All studies evaluated as “very low quality” will be **excluded**.
- Composite measures or outcomes are **excluded** even if they are patient-oriented.
- Study must appear in a peer-reviewed publication
- For any included study that uses “paper-and-pencil” outcome measures (e.g., SF-36), only those outcome measures that have been validated will be included
- For any given follow-up time point in any included study, there must be ≥ 50% patient follow-up (if the follow-up is >50% but <80%, the study quality will be downgraded by one Level)
- Study must be of humans
- Study must be published in English
- Study results must be quantitatively presented
- Study must not be an in vitro study
- Study must not be a biomechanical study
- Study must not have been performed on cadavers

We will only evaluate surrogate outcomes when no patient oriented outcomes are available.

**BEST EVIDENCE SYNTHESIS**

We included only the best available evidence for any given outcome addressing a recommendation. Accordingly, we first included the highest quality evidence for any given outcome if it was available. In the absence of two or more occurrences of an outcome at this quality, we considered outcomes of the next lowest quality until at least two or more occurrences of an outcome had been acquired. For example, if there were two ‘moderate’ quality occurrences of an outcome that addressed a recommendation, we did not include ‘low’ quality occurrences of this outcome. A summary of the evidence that met the inclusion criteria, but was not best available evidence was created and can be viewed by recommendation in Appendix XIII.

**RECOMMENDING FOR OR AGAINST A PROCEDURE**

The guideline work group considers the procedure of interest and comparison procedure when recommending or not recommending a procedure for clinical use. If the procedure of interest
results in outcomes that are similar to the comparison procedure, the work group may recommend both procedures due to no statistical difference in outcomes. If the procedure of interest results in outcomes that are not statistically different than a placebo or no procedure, the work group may recommend against the procedure of interest, because it adds no measurable benefit to a patient’s outcomes.

MINIMALLY CLINICALLY IMPORTANT IMPROVEMENT
Wherever possible, we consider the effects of treatments in terms of the minimally clinically important difference (MCID) in addition to whether their effects are statistically significant. The MCID is the smallest clinical change that is important to patients, and recognizes the fact that there are some treatment-induced statistically significant improvements that are too small to matter to patients. However, there were no occurrences of validated MCID outcomes in the studies included in this clinical practice guideline.

When MCID values from the specific guideline patient population are not available, we use the following measures listed in order of priority:

MCID/MID
PASS or Impact
Another validated measure
Statistical Significance

LITERATURE SEARCHES
We begin the systematic review with a comprehensive search of the literature. Articles we consider were published prior to January 2015 in four electronic databases: PubMed, EMBASE, CINAHL, and The Cochrane Central Register of Controlled Trials. The medical librarian conducts the search using key terms determined from the guideline development group’s PICO questions.

We supplement the electronic search with a manual search of the bibliographies of all retrieved publications, recent systematic reviews, and other review articles for potentially relevant citations. Recalled articles are evaluated for possible inclusion based on the study selection criteria and are summarized for the guideline development group who assist with reconciling possible errors and omissions.

The study attrition diagram in Appendix IV provides a detailed description of the numbers of identified abstracts and recalled and selected studies that were evaluated in the systematic review of this guideline. The search strategies used to identify the abstracts are contained in Appendix V.

METHODS FOR EVALUATING EVIDENCE

PROGNOSTIC STUDY QUALITY APPRAISAL QUESTIONS
The following questions are used to evaluate the study quality of prognostic study designs.

- Was the spectrum of patients studied for this prognostic variable representative of the patient spectrum seen in actual clinical practice?
- Was loss to follow up unrelated to key characteristics?
- Was the prognostic factor of interest adequately measured in the study to limit potential bias?
- Was the outcome of interest adequately measured in study participants to sufficiently limit bias?
- Were all important confounders adequately measured in study participants to sufficiently limit potential bias?
- Was the statistical analysis appropriate for the design of the study, limiting potential for presentation of invalid results?

**Prognostic Study Design Quality Key**

<table>
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<th>Study Quality Level</th>
<th>Flaw Count</th>
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</tr>
<tr>
<td>Moderate Quality Study</td>
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</tr>
<tr>
<td>Low Quality Study</td>
<td>≥2 and &lt;3 Flaws</td>
</tr>
<tr>
<td>Very Low Quality Study</td>
<td>≥3 Flaws</td>
</tr>
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**RANDOMIZED STUDY QUALITY APPRAISAL QUESTIONS**

The following domains are evaluated to determine the study quality of randomized study designs.

- Random Sequence Generation
- Allocation Concealment
- Blinding of Participants and Personnel
- Incomplete Outcome Data
- Selective Reporting
- Other Bias

**Upgrading Randomized Study Quality Questions**

- Is there a large magnitude of effect?
- Influence of All Plausible Residual Confounding
- Dose-Response Gradient

**Randomized Study Design Quality Key**

<table>
<thead>
<tr>
<th>Study Quality Level</th>
<th>Flaw Count</th>
</tr>
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<tbody>
<tr>
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<td>&lt;2 Flaw</td>
</tr>
<tr>
<td>Moderate Quality Study</td>
<td>≥2 and &lt;4 Flaws</td>
</tr>
<tr>
<td>Low Quality Study</td>
<td>≥4 and &lt;6 Flaws</td>
</tr>
<tr>
<td>Very Low Quality Study</td>
<td>≥6 Flaws</td>
</tr>
</tbody>
</table>
**OBSERVATIONAL STUDY DESIGN QUALITY APPRAISAL QUESTIONS**

The following questions are used to evaluate the study quality of observational study designs. Note that all observation studies begin the appraisal process at “low quality” due to design flaws inherent in observational studies.

- Is this observational study a prospective case series?
- Does the strategy for recruiting participants into the study differ across groups?
- Did the study fail to balance the allocation between the groups or match groups (e.g., through stratification, matching, propensity scores)?
- Were important confounding variables not taken into account in the design and/or analysis (e.g., through matching, stratification, interaction terms, multivariate analysis, or other statistical adjustment such as instrumental variables)?
- Was the length of follow-up different across study groups?
- Other Bias?

**Upgrading Observational Study Quality Questions**

- Is there a large magnitude of effect?
- Influence of All Plausible Residual Confounding
- Dose-Response Gradient

**Observational Study Design Quality Key**

<table>
<thead>
<tr>
<th>High Quality Study</th>
<th>&lt;2 Flaw</th>
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<tbody>
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<td>Moderate Quality Study</td>
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</tr>
<tr>
<td>Low Quality Study</td>
<td>≥4 and &lt;6 Flaws</td>
</tr>
<tr>
<td>Very Low Quality Study</td>
<td>≥6 Flaws</td>
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**DEFINING THE STRENGTH OF THE RECOMMENDATIONS**

Judging the quality of evidence is only a stepping stone towards arriving at the strength of a guideline recommendation. The strength of recommendation also takes into account the quality, quantity, and the trade-off between the benefits and harms of a treatment, the magnitude of a treatment’s effect, and whether there is data on critical outcomes.

Strength of recommendation expresses the degree of confidence one can have in a recommendation. As such, the strength expresses how possible it is that a recommendation will be overturned by future evidence. It is very difficult for future evidence to overturn a recommendation that is based on many high quality randomized controlled trials that show a large effect. It is much more likely that future evidence will overturn recommendations derived from a few small retrospective comparative studies. Consequently, recommendations based on the former kind of evidence are given a high strength of recommendation and recommendations based on the latter kind of evidence are given a low strength.

To develop the strength of a recommendation, AAOS staff first assigned a preliminary strength for each recommendation that took only the final quality and the quantity of evidence (see
Table 1. Strength of Recommendation Descriptions

<table>
<thead>
<tr>
<th>Strength</th>
<th>Overall Strength of Evidence</th>
<th>Description of Evidence Quality</th>
<th>Strength Visual</th>
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<tbody>
<tr>
<td>Strong</td>
<td>Strong</td>
<td>Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.</td>
<td>![5 stars]</td>
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<tr>
<td>Moderate</td>
<td>Moderate</td>
<td>Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.</td>
<td>![4 stars]</td>
</tr>
<tr>
<td>Limited</td>
<td>Low Strength Evidence or Conflicting Evidence</td>
<td>Evidence from two or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.</td>
<td>![3 stars]</td>
</tr>
<tr>
<td>Consensus*</td>
<td>No Evidence</td>
<td>There is no supporting evidence. In the absence of reliable evidence, the guideline development group is making a recommendation based on their clinical opinion. Consensus statements are published in a separate, complimentary document.</td>
<td>![2 stars]</td>
</tr>
</tbody>
</table>

**WORDING OF THE FINAL RECOMMENDATIONS**

To prevent bias in the way recommendations are worded, the AAOS uses specific predetermined language stems that are governed by the evidence strengths. Each recommendation was written using language that accounts for the final strength of the recommendation. This language, and the corresponding strength, is shown in Table 2.

Table 2. AAOS Guideline Language Stems

<table>
<thead>
<tr>
<th>Guideline Language</th>
<th>Strength of Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong evidence supports that the practitioner should/should not do X, because…</td>
<td>Strong</td>
</tr>
<tr>
<td>Moderate evidence supports that the practitioner could/could not do X, because…</td>
<td>Moderate</td>
</tr>
<tr>
<td>Limited evidence supports that the practitioner might/might not do X, because…</td>
<td>Limited</td>
</tr>
<tr>
<td>In the absence of reliable evidence, it is the <strong>opinion</strong> of this guideline development group that…*</td>
<td>Consensus*</td>
</tr>
</tbody>
</table>

*Consensus based recommendations are made according to specific criteria. These criteria can be found in Appendix VII.

**APPLYING THE RECOMMENDATIONS TO CLINICAL PRACTICE**

To increase the practicality and applicability of the guideline recommendations in this document, the information listed in Table 3 provides assistance in interpreting the correlation between the strength of a recommendation and patient counseling time, use of decision aids, and the impact of future research.
Table 3. Clinical Applicability: Interpreting the Strength of a Recommendation

<table>
<thead>
<tr>
<th>Strength of Recommendation</th>
<th>Patient Counseling (Time)</th>
<th>Decision Aids</th>
<th>Impact of Future Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Least</td>
<td>Least Important, unless the evidence supports no difference between two alternative interventions</td>
<td>Not likely to change</td>
</tr>
<tr>
<td>Moderate</td>
<td>Less</td>
<td>Less Important</td>
<td>Less likely to change</td>
</tr>
<tr>
<td>Limited</td>
<td>More</td>
<td>Important</td>
<td>Change possible/anticipated</td>
</tr>
<tr>
<td>Consensus</td>
<td>Most</td>
<td>Most Important</td>
<td>Impact unknown</td>
</tr>
</tbody>
</table>

VOTING ON THE RECOMMENDATIONS
The recommendations and their strength were voted on by the guideline development group members during the final meeting. If disagreement between the guideline development group occurred, there was further discussion to see whether the disagreement(s) could be resolved. Recommendations were approved and adopted in instances where a simple majority (60%) of the guideline development group voted to approve.

STATISTICAL METHODS

ANALYSIS OF INTERVENTION/PREVENTION DATA
When possible, the AAOS EBM Unit recalculates the results reported in individual studies and compile them to answer the recommendations. The results of all statistical analysis conducted by the AAOS EBM Unit are conducted using SAS 9.4. SAS was used to determine the magnitude, direction, and/or 95% confidence intervals of the treatment effect. For data reported as means (and associated measures of dispersion) the mean difference between groups and the 95% confidence interval was calculated and a two-tailed t-test of independent groups was used to determine statistical significance. When published studies report measures of dispersion other than the standard deviation the value was estimated to facilitate calculation of the treatment effect. In studies that report standard errors or confidence intervals the standard deviation was back-calculated. In some circumstances statistical testing was conducted by the authors and measures of dispersion were not reported. In the absence of measures of dispersion, the results of the statistical analyses conducted by the authors (i.e. the p-value) are considered as evidence. For proportions, we report the proportion of patients that experienced an outcome along with the percentage of patients that experienced an outcome. The variance of the arcsine difference was used to determine statistical significance. P-values < 0.05 were considered statistically significant.

When the data was available, we performed meta-analyses using the random effects method of DerSimonian and Laird. A minimum of three studies was required for an outcome to be considered by meta-analysis. Heterogeneity was assessed with the I-squared statistic. Meta-analyses with I-squared values less than 50% were considered as evidence. Those with I-squared
larger than 50% were not considered as evidence for this guideline. All meta-analyses were performed using SAS 9.4. The arcsine difference was used in meta-analysis of proportions. In order to overcome the difficulty of interpreting the magnitude of the arcsine difference, a summary odds ratio is calculated based on random effects meta-analysis of proportions and the number needed to treat (or harm) is calculated. The standardized mean difference was used for meta-analysis of means and magnitude was interpreted using Cohen’s definitions of small, medium, and large effect.

**PEER REVIEW**

Following the final meeting, the guideline draft undergoes peer review for additional input from external content experts. Written comments are provided on the structured review form (see Appendix VII). All peer reviewers are required to disclose their conflicts of interest. To guide who participates, the guideline development group identifies specialty societies at the introductory meeting. Organizations, not individuals, are specified.

The specialty societies are solicited for nominations of individual peer reviewers approximately six weeks before the final meeting. The peer review period is announced as it approaches and others interested are able to volunteer to review the draft. The chairs of the guideline development group and chair of the AAOS committee on Evidence Based Quality and Value reviews the draft of the guideline prior to dissemination.

Some specialty societies (both orthopaedic and non-orthopaedic) ask their evidence-based practice (EBP) committee to provide review of the guideline. The organization is responsible for coordinating the distribution of our materials and consolidating their comments onto one form. The chair of the external EBP committees provides disclosure of their conflicts of interest (COI) and manages the potential conflicts of their members.

Again, the AAOS asks for comments to be assembled into a single response form by the specialty society and for the individual submitting the review to provide disclosure of potentially conflicting interests. The peer review stage gives external stakeholders an opportunity to provide evidence-based direction for modifications that they believe have been overlooked. Since the draft is subject to revisions until its approval by the AAOS Board of Directors as the final step in the guideline development process, confidentiality of all working drafts is essential.

The chairs of the guideline development group and the manager of the AAOS evidence-based medicine unit drafts the initial responses to comments that address methodology. These responses are then reviewed by the chair and co-chair, who respond to questions concerning clinical practice and techniques. The director of the Department of Research and Scientific Affairs may provide input as well. All comments received and the initial drafts of the responses are also reviewed by all members of the guideline development group. All proposed changes to recommendation language as a result of peer review are based on the evidence and undergoes majority vote by the guideline development group members. Final revisions are summarized in a detailed report that is made part of the guideline document throughout the remainder of the review and approval processes.
The AAOS believes in the importance of demonstrating responsiveness to input received during the peer review process and welcomes the critiques of external specialty societies. Following final approval of the guideline, all individual responses are posted on our website http://www.aaos.org/guidelines with a point-by-point reply to each non-editorial comment. Reviewers who wish to remain anonymous notify the AAOS to have their names de-identified; their comments, our responses, and their COI disclosures are still posted.

Review of the Surgical Management of Osteoarthritis of the Knee guideline was requested of 21 organizations. Seven individuals representing six organizations returned comments on the structured review form (see Appendix VII).

PUBLIC COMMENTARY
After modifying the draft in response to peer review, the guideline was subjected to a thirty day period of “Public Commentary.” Commentators consist of members of the AAOS Board of Directors (BOD), members of the Council on Research and Quality (CORQ), members of the Board of Councilors (BOC), and members of the Board of Specialty Societies (BOS). The guideline is automatically forwarded to the AAOS BOD and CORQ so that they may review it and provide comment prior to being asked to approve the document. Members of the BOC and BOS are solicited for interest. If they request to see the document, it is forwarded to them for comment. Based on these bodies, over 200 commentators have the opportunity to provide input into this guideline. One organization returned public comments.

THE AAOS GUIDELINE APPROVAL PROCESS
This final guideline draft must be approved by the AAOS Committee on Evidence Based Quality and Value Committee, the AAOS Council on Research and Quality, and the AAOS Board of Directors. These decision-making bodies are described in Appendix II and are not designated to modify the contents. Their charge is to approve or reject its publication by majority vote.

REVISION PLANS
This guideline represents a cross-sectional view of current treatment and may become outdated as new evidence becomes available. This guideline will be revised in accordance with new evidence, changing practice, rapidly emerging treatment options, and new technology. This guideline will be updated or withdrawn in five years in accordance with the standards of the National Guideline Clearinghouse.

GUIDELINE DISSEMINATION PLANS
The primary purpose of the present document is to provide interested readers with full documentation about not only our recommendations, but also about how we arrived at those recommendations.

To view all AAOS published guideline recommendations in a user-friendly app, please visit www.orthoguidelines.org.
Shorter versions of the guideline are available in other venues. Publication of most guidelines is announced by an Academy press release, articles authored by the guideline development group and published in the Journal of the American Academy of Orthopaedic Surgeons, and articles published in AAOS Now. Most guidelines are also distributed at the AAOS Annual Meeting in various venues such as on Academy Row and at Committee Scientific Exhibits.

Selected guidelines are disseminated by webinar, an Online Module for the Orthopaedic Knowledge Online website, Radio Media Tours, Media Briefings, and by distributing them at relevant Continuing Medical Education (CME) courses and at the AAOS Resource Center.

Other dissemination efforts outside of the AAOS will include submitting the guideline to the National Guideline Clearinghouse and distributing the guideline at other medical specialty societies’ meetings.
RECOMMENDATIONS

OVERVIEW OF ARTICLES BY RECOMMENDATION

Strength of Included Articles by Recommendation

- **Low**
- **Moderate**
- **High**

Recommendation:
- Drains
- Antibiotic Bone Cement
- Uncompartimental Arthroplasty
- Regional Nerve Blockade
- Tramexamic Acid
- Bone Cement
- Bilateral TKA
- Surgical Navigation
- Delay TKA
- Risk Stratification
- Pre-Operative Physical Therapy
- Post-Operative Mobilisation
- Continuous Passive Motion
- Cyrotherapy
- Patellar Resurfacing
- Patellar Resurfacing Arthroplasty
- Cruciate Retaining Arthroplasty
- Joint Specific Exercise Program
- Peri-articular Local Infiltration
- Poly-thesis

# Of Included Articles

- Drains: 5 Low, 2 Moderate, 1 High
- Antibiotic Bone Cement: 2 Low, 1 Moderate, 4 High
- Uncompartimental Arthroplasty: 3 Low, 2 Moderate, 2 High
- Regional Nerve Blockade: 6 Low, 4 Moderate, 2 High
- Tramexamic Acid: 9 Low, 7 Moderate, 2 High
- Bone Cement: 7 Low, 6 Moderate, 3 High
- Bilateral TKA: 10 Low, 7 Moderate, 2 High
- Surgical Navigation: 6 Low, 7 Moderate, 3 High
- Delay TKA: 4 Low, 2 Moderate, 1 High
- Risk Stratification: 2 Low, 2 Moderate, 1 High
- Pre-Operative Physical Therapy: 7 Low, 6 Moderate, 5 High
- Post-Operative Mobilisation: 6 Low, 3 Moderate, 2 High
- Continuous Passive Motion: 5 Low, 2 Moderate, 4 High
- Cyrotherapy: 3 Low, 5 Moderate, 2 High
- Patellar Resurfacing: 2 Low, 2 Moderate, 5 High
- Patellar Resurfacing Arthroplasty: 2 Low, 1 Moderate, 12 High
- Cruciate Retaining Arthroplasty: 3 Low, 2 Moderate, 12 High
- Joint Specific Exercise Program: 2 Low, 2 Moderate, 8 High
- Peri-articular Local Infiltration: 2 Low, 2 Moderate, 5 High
- Poly-thesis: 3 Low, 5 Moderate, 3 High

Total:
- Low: 52
- Moderate: 52
- High: 52

Total Articles: 156
RISK STRATIFICATION RECOMMENDATIONS
This AAOS guideline provides risk stratification for various potentially reversible/maximized factors/conditions (obesity, diabetes, chronic pain, depression/anxiety and cirrhosis/hepatitis C). By design the literature was reviewed as pertains to patients having a total knee arthroplasty. That literature is limited in terms of a wide variety of other risks, especially those that are not reversible. Capturing the rates of certain complications such as myocardial infarction, stroke, pneumonia etc., is not statistically possible from the higher quality levels of the literature because they are rare and the numbers of patients available in most studies limited. These areas were considered beyond the methodology of the current guideline.

BMI AS A RISK FACTOR
Strong evidence supports that obese patients have less improvement in outcomes with total knee arthroplasty (TKA).

**Strength of Recommendation: Strong Evidence ★★★★★**
*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*

DIABETES AS A RISK FACTOR
Moderate evidence supports that patients with diabetes are at higher risk for complications with total knee arthroplasty (TKA).

**Strength of Recommendation: Moderate Evidence ★★★★★**
*Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.*

CHRONIC PAIN AS A RISK FACTOR
Moderate evidence supports that patients with select chronic pain conditions have less improvement in patient reported outcomes with TKA.

**Strength of Recommendation: Moderate Evidence ★★★★★**
*Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.*

DEPRESSION/ANXIETY AS A RISK FACTOR
Limited evidence supports that patients with depression and/or anxiety symptoms have less improvement in patient reported outcomes with total knee arthroplasty (TKA).

**Strength of Recommendation: Limited Evidence ★★★★★**
*Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.*

CIRRHOSIS/HEPATITIS C AS A RISK FACTOR
Limited evidence supports that patients with cirrhosis or hepatitis C are at higher risk for complications with total knee arthroplasty (TKA).

**Strength of Recommendation: Limited Evidence ★★★★★**
RATIONALES

RATIONALE: BMI AS A RISK FACTOR
There were four high quality papers extracted that addressed complication rates after total knee arthroplasty for obese patients. Two (Bordini 2009, Judge 2012) demonstrated no higher complication rates in obese patients, whereas the other two (Jamsen, 2013, Amin, 2006) did show higher rates of complications. The conflicting high quality papers negate each other and did not allow for a recommendation regarding complications. There were two high quality papers that demonstrated less improvement in functional outcomes in obese patients after total knee arthroplasty (Judge 2012, Amin 2006). As such the recommendation was made that strong evidence supports the risk for less good outcomes after total knee arthroplasty.

RATIONALE: DIABETES AS A RISK FACTOR
There was one high quality paper (Jamsen 2013) that showed a higher rate of complications and an increased risk of revision surgery for diabetics after total knee arthroplasty. Since it was the only high quality paper extracted, the recommendation strength is moderate.

RATIONALE: CHRONIC PAIN AS A RISK FACTOR
One moderate quality paper (Boyle 2014) used low back pain as one form of chronic pain and demonstrated less good outcomes. Another moderate quality paper (Perruccio 2012) showed less good outcomes after total knee arthroplasty for patients with multiple joint and/or spine pain. The two retain a moderate quality of evidence leading to the recommendation that moderate evidence supports that patients with select chronic pain conditions have less improvement in patient reported outcomes with total knee arthroplasty.

RATIONALE: DEPRESSION/ANXIETY AS A RISK FACTOR
One moderate quality study (Duiven 2013) and one low quality paper (Singh 2010) demonstrated less good outcomes in patients with anxiety/depression. There only being one moderate quality paper, the recommendation made was that limited evidence supports that patients with depression and/or anxiety symptoms have less improvement in patient reported outcomes with total knee arthroplasty.

RATIONALE: CIRRHOSIS/HEPATITIS C AS A RISK FACTOR
Given that the liver is the target organ for hepatitis C, these two risk factors were grouped together. Shih (2004) demonstrated higher complication rates after total knee arthroplasty in patients with cirrhosis and was assigned moderate quality. Pour (2011) was lower quality paper that demonstrated the same in patients with hepatitis C virus status alone and without liver damage. Given the one moderate study and one low quality study, the recommendation was made that limited evidence supports that patients with cirrhosis or hepatitis C are at higher risk for complications with total knee arthroplasty.

RISK/HARMS STATEMENT
The above co-morbidity groups each have wide spectrums of disease intensity and subsequent great variability in terms of marginally less good outcomes and higher risk. There is a possible risk of patients being treated as a member of a class, rather than as individuals. This is especially the case given that federal payments are increasingly being linked to rates of readmission and complications as well as cost and outcomes. The risk adjustments are not exact enough to protect hospitals and surgeons if they offer surgery to all patients from co-morbidity classes with higher risk or less good outcomes. Given the current pressures from value based payments, separating out the patients with lower
expression of their co-morbidities for treatment is less likely than avoidance of the particular class as a whole, even if there is a high likelihood of success for selective cases.

**FUTURE RESEARCH**

Future research can be directed in several directions. One direction would be the evaluation of patient’s outcomes and risks after they have had successful treatment of their co-morbidity. Examples would include patients successfully status post gastric bypass surgery or those patients treated for, and who have eradication of, hepatitis C. Sub-group analysis of various levels of involvement of the above co-morbidities has been difficult because of smaller cohorts or the use of administrative data sets with only a few non-discriminating utilized codes. Future research could be addressed towards utilization of more complex registry data to better define the marginal increase in risk and less good outcomes for patients with less severe expression of various co-morbidities. It could also address the creation of better models of risk adjustment for performance measures in such sub-groups versus those with more severe expression of disease. Careful analysis of risk category may also be helpful to assess if one or more component of the risk factor contributes significantly or may act as a surrogate (e.g. malnutrition in obesity).
# RESULTS

## SUMMARY OF FINDINGS

### TABLE 20: OBESITY

<table>
<thead>
<tr>
<th></th>
<th>High-Quality</th>
<th>Moderate-Quality</th>
<th>Low-Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMI (continuous)</strong></td>
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<tr>
<td>Function</td>
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<td>BMI per 5 unit increase</td>
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<td>Function</td>
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<tr>
<td>Oxford Knee Score</td>
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<td>Pain</td>
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<tr>
<td><strong>Moderately Obese vs non-obese</strong></td>
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<td>Function</td>
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<td>Pain</td>
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<tr>
<td><strong>Moderately Obese vs Normal</strong></td>
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<tr>
<td>Performing Functional Task</td>
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<tr>
<td>Complications</td>
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<tr>
<td>Normal, Overweight, Moderately and Severely Obese</td>
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<td>Complications</td>
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<td>Obese vs non-obese</td>
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<td>Complications</td>
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<td>Function</td>
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<td>Mortality</td>
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<td>Pain</td>
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<td>Performing Functional Task</td>
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<td>Reoperation</td>
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<td>Stiffness</td>
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<tr>
<td><strong>Obese vs Normal</strong></td>
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<td>Function</td>
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<tr>
<td>Mental Function</td>
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<td>Pain</td>
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<td></td>
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<td>Reoperation</td>
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<tr>
<td><strong>Obese, Overweight, Normal</strong></td>
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<td>Complications</td>
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<td><strong>Overweight vs Normal</strong></td>
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<td>Complications</td>
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<td>Function</td>
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<td>Mental Function</td>
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<td>Performing Functional Task</td>
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<td>Reoperation</td>
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<td><strong>Overweight, Obese, and Severely Obese vs Normal</strong></td>
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<tr>
<td>Complications</td>
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<tr>
<td>EQ-5D</td>
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<tr>
<td>General Health State(eq-5d)</td>
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<tr>
<td>Oxford Knee Score</td>
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<tr>
<td>Re-Hospitalization</td>
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<td>Reoperation</td>
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<td><strong>Severely Obese vs non-obese</strong></td>
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<td>Function</td>
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<td>Pain</td>
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<td><strong>Severely Obese vs Normal</strong></td>
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<td>Performing Functional Task</td>
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<td><strong>Severely Obese vs not severely obese (BMI&lt;35)</strong></td>
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<td>Complications</td>
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<td>Stiffness</td>
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<td><strong>Very Severely Obese (BMI&gt;40) vs Moderately to Severely Obese (BMI 30-40)</strong></td>
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<td>Complications</td>
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<td><strong>Very Severely Obese vs non-obese</strong></td>
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<td>Oxford Knee Score</td>
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<td>Reoperation</td>
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<td><strong>Very Severely Obese vs not very severely obese</strong></td>
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# SUMMARY OF FINDINGS TABLE 21: OTHER RISK FACTORS

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QUALITY EVALUATION TABLE 11: RISK STRATIFICATION

Quality Chart Key

● = No Flaw in Domain of Interest
○ = Flaw in Domain of Interest
◦ = Half Flaw in domain of interest

QE - Prognostic

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<th>Prognostic Factor Measured</th>
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<th>Confounders</th>
<th>Appropriate Statistical Analysis</th>
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## DETAILED DATA TABLES

### TABLE 4: RISK STRATIFICATION: CHRONIC PAIN

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<th>patients with pain at 6 months had greater preoperative depression symptoms than those with out pain</th>
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<td>Beck Depression Inventory (higher=worse symptom) in patients with and without pain after TKA</td>
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<td>diabetes</td>
<td>回归系数</td>
<td>0.96 (-4.31, 6.22)</td>
<td>NS</td>
<td></td>
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</tr>
<tr>
<td>Jones,C.A., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC pain</td>
<td>bmi, diabetes, cardiac disease, gender, age, diabetes<em>time interaction effect, gender</em>time interaction, time of measurement measured at 6 months and 3 years</td>
<td>diabetes*time interaction effect</td>
<td>回归系数</td>
<td>0.25 (0.04, 0.46)</td>
<td>pain scores kept continuously decreasing after 6 months to 3 years among non-diabetic patients but slightly increased after 6 months among diabetics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nashi,N., 2014</td>
<td>Low Quality</td>
<td>residual knee pain on Knee society pain score</td>
<td>unclear</td>
<td>1 year</td>
<td>Diabetes versus no diabetes</td>
<td>357</td>
<td>NR</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Nashi,N., 2014</td>
<td>Low Quality</td>
<td>residual knee pain on Knee society pain score</td>
<td>unclear</td>
<td>2 years</td>
<td>Diabetes versus no diabetes</td>
<td>357</td>
<td>NR</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Jamsen,E., 2013</td>
<td>High Quality</td>
<td>revision</td>
<td>age sex, operation year, laterality of operation, method of prosthesis fixation, type of operating hospital, other comorbidities</td>
<td>0-5 years</td>
<td>Diabetes versus no Diabetes</td>
<td>53007</td>
<td>Hazard Ratio</td>
<td>1.27(1.08, 1.5)</td>
<td>patients with diabetes had significantly higher revision rates up to 5 years</td>
</tr>
<tr>
<td>Jamsen,E., 2013</td>
<td>High Quality</td>
<td>revision</td>
<td>age sex, operation year, laterality of operation, method of prosthesis fixation, type of operating hospital, other comorbidities</td>
<td>&gt;5 years</td>
<td>Diabetes versus no Diabetes</td>
<td>53007</td>
<td>Hazard Ratio</td>
<td>0.48(0.22, 1.01)</td>
<td>NS</td>
</tr>
</tbody>
</table>
## TABLE 6: RISK STRATIFICATION: LIVER DISEASE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome</th>
<th>Confounding Adjustment</th>
<th>Duration</th>
<th>Comparison</th>
<th>Study N</th>
<th>Statistic</th>
<th>Result</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Blood loss (mL)</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>8-128 months</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>by group continuous</td>
<td>470 (333.55, 606.45)</td>
<td>worse for cirrhosis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Blood transfusion (U)</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>8-128 months</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>by group continuous</td>
<td>0.5 (-0.01, 1.01)</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Deep infection</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>&gt;30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Duration of hospitalization (d)</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>8-128 months</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>by group continuous</td>
<td>3 (1.76, 4.24)</td>
<td>worse for cirrhosis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Hemoglobin (g/dL)</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>8-128 months</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>by group continuous</td>
<td>-0.8 (-1.33, -0.27)</td>
<td>worse for cirrhosis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Knee Society Function</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>8-128 months</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>by group continuous</td>
<td>-12 (-15.56, -8.44)</td>
<td>worse for cirrhosis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Mortality</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>8-128 months</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>risk ratio</td>
<td>7.5</td>
<td>risk higher in Cirrhosis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Patellar subluxation</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>Perioperative &lt;30 days postop</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>-1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>Polyethylene Wear</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>&gt;30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>risk ratio</td>
<td>1</td>
<td>NS</td>
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<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>anterior knee pain</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>&gt;30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>bloody effusion</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>7.84</td>
<td>worse for cirrhosis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>deep infection</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>3.92</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>encephalopathy</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>Perioperative &lt;30 days postop</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>heart failure</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>Perioperative &lt;30 days postop</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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</tr>
<tr>
<td>Pour,A.E., 2011</td>
<td>Low Quality</td>
<td>hemoglobin drop (g/l)</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>Mean Difference</td>
<td>0.4</td>
<td>NS</td>
</tr>
<tr>
<td>Pour,A.E., 2011</td>
<td>Low Quality</td>
<td>hospital stay</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>Mean Difference</td>
<td>2.5</td>
<td>longer hospital stay in Hepatitis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>infection</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>Perioperative &lt;30 days postop</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>7.84</td>
<td>worse for cirrhosis patients</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>iatrogenic fracture</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate Quality</td>
<td>limited range of motion</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>3.92</td>
<td>NS</td>
</tr>
<tr>
<td>Pour,A.E., 2011</td>
<td>Low Quality</td>
<td>medical complications</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>OR</td>
<td>0.656(0.065, 6.57)</td>
<td>NS</td>
</tr>
<tr>
<td>Pour,A.E., 2011</td>
<td>Low Quality</td>
<td>need for transfusion</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>OR</td>
<td>0.714(0.297, 1.717)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Pour,A.E., 2011</td>
<td>Low</td>
<td>needed manipulation under anesthesia</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>OR</td>
<td>2.032(0.123, 33.583)</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate</td>
<td>pathological fracture</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>&gt;30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate</td>
<td>pulmonary edema</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>Perioperative &lt;30 days postop</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Pour,A.E., 2011</td>
<td>Low</td>
<td>revision</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>OR</td>
<td>3.207(0.508, 20.249)</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate</td>
<td>superficial infection</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>risk ratio</td>
<td>3</td>
<td>NS</td>
</tr>
<tr>
<td>Pour,A.E., 2011</td>
<td>Low</td>
<td>surgical complications</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>OR</td>
<td>1.221(0.273, 5.466)</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate</td>
<td>tibial loosening</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>&gt;30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih,L.Y., 2004</td>
<td>Moderate</td>
<td>total complications</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>8-128 months</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>risk ratio</td>
<td>7.333333333</td>
<td>risk higher in Cirrhosis patients</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Pour, A.E., 2011</td>
<td>Low Quality</td>
<td>units transfused</td>
<td>matched with the patients in the study group for age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)</td>
<td>postoperative</td>
<td>seropositive but asymptomatic Hepatitis C versus no Hepatitis</td>
<td>96</td>
<td>Mean Difference</td>
<td>-0.02</td>
<td>NS (p=.07)</td>
</tr>
<tr>
<td>Shih, L.Y., 2004</td>
<td>Moderate Quality</td>
<td>upper GI bleeding</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>Perioperative &lt;30 days postop</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Shih, L.Y., 2004</td>
<td>Moderate Quality</td>
<td>wound dishiscence</td>
<td>matched by age, gender, date of surgery, follow up duration</td>
<td>30 days</td>
<td>cirrhosis versus no cirrhosis</td>
<td>102</td>
<td>% risk difference</td>
<td>1.96</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Jamsen,E., 2013</td>
<td>High Quality</td>
<td>revision</td>
<td>age sex, operation year, laterality of operation, method of prosthesis fixation, type of operating hospital, other comorbidities)</td>
<td>median 5 years</td>
<td>Neurodegenerative disease versus Neurodegenerative disease</td>
<td>53007</td>
<td>Hazard Ratio</td>
<td>1.32(0.95, 1.82)</td>
<td>NS</td>
</tr>
<tr>
<td>Jamsen,E., 2014</td>
<td>Moderate Quality</td>
<td>revision</td>
<td>Age, gender, hospital district area (i.e. geographical region), month and year of surgery, history of other joint replacements and comorbidity</td>
<td>up to 2 years</td>
<td>Parkinson's versus no Parkinson's Disease</td>
<td>0</td>
<td>Hazard Ratio</td>
<td>1.14(.64, 2.03)</td>
<td>NS</td>
</tr>
<tr>
<td>Jamsen,E., 2014</td>
<td>Moderate Quality</td>
<td>revision</td>
<td>Age, gender, hospital district area (i.e. geographical region), month and year of surgery, history of other joint replacements and comorbidity</td>
<td>after 2 years</td>
<td>Parkinson's versus no Parkinson's Disease</td>
<td>0</td>
<td>Hazard Ratio</td>
<td>.47(.14, 1.53)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>Bleeding problems</td>
<td>none</td>
<td>6 months</td>
<td>BMI(40-60 versus 15-24.9)</td>
<td>2310</td>
<td>risk ratio</td>
<td>1.23</td>
<td>NS</td>
</tr>
<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>Bleeding problems</td>
<td>none</td>
<td>6 months</td>
<td>BMI(40-60 versus 25-39.9)</td>
<td>12381</td>
<td>risk ratio</td>
<td>1.02</td>
<td>NS</td>
</tr>
<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>Bleeding problems</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12655</td>
<td>risk ratio</td>
<td>0.83</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Deep infection</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>-4 (-9.43, 1.43)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Deep infection</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>0 (0, 0)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Deep vein thrombosis</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>0 (0, 0)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Deep vein thrombosis</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>0 (0, 0)</td>
<td>NS</td>
</tr>
<tr>
<td>Amin, A.K., 2006</td>
<td>Moderate Quality</td>
<td>Deep venous thrombosis</td>
<td>none</td>
<td>Peri-Op</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>320</td>
<td>0.38</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>Hematoma</td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>No significant difference between BMI groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perruccio, A.V., 2012</td>
<td>Moderate Quality</td>
<td>Hospital Anxiety and Depression Score-post op Depression</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;25&lt;=30</td>
<td>435</td>
<td>Regression Coefficient</td>
<td>0.49(-1.36, 0.37)</td>
<td>NS</td>
</tr>
<tr>
<td>Perruccio, A.V., 2012</td>
<td>Moderate Quality</td>
<td>Hospital Anxiety and Depression Score-post op Depression</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;=30</td>
<td>435</td>
<td>Regression Coefficient</td>
<td>-0.4(-1.26, 0.46)</td>
<td>NS</td>
</tr>
<tr>
<td>Perruccio, A.V., 2012</td>
<td>Moderate Quality</td>
<td>Hospital Anxiety and Depression Score-post op anxiety</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;25&lt;=30</td>
<td>435</td>
<td>Regression Coefficient</td>
<td>-1.26(-2.23, -0.28)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Perruccio,A.V., 2012</td>
<td>Moderate</td>
<td>Hospital Anxiety and Depression Score-post op</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25, BMI&gt;=30</td>
<td>435</td>
<td>Regression Coefficient</td>
<td>-0.9(-1.86,0.06)</td>
<td>NS</td>
</tr>
<tr>
<td>Yeung,E. 2011</td>
<td>Moderate</td>
<td>Hospital for Special Surgery Function score</td>
<td>matched for age sex, side of surgery, surgeon, time to follow up</td>
<td>10 years</td>
<td>BMI&lt;30, BMI&gt;=30</td>
<td>100</td>
<td>Mean Difference</td>
<td>1.7</td>
<td>non-obese group</td>
</tr>
<tr>
<td>Yeung,E. 2011</td>
<td>Moderate</td>
<td>Hospital for Special Surgery Function score</td>
<td>matched for age sex, side of surgery, surgeon, time to follow up</td>
<td>10 years</td>
<td>BMI&lt;30, BMI&gt;=30</td>
<td>100</td>
<td>Mean Difference</td>
<td>0.5</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate</td>
<td>Hyperesthesia</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>OR</td>
<td>2.042(0.179,23.271)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate</td>
<td>Hyperesthesia</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>2 (-1.88, 5.88)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate</td>
<td>Intra-operative tibial plateau fracture</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>-2 (-5.88,1.88)</td>
<td>NS</td>
</tr>
<tr>
<td>Amin,A.K., 2006</td>
<td>Moderate</td>
<td>Knee Society Score-Function</td>
<td>none</td>
<td>6 months</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>283</td>
<td>Mean Difference</td>
<td>-4.2</td>
<td>NS</td>
</tr>
<tr>
<td>Amin,A.K., 2006</td>
<td>Moderate</td>
<td>Knee Society Score-Function</td>
<td>none</td>
<td>18 months</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>283</td>
<td>Mean Difference</td>
<td>5.6</td>
<td>NS</td>
</tr>
<tr>
<td>Amin,A.K., 2006</td>
<td>Moderate</td>
<td>Knee Society Score-Function</td>
<td>none</td>
<td>36 months</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>283</td>
<td>Mean Difference</td>
<td>7.5</td>
<td>NS</td>
</tr>
<tr>
<td>Amin,A.K., 2006</td>
<td>Moderate</td>
<td>Knee Society Score-Function</td>
<td>none</td>
<td>60 months</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>283</td>
<td>Mean Difference</td>
<td>0.4</td>
<td>NS</td>
</tr>
<tr>
<td>Jarvenpaa,J., 2012</td>
<td>Moderate</td>
<td>Knee society function</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI&gt;=30, BMI&lt;30</td>
<td>52</td>
<td>mean difference</td>
<td>-12.7</td>
<td>NS</td>
</tr>
<tr>
<td>Amin,A.K., 2006</td>
<td>Moderate</td>
<td>Mortality- Mortality</td>
<td>none</td>
<td>hours</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>370</td>
<td>risk difference</td>
<td>0.5</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Judge,A., 2012</td>
<td>High Quality</td>
<td>Oxford Knee Score</td>
<td>age, baseline Oxford Knee Score, sex, side of surgery, primary diagnosis, Operation Type(TKR versus UKR, ASA grade, EQ-5D anxiety score, year of surgery</td>
<td>6 months</td>
<td>bmi per 5 unit increase</td>
<td>1991</td>
<td>regression coefficient</td>
<td>0.44 (0.86, 0.01)</td>
<td>for each 5 unit increase in bmi, patients score an average of .44 points worse on the OKS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score</td>
<td>BMI(40-60 versus 15-24.9) age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(40-60 versus 15-24.9)</td>
<td>2310</td>
<td>Mean Difference</td>
<td>0.5(-0.5, 1.5)</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score</td>
<td>BMI(40-60 versus 25-39.9) age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(40-60 versus 25-39.9)</td>
<td>12381</td>
<td>Mean Difference</td>
<td>0.9(0.1, 1.6)</td>
<td>improvement greater in patients with bmi&gt;40 than between 25-39.9</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score</td>
<td>BMI(15-24.9 versus 25-39.9) age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12655</td>
<td>Mean Difference</td>
<td>0.4(-0.3, 1.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score</td>
<td>matched by age</td>
<td>3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>-1 (-4.22, 2.22)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>-0.9 (-4.59, 2.79)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Judge,A., 2012</td>
<td>High Quality</td>
<td>Oxford Knee Score (OKS) function</td>
<td></td>
<td>6 months</td>
<td>bmi per 5 unit increase</td>
<td>1991</td>
<td>regression coefficient</td>
<td>-0.33 ( -0.57, -0.09)</td>
<td>for each 5 unit increase in bmi, patients score an average of .33 points worse on the OKS function</td>
</tr>
<tr>
<td>Judge,A., 2012</td>
<td>High Quality</td>
<td>Oxford Knee Score (OKS) function reached Patient Acceptable Symptom State</td>
<td></td>
<td>6 months</td>
<td>bmi per 5 unit increase</td>
<td>1991</td>
<td>OR</td>
<td>0.80 (0.68, 0.94)</td>
<td>for each 5 units increase in BMI the odds of reaching the patient acceptable symptom state decreases significantly</td>
</tr>
<tr>
<td>Judge,A., 2012</td>
<td>High Quality</td>
<td>Oxford Knee Score (OKS) pain</td>
<td></td>
<td>6 months</td>
<td>bmi per 5 unit increase</td>
<td>1991</td>
<td>regression coefficient</td>
<td>-0.13 (-0.36, -0.09)</td>
<td>NS</td>
</tr>
<tr>
<td>Judge,A., 2012</td>
<td>High Quality</td>
<td>Oxford Knee Score (OKS) function reached Patient Acceptable Symptom State</td>
<td></td>
<td>6 months</td>
<td>bmi per 5 unit increase</td>
<td>1991</td>
<td>OR</td>
<td>0.94 (0.84, 1.06)</td>
<td>NS</td>
</tr>
<tr>
<td>Judge,A., 2012</td>
<td>High Quality</td>
<td>Oxford Knee Score (OKS) function reached Patient Acceptable Symptom State</td>
<td></td>
<td>6 months</td>
<td>bmi per 5 unit increase</td>
<td>1991</td>
<td>OR</td>
<td>0.90 (0.80, 1.01)</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>PE</td>
<td>postoperative</td>
<td>BMI≤25, BMI 25 to 30, BMI 30&gt; to ≤40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td></td>
<td>no significant difference between BMI groups</td>
<td></td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Peri-operative mortality matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>0 (0, 0)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Jansen,E., 2012</td>
<td>Moderate Quality</td>
<td>Periprosthetic Joint Infection none</td>
<td>1 year</td>
<td>BMI&gt;40, BMI&lt;40</td>
<td>3915</td>
<td>risk ratio</td>
<td>5.78</td>
<td>worse in patients with higher BMI</td>
<td></td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Pes anserinus bursitis matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>-4 (-9.43, 1.43)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Pes anserinus bursitis</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>-2 (-5.88, 1.88)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Phlebitis</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>-2 (-5.88, 1.88)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Poor Flexion</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>OR</td>
<td>1(0.061, 16.445)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Poor Flexion</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>-2 (-5.88, 1.88)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Poor extension</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>4 (-1.43, 9.43)</td>
<td>NS</td>
</tr>
<tr>
<td>Perruccio,A.V., 2012</td>
<td>Moderate Quality</td>
<td>Profile of Mood States- post op fatigue</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;25-&lt;30</td>
<td>435</td>
<td>Regression Coefficient</td>
<td>-1.17(-2.55, 0.22)</td>
<td>NS</td>
</tr>
<tr>
<td>Perruccio,A.V., 2012</td>
<td>Moderate Quality</td>
<td>Profile of Mood States- post op fatigue</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;=30</td>
<td>435</td>
<td>Regression Coefficient</td>
<td>-0.67(-2.05, 0.7)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Prolonged wound ooze</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>OR</td>
<td>5.444(0.612, 48.395)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>Rash</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>2 (-1.88, 5.88)</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>Reoperation</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>2310</td>
<td>risk ratio</td>
<td>0.65</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>Reoperation</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12381</td>
<td>risk ratio</td>
<td>0.71</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>Reoperation</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12655</td>
<td>risk ratio</td>
<td>1.09</td>
<td>NS</td>
</tr>
<tr>
<td>Yeung,E. 2011</td>
<td>Moderate Quality</td>
<td>Revision (implant survival)</td>
<td>matched for age sex, side of surgery , surgeon, time to follow up</td>
<td>10 years</td>
<td>BMI&lt;30, BMI&gt;=30</td>
<td>100</td>
<td>odds ratio</td>
<td>.49(.042, 5.58)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>SF-12 Mental Component Score</td>
<td>matched by age</td>
<td>3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>1.6 (-2.59, 5.79)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>SF-12 Mental Component Score</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>-3.3 (-7.75, 1.15)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>SF-12 Physical Component Score</td>
<td>matched by age</td>
<td>3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>1.9 (-1.69, 5.49)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>SF-12 Physical Component Score</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>-0.8 (-4.96, 3.36)</td>
<td>NS</td>
</tr>
<tr>
<td>Sharma, L.; Sinacore, J.; Daugherty, C.; Kuesis, D.T.; Stulberg, S.D.; Lewis, M.; Baumann, G.; Chang, R.W.</td>
<td>Moderate Quality</td>
<td>SF-36 Physical Functioning-Function</td>
<td>social support, gender, age, education, role function-emotional score, social function, motivation, previous reconstruction, CIRS score, BMI, pain, physical function, quad strength</td>
<td>3 months</td>
<td>continuous predictor</td>
<td>57</td>
<td>Correlation</td>
<td>-0.04</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Significant pain</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>OR</td>
<td>1.532 (0.245, 9.587)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Significant pain</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>OR</td>
<td>0.235 (0.025, 2.181)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Superficial infection</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>8 (0.48, 15.52)</td>
<td>risk is higher in morbidly obese patients with BMI of at least 40</td>
</tr>
<tr>
<td>Napier, R.J., 2014</td>
<td>Moderate Quality</td>
<td>Superficial infection</td>
<td>matched by age</td>
<td>1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>risk difference</td>
<td>0 (0, 0)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>risk higher in patients with BMI of at least 40 than patients</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
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<td>Statistic</td>
<td>Result</td>
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<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>Higher risk in higher bmi group</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>Unlimited walking distance</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>Higher risk in higher bmi group</td>
</tr>
<tr>
<td>Jarvenpaa, J., 2012</td>
<td>Moderate Quality</td>
<td>Up and Go-test (s)</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI $\geq 30$, BMI $&lt; 30$</td>
<td>52</td>
<td>mean difference</td>
<td>0.6</td>
<td>NS</td>
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<tr>
<td>Jarvenpaa, J., 2012</td>
<td>Moderate Quality</td>
<td>VTE</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI $\geq 30$, BMI $&lt; 30$</td>
<td>52</td>
<td>% risk difference</td>
<td>-7.41</td>
<td>NS</td>
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<tr>
<td>Nunez, M., 2011</td>
<td>Moderate Quality</td>
<td>WOMAC Pain (0-100)</td>
<td>matched by age, sex, baseline WOMAC score</td>
<td>1 year</td>
<td>BMI $\geq 35$ versus BMI $&lt; 35$</td>
<td>120</td>
<td>mean difference</td>
<td>5.2</td>
<td>NS</td>
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<tr>
<td>Jones, C.A., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC function</td>
<td>bmi, diabetes, cardiac disease, gender, age, diabetes<em>time interaction effect, gender</em>time interaction, time of measurement</td>
<td>measured at 6 months and 3 years</td>
<td>BMI 30 to 34.9 versus less than 30</td>
<td>0</td>
<td>regression coefficient</td>
<td>0.67 (-3.15, 4.49)</td>
<td>NS</td>
</tr>
<tr>
<td>Jones, C.A., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC function</td>
<td>bmi, diabetes, cardiac disease, gender, age, diabetes<em>time interaction effect, gender</em>time interaction, time of measurement</td>
<td>measured at 6 months and 3 years</td>
<td>BMI 35 or higher versus less than 30</td>
<td>0</td>
<td>regression coefficient</td>
<td>5.06 (0.79, 9.34)</td>
<td>function scores were significantly worse in patients with BMI of 35 or above than in those below 30</td>
</tr>
<tr>
<td>Perruccio, A.V., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC function</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI $&lt; 25$, BMI $= 25$ to $&lt; 30$</td>
<td>435</td>
<td>standardized regression coefficients(change in standard deviation units of outcome scale)</td>
<td>-0.17(-2.44, 2.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
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<td>Statistic</td>
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<tr>
<td>Perruccio,A.V., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC function</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;=30</td>
<td>435</td>
<td>standardized regression coefficients(change in standard deviation units of outcome scale)</td>
<td>0.165(-2.108, 2.438)</td>
<td>NS</td>
</tr>
<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>WOMAC function (0-100)</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>mean difference</td>
<td>1.3</td>
<td>NS</td>
</tr>
<tr>
<td>Jones,C.A., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC pain</td>
<td>bmi, diabetes, cardiac disease, gender, age, diabetes<em>time interaction effect, gender</em>time interaction, time of measurement</td>
<td>measured at 6 months and 3 years</td>
<td>BMI 30 to 34.9 versus less than 30</td>
<td>0</td>
<td>regression coefficient</td>
<td>0.42 (-3.30, 4.13)</td>
<td>NS</td>
</tr>
<tr>
<td>Jones,C.A., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC pain</td>
<td>bmi, diabetes, cardiac disease, gender, age, diabetes<em>time interaction effect, gender</em>time interaction, time of measurement</td>
<td>measured at 6 months and 3 years</td>
<td>BMI 35 or higher versus less than 30</td>
<td>0</td>
<td>regression coefficient</td>
<td>4.01 (-0.15, 8.17)</td>
<td>NS</td>
</tr>
<tr>
<td>Perruccio,A.V., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC pain</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;25-30</td>
<td>435</td>
<td>standardized regression coefficients(change in standard deviation units of outcome scale)</td>
<td>-0.385(-1.15, 0.346)</td>
<td>NS</td>
</tr>
<tr>
<td>Perruccio,A.V., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC pain</td>
<td>age, sex, level of education, obesity, comorbidity count</td>
<td>mean 12.5 months</td>
<td>BMI&lt;=25,BMI&gt;=30</td>
<td>435</td>
<td>standardized regression coefficients(change in standard deviation units of outcome scale)</td>
<td>-0.355(-1.083, 0.372)</td>
<td>NS</td>
</tr>
<tr>
<td>Jarvenpaa,J., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC pain (VAS 0-100)</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI&gt;=30,BMI&lt;30</td>
<td>52</td>
<td>mean difference</td>
<td>9.1</td>
<td>NS</td>
</tr>
<tr>
<td>Jarvenpaa,J., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC physical function</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI&gt;=30,BMI&lt;30</td>
<td>52</td>
<td>mean difference</td>
<td>12.1</td>
<td>worse with higher bmi</td>
</tr>
<tr>
<td>Jarvenpaa,J., 2012</td>
<td>Moderate Quality</td>
<td>WOMAC stiffness</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI&gt;=30,BMI&lt;30</td>
<td>52</td>
<td>mean difference</td>
<td>13.5</td>
<td>worse with higher bmi</td>
</tr>
<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>WOMAC stiffness (0-100)</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>mean difference</td>
<td>19</td>
<td>patients with diabetes had significantly higher revision rates up to 5 years</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
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<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>WOMAC total (0-100)</td>
<td>matched by age, sex, baseline WOMAC score</td>
<td>1 year</td>
<td>BMI $\geq 35$ versus BMI $&lt; 35$</td>
<td>120</td>
<td>mean difference</td>
<td>3.5</td>
<td>NS</td>
</tr>
<tr>
<td>Jarvenpaa,J., 2012</td>
<td>Moderate Quality</td>
<td>Walking distance (m)</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI $\geq 30$, BMI $&lt; 30$</td>
<td>52</td>
<td>mean difference</td>
<td>-1041</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
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<td>Singh, J.A., 2010</td>
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<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
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<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
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<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to rise from chair with no arms</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
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<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>Higher risk in higher bmi group</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>Higher risk in higher bmi group</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>2 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4701</td>
<td>None given</td>
<td>NR</td>
<td>Higher risk in higher bmi group</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
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<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>Higher risk in higher bmi group</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>ability to walk stairs without support</td>
<td>age, gender, BMI, comorbidity, income, distance from medical center, ASA class, operative diagnosis and the type of implant</td>
<td>5 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4211</td>
<td>None given</td>
<td>NR</td>
<td>Higher risk in higher bmi group</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>acute anemia</td>
<td>postoperative</td>
<td>BMI &lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>anesthetic complications</td>
<td>intraoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>bone fracture</td>
<td>intraoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
<td></td>
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<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>cardiac infarction</td>
<td>postoperative</td>
<td>BMI &lt;= 25, 25 &lt; BMI &lt;= 30</td>
<td>6532</td>
<td>% risk difference</td>
<td>-0.001</td>
<td>lower risk in lower bmi group</td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>cardiac infarction</td>
<td>postoperative</td>
<td>BMI &lt;= 25, 30 &lt; BMI &lt;= 40</td>
<td>4871</td>
<td>% risk difference</td>
<td>0</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>cardiac infarction</td>
<td>postoperative</td>
<td>BMI &lt;= 25, BMI &gt; 40</td>
<td>2012</td>
<td>% risk difference</td>
<td>-0.006</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>cardiac infarction</td>
<td>postoperative</td>
<td>BMI &lt;= 25, 30 &lt; BMI &lt;= 40</td>
<td>4871</td>
<td>% risk difference</td>
<td>0</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>cardiac infarction</td>
<td>postoperative</td>
<td>25 &lt; BMI &lt;= 30, BMI &gt; 40</td>
<td>4864</td>
<td>risk ratio</td>
<td>0.26</td>
<td>NS</td>
<td></td>
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<td>Reference</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>cardiac infarction</td>
<td></td>
<td>postoperative</td>
<td>30 &lt; BMI &lt;= 40, BMI &gt; 40</td>
<td>3203</td>
<td>risk ratio</td>
<td>0.06</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>complications</td>
<td>matched by age</td>
<td>at 3 months</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>1.64 (0.86, 3.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>complications</td>
<td>matched by age</td>
<td>at 1 year</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>OR</td>
<td>0.4 (0.08, 1.97)</td>
<td>NS</td>
</tr>
<tr>
<td>Amin,A.K., 2006</td>
<td>Moderate Quality</td>
<td>deep infection</td>
<td>none</td>
<td>5 years</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>370</td>
<td>risk ratio</td>
<td>0.65625</td>
<td>NS</td>
</tr>
<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>deep infection</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>risk ratio</td>
<td>3</td>
<td>NS</td>
</tr>
<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>deep infection</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>-1.67</td>
<td>NS</td>
</tr>
<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>discomfort in the femoropatellar joint</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>-11.67</td>
<td>favors higher bmi</td>
</tr>
<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>distal woun dehiscence</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>1.67</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>dvt</td>
<td></td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>eq-5d general health state VAS</td>
<td>BMI(40-60 versus 15-24.9) age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(40-60 versus 15-24.9)</td>
<td>2310</td>
<td>Mean Difference</td>
<td>-0.19(-4.1, 0.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>eq-5d general health state VAS</td>
<td>BMI(40-60 versus 25-39.9) age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(40-60 versus 25-39.9)</td>
<td>12381</td>
<td>Mean Difference</td>
<td>-1.3(-0.4, 3.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>eq-5d general health state VAS</td>
<td>BMI(15-24.9 versus 25-39.9)age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12655</td>
<td>Mean Difference</td>
<td>-0.5(-2.1, 1)</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>eq-5d index scores</td>
<td>BMI(40-60 versus 15-24.9)age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(40-60 versus 15-24.9)</td>
<td>2310</td>
<td>Mean Difference</td>
<td>0.014(-0.021, 0.048)</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>eq-5d index scores</td>
<td>BMI(40-60 versus 25-39.9)age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(40-60 versus 25-39.9)</td>
<td>12381</td>
<td>Mean Difference</td>
<td>0.019(-0.008, 0.045)</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate Quality</td>
<td>eq-5d index scores</td>
<td>BMI(15-24.9 versus 25-39.9)age, sex, ASA grade, number of comorbidities, general health rating</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12655</td>
<td>Mean Difference</td>
<td>0.005(-0.021, 0.031)</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>general post operative complications</td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>hospital for special surgery-function</td>
<td>matched for age sex, side of surgery, surgeon, time to follow up</td>
<td>postoperative</td>
<td>BMI&lt;30, BMI&gt;=30</td>
<td>100</td>
<td>Mean Difference</td>
<td>non-obese group</td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>hospital for special surgery-pain</td>
<td>matched for age sex, side of surgery, surgeon, time to follow up</td>
<td>post operative</td>
<td>BMI&lt;30, BMI&gt;=30</td>
<td>100</td>
<td>Mean Difference</td>
<td>0.5</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>implant survival</td>
<td>matched for age, sex, side of surgery, surgeon, time to follow up</td>
<td>10 years</td>
<td>BMI&lt;30, BMI&gt;=30</td>
<td>100</td>
<td>risk ratio</td>
<td>0.98</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>intraoperative</td>
<td>None</td>
<td>intraoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
</tr>
<tr>
<td>Napier,R.J., 2014</td>
<td>Moderate Quality</td>
<td>length of hospital stay</td>
<td>matched by age</td>
<td>during hospital stay</td>
<td>BMI over 40 versus BMI less than 30</td>
<td>100</td>
<td>Mean Difference</td>
<td>0.9 (-0.15, 1.95)</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>local post operative complications</td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nunez,M., 2011</td>
<td>Moderate Quality</td>
<td>loosening of tibial implant</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>3.33</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>mortality</td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>NS</td>
<td></td>
<td></td>
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<tr>
<td>Bordini,B., 2009</td>
<td>High Quality</td>
<td>mortality</td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
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<tr>
<td>Lizaur-Utrilla,A., 2015</td>
<td>High Quality</td>
<td>mortality</td>
<td>age, sex, Charlson index, post operative KSS function, use of walking aids, post operative womac pain, post op SF-12 physical, SF 12 mental</td>
<td>10 years</td>
<td>BMI over 30 versus under 30 in patients getting TKA</td>
<td>1768</td>
<td>Hazard Ratio</td>
<td>0.8 (0.6–1.3)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), income category and pre-operative overall limitations</td>
<td>2 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4701</td>
<td>OR</td>
<td>1.1 (0.6,2.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), income category and pre-operative overall limitations</td>
<td>2 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4701</td>
<td>OR</td>
<td>0.7 (0.4,1.5)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), income category and pre-operative overall limitations</td>
<td>2 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4701</td>
<td>OR</td>
<td>1.7 (0.8,3.6)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), income category and pre-operative overall limitations</td>
<td>2 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4701</td>
<td>OR</td>
<td>1.6 (0.7,3.6)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), income category and pre-operative overall limitations</td>
<td>5 years</td>
<td>BMI between 25 and 29.9 versus less than 25</td>
<td>4211</td>
<td>OR</td>
<td>0.9 (0.4,1.6)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low Quality</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), income category and pre-operative overall limitations</td>
<td>5 years</td>
<td>BMI between 30 and 34.99 versus less than 25</td>
<td>4211</td>
<td>OR</td>
<td>1.1 (0.5,2.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Singh, J.A., 2010</td>
<td>Low</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), incomecategory and pre-operative overall limitations</td>
<td>5 years</td>
<td>BMI between 35 and 39.9 versus less than 25</td>
<td>4211</td>
<td>OR</td>
<td>1.0 (0.5,2.3)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2010</td>
<td>Low</td>
<td>need for walking aids</td>
<td>gender, age, Deyo-Charlson index, BMI, ASA score, distance from medical center, operative diagnosis, type of implant (cemented, uncemented, hybrid), incomecategory and pre-operative overall limitations</td>
<td>5 years</td>
<td>BMI between at least 40 versus less than 25</td>
<td>4211</td>
<td>OR</td>
<td>2.0 (0.8,4.7)</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High</td>
<td>nerve injury</td>
<td>postoperative</td>
<td></td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High</td>
<td>other general postoperative complications</td>
<td>postoperative</td>
<td></td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
</tr>
<tr>
<td>Bordini,B., 2009</td>
<td>High</td>
<td>other local postoperative complications</td>
<td>postoperative</td>
<td></td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
</tr>
<tr>
<td>Jarvenpaa,J., 2012</td>
<td>Moderate</td>
<td>prosthesis infection</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI&gt;=30,BMI&lt;30</td>
<td>52</td>
<td>risk ratio</td>
<td>2.16</td>
<td>NS</td>
</tr>
<tr>
<td>Baker,P., 2012</td>
<td>Moderate</td>
<td>readmission</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>2310</td>
<td>risk ratio</td>
<td>1.01</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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</tr>
<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>readmission</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12381</td>
<td>risk ratio</td>
<td>1.04</td>
<td>NS</td>
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<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>readmission</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12655</td>
<td>risk ratio</td>
<td>1.03</td>
<td>NS</td>
</tr>
<tr>
<td>Nunez, M., 2011</td>
<td>Moderate Quality</td>
<td>reintervention due to arthrolysis due to stiffness</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>3.33</td>
<td>NS</td>
</tr>
<tr>
<td>Nunez, M., 2011</td>
<td>Moderate Quality</td>
<td>reintervention for patellar prosthesis</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>1.67</td>
<td>NS</td>
</tr>
<tr>
<td>van Jonbergen, H.P., 2010</td>
<td>High Quality</td>
<td>revision</td>
<td>Diagnostic group(isolated patellofemoral, post traumatic, or patellofemoral OA with a previous realignment procedure), sex, age&gt;50/age&lt;=50,</td>
<td>median 13.3 years</td>
<td>BMI &gt; 30 BMI &lt;=30</td>
<td>157</td>
<td>Hazard Ratio</td>
<td>2.1(1.2, 4)</td>
<td>rate of revision is higher in obese patients</td>
</tr>
<tr>
<td>Nunez, M., 2011</td>
<td>Moderate Quality</td>
<td>revision</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>5</td>
<td>NS</td>
</tr>
<tr>
<td>Amin, A.K., 2006</td>
<td>High Quality</td>
<td>revision (BMI&gt;40; deep infection needing revision (2); aseptic loosening needing revision (2), unexplained pain (1)) (BMI&lt;30; unexplained pain (2))</td>
<td>matched for age, gender, diagnosis, type of prosthesis, laterality and preop knee society score</td>
<td>mean 38.5 months</td>
<td>bmi&gt;=40, BMI &lt;30</td>
<td>74</td>
<td>risk ratio</td>
<td>4</td>
<td>NS</td>
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<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>revision due to infection</td>
<td>gender, fixed versus mobil insert, age</td>
<td>mean follow up =3.1 years</td>
<td>BMI &gt;25-30, BMI&lt;=25</td>
<td>6532</td>
<td>Hazard Ratio</td>
<td>1.17</td>
<td>NS</td>
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<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>revision due to infection</td>
<td>gender, fixed versus mobil insert, age</td>
<td>mean follow up =3.1 years</td>
<td>BMI &gt;30-40, BMI&lt;=25</td>
<td>4871</td>
<td>Hazard Ratio</td>
<td>0.89</td>
<td>NS</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>revision due to infection</td>
<td>gender, fixed versus mobil insert, age</td>
<td>mean follow up =3.1 years</td>
<td>BMI &gt;40, BMI&lt;=25</td>
<td>2012</td>
<td>Hazard Ratio</td>
<td>0.94</td>
<td>NS</td>
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<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>revision for any reason</td>
<td>gender, fixed versus mobil insert, age</td>
<td>mean follow up =3.1 years</td>
<td>BMI &gt;25-30, BMI&lt;=25</td>
<td>6532</td>
<td>Hazard Ratio</td>
<td>0.92</td>
<td>NS</td>
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<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>revision for any reason</td>
<td>gender, fixed versus mobil insert, age</td>
<td>mean follow up =3.1 years</td>
<td>BMI &gt;30-40, BMI&lt;=25</td>
<td>4871</td>
<td>Hazard Ratio</td>
<td>0.91</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>revision for any reason</td>
<td>gender, fixed versus mobil insert, age</td>
<td>mean follow up =3.1 years</td>
<td>BMI &gt;40, BMI&lt;=25</td>
<td>2012</td>
<td>Hazard Ratio</td>
<td>1.02</td>
<td>NS</td>
</tr>
<tr>
<td>Amin, A.K., 2006</td>
<td>Moderate Quality</td>
<td>superficial infection</td>
<td>none</td>
<td>5 years</td>
<td>BMI&gt; 30, BMI &lt;30</td>
<td>370</td>
<td>risk ratio</td>
<td>1.53125</td>
<td>NS</td>
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<td>Nunez, M., 2011</td>
<td>Moderate Quality</td>
<td>superficial infection</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>% risk difference</td>
<td>1.67</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>superficial infections</td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
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<td></td>
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<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>tendon/ligament rupture</td>
<td>intraoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nunez, M., 2011</td>
<td>Moderate Quality</td>
<td>total complications</td>
<td>matched by age, sex, baseline womac score</td>
<td>1 year</td>
<td>BMI&gt;=35 versus BMI &lt;35</td>
<td>120</td>
<td>risk ratio</td>
<td>1.25</td>
<td>NS</td>
</tr>
<tr>
<td>Bordini, B., 2009</td>
<td>High Quality</td>
<td>urinary</td>
<td>postoperative</td>
<td>BMI&lt;=25, BMI 25 to 30, BMI 30&gt; to &lt;=40</td>
<td>9735</td>
<td>fisher's exact test</td>
<td>no significant difference between BMI groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jarvenpaa, J., 2012</td>
<td>Moderate Quality</td>
<td>use of ambulatory support</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI&gt;=30, BMI&lt;30</td>
<td>52</td>
<td>risk ratio</td>
<td>1.08</td>
<td>NS</td>
</tr>
<tr>
<td>Jarvenpaa, J., 2012</td>
<td>Moderate Quality</td>
<td>wound infection</td>
<td>none</td>
<td>mean 10.8</td>
<td>BMI&gt;=30, BMI&lt;30</td>
<td>52</td>
<td>% risk difference</td>
<td>4</td>
<td>NS</td>
</tr>
<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>wound problems</td>
<td>none</td>
<td>6 months</td>
<td>BMI(40-60 versus 15-24.9)</td>
<td>2310</td>
<td>risk ratio</td>
<td>1.76</td>
<td>favors lower BMI</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
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</tr>
<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>wound problems</td>
<td>none</td>
<td>6 months</td>
<td>BMI(40-60 versus 25-39.9)</td>
<td>12381</td>
<td>risk ratio</td>
<td>1.39</td>
<td>favors lower BMI</td>
</tr>
<tr>
<td>Baker, P., 2012</td>
<td>Moderate Quality</td>
<td>wound problems</td>
<td>none</td>
<td>6 months</td>
<td>BMI(15-24.9 versus 25-39.9)</td>
<td>12655</td>
<td>risk ratio</td>
<td>0.79</td>
<td>favors lower BMI</td>
</tr>
</tbody>
</table>
### TABLE 9: RISK STRATIFICATION: RENAL INSUFFICIENCY

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome</th>
<th>Confounding Adjustment</th>
<th>Duration</th>
<th>Comparison</th>
<th>Study N</th>
<th>Statistic</th>
<th>Result</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duchman, K.R., 2014</td>
<td>Moderate Quality</td>
<td>Any complication after UKA</td>
<td>Not included in a multivariate analysis since bivariate association was not significant</td>
<td>30 day</td>
<td>On dialysis versus not</td>
<td>1588</td>
<td>None given</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2013</td>
<td>Low Quality</td>
<td>moderate to severe knee pain on Mayo Knee Questionnaire</td>
<td>age, gender, BMI, ASA class, distance from medical centre, operative diagnosis, implant fixation (cement status), six Deyo Charlson comorbidity categories, anxiety and depression, heart disease, renal disease, COPD, Diabetes (with or without organ damage, CTD</td>
<td>2 years</td>
<td>renal disease versus no renal disease in patients undergoing TKA</td>
<td>7139</td>
<td>OR</td>
<td>1.2 (0.8, 1.8)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2013</td>
<td>Low Quality</td>
<td>moderate to severe knee pain on Mayo Knee Questionnaire</td>
<td>age, gender, BMI, ASA class, distance from medical centre, operative diagnosis, implant fixation (cement status), six Deyo Charlson comorbidity categories, anxiety and depression, heart disease, renal disease, COPD, Diabetes (with or without organ damage, CTD</td>
<td>5 years</td>
<td>renal disease versus no renal disease in patients undergoing TKA</td>
<td>4234</td>
<td>OR</td>
<td>0.7 (0.3, 1.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome</td>
<td>Confounding Adjustment</td>
<td>Duration</td>
<td>Comparison</td>
<td>Study N</td>
<td>Statistic</td>
<td>Result</td>
<td>Significance</td>
</tr>
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</tr>
<tr>
<td>Singh, J.A., 2013</td>
<td>Low Quality</td>
<td>moderate to severe knee pain on Mayo Knee Questionnaire</td>
<td>age, gender, BMI, ASA class, distance from medical centre, operative diagnosis, implant fixation (cement status), six Deyo Charlson comorbidity categories, anxiety and depression, heart disease, renal disease, COPD, Diabetes (with or without organ damage, CTD)</td>
<td>2 years</td>
<td>renal disease versus no renal disease in patients undergoing revision TKA</td>
<td>1533</td>
<td>OR</td>
<td>0.9 (0.4, 1.7)</td>
<td>NS</td>
</tr>
<tr>
<td>Singh, J.A., 2013</td>
<td>Low Quality</td>
<td>moderate to severe knee pain on Mayo Knee Questionnaire</td>
<td>age, gender, BMI, ASA class, distance from medical centre, operative diagnosis, implant fixation (cement status), six Deyo Charlson comorbidity categories, anxiety and depression, heart disease, renal disease, COPD, Diabetes (with or without organ damage, CTD)</td>
<td>5 years</td>
<td>renal disease versus no renal disease in patients undergoing revision TKA</td>
<td>881</td>
<td>OR</td>
<td>1.4 (0.5, 4.5)</td>
<td>NS</td>
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</tbody>
</table>
PREOPERATIVE PHYSICAL THERAPY

Limited evidence supports that supervised exercise before total knee arthroplasty (TKA) might improve pain and physical function after surgery.

Strength of Recommendation: Limited Evidence

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

RATIONALE


One study of high quality (Villadsen 2013) and two studies of moderate quality (Topp 2009, Brown 2012) investigated the effects of exercise programs that combined primarily functional training, resistance training, and flexibility exercises compared to not receiving such exercise programs. Villadsen et al compared an exercise program of eight week duration (1 hour twice a week) supervised by physical therapists that combined warm-up, core stability, postural orientation, resistance training, and functional exercises, to a group who received education on exercise. They reported significantly improved physical function and pain six weeks after surgery, but the differences were no longer significant 3 months after total knee arthroplasty.

Topp et al compared an experimental group who received supervised exercise program of four week duration (3 times per week) that combined flexibility exercises, resistance training, and step training, to a group who did not exercise. They reported conflicting results for physical function and pain. At 3 months after total knee arthroplasty the exercise group performed more sit-to-stand repetitions than the control group but the control group ascended stairs faster than the exercise group. The exercise group has less pain during stairs descend but more pain during sit-to-stand task as compared to the control group. Brown et al compared a 8-week (3 session per week) supervised exercise program comprised of warm up, resistance training at moderate intensity, flexibility exercises, and step training, to a control group who did not exercise. They reported better physical function in the exercise group.

Two studies of high quality (McKay 2012, D’Lima 1996) and one study of moderate quality (Weidenhielm 1993) evaluated the effects of resistance training primarily. McKay et al compared a group who performed 6 weeks of moderate-intensity strength training of the lower body to a group who did upper body resistance training (placebo). D’Lima designed a three-group study to compare strength training of lower and upper body, aerobic training, and routine care (no exercise). D’Lima was the only study on pre-rehabilitation that had an exercise group who did aerobic training only. Weidenhielm et al compared a 5-week exercise program of knee range of motion and lower body strength training to a group who did not exercise. These studies found no significant differences in outcome between groups. One study of moderate quality (Rooks 2006) et al compared a 6-week exercise program with cardiovascular, strength, and flexibility training to an attention-control group who received education on total knee arthroplasty. Amongst the outcomes evaluated at 8 and 26 weeks after total knee arthroplasty,
only bodily pain at 26-week was significantly less in the exercise group. One study of high quality (Gstoettner 2011) demonstrated that 6-week of stretching and balance training was not effective on physical function and pain.

POSSIBLE HARM OF IMPLEMENTATION
There are no known harms associated with implementing this recommendation. Of note, this recommendation is specific to patients who have failed prior conservative intervention for knee osteoarthritis and are scheduled for a total knee arthroplasty. This does not replace prior recommendation from the AAOS Clinical Practice Guideline on treatment for knee osteoarthritis that strongly supports that patients with symptomatic osteoarthritis of the knee participate in self-management programs, strengthening, low-impact aerobic exercises, and neuromuscular education; and engage in physical activity consistent with national guidelines.

FUTURE RESEARCH
Further studies on rehabilitation pre-surgery should be aligned with exercise recommendations from national guidelines and use exercise programs sufficiently long to promote gradual progression and overload. Research could test the effect of pre surgical rehabilitation on cost and utilization of care after surgery. Future research could also test pre-operative rehabilitation on selected patient populations in whom TKA might be delayed due to co-existing morbidities such as obesity, diabetes, and musculoskeletal conditions associated to chronic pain.
## RESULTS

### SUMMARY OF FINDINGS: TABLE 22: PRE-OPERATIVE STRUCTURED EXERCISE

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors Pre-op Structured Exercise</td>
<td>McKay, C., 2012</td>
<td>Matassi, F., 2014</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Favors Pre-op Structured Exercise</td>
<td>Huang, S.W., 2012</td>
<td>Topp, R., 2009</td>
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<tr>
<td>Complications</td>
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<tr>
<td>Fall in HB, g/dL</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Manipulation Under Anesthesia- Other</td>
<td></td>
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<tr>
<td>Composite</td>
<td></td>
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<tr>
<td>Knee Society Score KSS</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Knee Society Score-Function- Function</td>
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<tr>
<td>Hospital for Special Surgery Knee Rating</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Function</td>
<td></td>
<td></td>
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<tr>
<td>Range of Motion</td>
<td></td>
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<tr>
<td>SF-36 Physical component summary</td>
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<td>SF-36 Physical Functioning- Function</td>
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<tr>
<td>Timed Functional Tests</td>
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<tr>
<td>WOMAC-Function likert version (0-68)</td>
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<tr>
<td>KOOS-Function, Daily Living- Function</td>
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<tr>
<td>Ambulation (walking)</td>
<td></td>
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<tr>
<td>KOOS-Function, Sports And Recreational Activities- Function</td>
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<td>WOMAC function NRS (0-11)</td>
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<tr>
<td>Length Of Stay</td>
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</tr>
<tr>
<td>Days- Length Of Stay</td>
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<tr>
<td>Length Of Recovery- Length Of Stay</td>
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<tr>
<td>Other</td>
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<td>SF-36 Emotional Role Functioning</td>
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<td>SF-36 General Health Perceptions</td>
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<td>SF-36 Social Role Functioning</td>
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<td>KOOS-Symptoms</td>
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<td>SF-36 Bodily Pain- Pain</td>
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<td>VAS Pain (10cm)- Pain</td>
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<td>WOMAC-Pain</td>
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<tr>
<td>KOOS-Pain</td>
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<tr>
<td>Pain</td>
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<tr>
<td>Pain during 6-minute walk</td>
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<tr>
<td>Pain when ascending stairs</td>
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<tr>
<td>Pain when descending stairs</td>
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<tr>
<td>Euroqol-5d(Eq-5d) Pain/Discomfort- Pain</td>
<td></td>
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<tr>
<td>Quality of Life</td>
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<tr>
<td>Euroqol-5d(Eq-5d) Total</td>
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<tr>
<td>KOOS-Quality Of Life- Quality Of Life</td>
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<td>Stiffness</td>
<td></td>
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<tr>
<td>WOMAC stiffness NRS (0-11)</td>
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</tbody>
</table>
QUALITY EVALUATION TABLE 12: PRE-OPERATIVE STRUCTURED EXERCISE PROGRAM

Quality Chart Key

● = No Flaw in Domain of Interest
○ = Flaw in Domain of Interest
★ = Half flaw in domain of interest

**QE - Intervention - Observational**

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huang, S.W., 2012</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
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**QE - Intervention - Randomized**

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
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<tr>
<td>Brown, K., 2012</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Brown, K., 2014</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>D'Lima, D.D., 1996</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Evgeniadis, G., 2008</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
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<tr>
<td>Gosper, M., 2011</td>
<td>●</td>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Matassi, F., 2014</td>
<td>●</td>
<td>○</td>
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<td>○</td>
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<td>○</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>McKay, C., 2012</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<td>○</td>
<td>Include</td>
<td>High Quality</td>
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<tr>
<td>Mitchell, C., 2005</td>
<td>●</td>
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<td>Rooks, D.S., 2006</td>
<td>○</td>
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<td>Moderate Quality</td>
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<tr>
<td>Topp, R., 2009</td>
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<td>Moderate Quality</td>
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<tr>
<td>Villadsen, A., 2013</td>
<td>●</td>
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<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
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<td>High Quality</td>
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<td>Weidenhielm, L., 1993</td>
<td>○</td>
<td>○</td>
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<td>Include</td>
<td>Moderate Quality</td>
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## TABLE 10: PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM VERSUS NO PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM: COMPOSITE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>D'Lima,D.D., 1996</td>
<td>High Quality</td>
<td>Hospital for Special Surgery Knee Rating( )</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>10</td>
<td>69.33(15.05)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>10</td>
<td>66.69(13.12)</td>
<td>Mean Difference</td>
<td>2.64(-9.73,15.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>D'Lima,D.D., 1996</td>
<td>High Quality</td>
<td>Hospital for Special Surgery Knee Rating( )</td>
<td>1 week</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>10</td>
<td>69.5(10.58)</td>
<td>Pre-Op: No Structured Exercise program (control) (Cardiovascular conditioning)</td>
<td>10</td>
<td>73.33(11.47)</td>
<td>Mean Difference</td>
<td>-3.83(-13.50,5.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>D'Lima,D.D., 1996</td>
<td>High Quality</td>
<td>Hospital for Special Surgery Knee Rating( )</td>
<td>3 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>10</td>
<td>71.46(8.62)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>10</td>
<td>65.4(10.58)</td>
<td>Mean Difference</td>
<td>6.06(-2.40,14.52)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>D'Lima,D.D., 1996</td>
<td>High Quality</td>
<td>Hospital for Special Surgery Knee Rating( )</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>10</td>
<td>82.1(10.57)</td>
<td>Pre-Op: No Structured Exercise program (control) (Cardiovascular conditioning)</td>
<td>10</td>
<td>73(10.55)</td>
<td>Mean Difference</td>
<td>9.1(-0.16,18.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>D'Lima,D.D., 1996</td>
<td>High Quality</td>
<td>Hospital for Special Surgery Knee Rating( )</td>
<td>5.5 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>10</td>
<td>82.9(9.21)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>10</td>
<td>85.56(7.99)</td>
<td>Mean Difference</td>
<td>-2.66(-10.22,4.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>D'Lima,D.D., 1996</td>
<td>High Quality</td>
<td>Hospital for Special Surgery Knee Rating( )</td>
<td>11 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>10</td>
<td>88.6(7.40)</td>
<td>Pre-Op: No Structured Exercise program (control) (Cardiovascular conditioning)</td>
<td>10</td>
<td>87.77(7.80)</td>
<td>Mean Difference</td>
<td>0.83(-5.83,7.49)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Matassi,F., 2014</td>
<td>High Quality</td>
<td>Knee Society Score-Knee(All follow-ups)</td>
<td>1 years</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Patients instructed on)</td>
<td>61</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) (Regular activities until surgery)</td>
<td>61</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>exercises focused on muscle strength and flexibility; 5 days/week for 6 weeks at home)</td>
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</table>

(exercises focused on muscle strength and flexibility; 5 days/week for 6 weeks at home)
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown.K., 2014</td>
<td>High Quality</td>
<td>Self-efficacy for Exercise (SEE) ( )</td>
<td>2 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week prehabilitation exercise program with strength training, flexibility exercises and step exercises; 3 times a week (1 supervised and 2 at home))</td>
<td>16</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) (usual care before surgery)</td>
<td>15</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Brown.K., 2014</td>
<td>High Quality</td>
<td>Outcome Expectations for Exercise (OEE) ( )</td>
<td>2 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week prehabilitation exercise program with strength training, flexibility exercises and step exercises; 3 times a week (1 supervised and 2 at home))</td>
<td>.</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) (usual care before surgery)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evgeniadis.G., 2008</td>
<td>High Quality</td>
<td>Range of Motion (flexion) – Function (Active flexion)</td>
<td>2 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>65.9(6.36)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>70.25(11.30)</td>
<td>Mean Difference</td>
<td>-4.35(-10.11,1.41)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Range of Motion (flexion) – Function (Active flexion)</td>
<td>2.3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>73.3(6.87)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>76.08(10.30)</td>
<td>Mean Difference</td>
<td>-2.78(-8.30,2.74)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Range of Motion (flexion) – Function (Active flexion)</td>
<td>3.2 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>80.73(6.70)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>80.42(10.20)</td>
<td>Mean Difference</td>
<td>0.31(-5.13,5.75)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Range of Motion (extension) – Function (Active extension. Hypoextension reported as negative values)</td>
<td>2 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>-5.45(3.80)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>-6.5(3.83)</td>
<td>Mean Difference</td>
<td>1.05(-1.38,3.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Range of Motion (extension) – Function (Active extension. Hypoextension)</td>
<td>2.3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>-7.45(5.56)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise</td>
<td>20</td>
<td>-7(3.95)</td>
<td>Mean Difference</td>
<td>-0.45(-3.55,2.65)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Range of Motion (extension) – Function (Active extension, Hypoextension reported as negative values)</td>
<td>3.2 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>-5.7(4.27)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>-6.42(3.60)</td>
<td>Mean Difference</td>
<td>0.72(-1.81,3.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function (ILAS Total (0-50))</td>
<td>3 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>29.5(2.90)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>28.9(3.30)</td>
<td>Mean Difference</td>
<td>0.6(-1.37,2.57)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function (ILAS Total (0-50))</td>
<td>2 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>19.7(2.45)</td>
<td>Pre-Op: No Structured Exercise program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>20.3(1.97)</td>
<td>Mean Difference</td>
<td>-0.6(-2.02,0.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function (ILAS Total (0-50))</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (3 week pre-op</td>
<td>18</td>
<td>9.82(0.98)</td>
<td>Pre-Op: No Structured Exercise program (control)</td>
<td>20</td>
<td>10.08(1.16)</td>
<td>Mean Difference</td>
<td>-0.26(-0.94,0.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
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</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function (ILAS Total (0-50))</td>
<td>2.3 months</td>
<td>Pre-Op: Strengthening Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>4.65(0.58)</td>
<td>Pre-Op: No Structured Exercise Program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>4.87(0.73)</td>
<td>Mean Difference</td>
<td>-0.22(-0.64,0.20)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function (ILAS Total (0-50))</td>
<td>3.2 months</td>
<td>Pre-Op: Strengthening Exercise Program Or Pt (3 week pre-op strengthening exercise program)</td>
<td>18</td>
<td>0.31(0.49)</td>
<td>Pre-Op: No Structured Exercise Program (control) (Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>0.38(0.56)</td>
<td>Mean Difference</td>
<td>-0.07(-0.40,0.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Matassi,F., 2014</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active and passive at all follow-ups)</td>
<td>1 years</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Patients instructed on exercises focused on muscle strength and flexibility; 5 days/week for 6 weeks at home)</td>
<td>61</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise Program (control) (Regular activities until surgery)</td>
<td>61</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
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<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Matassi,F., 2014</td>
<td>High</td>
<td>Range of Motion (extension) – Function (All follow-ups)</td>
<td>1 years</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Patients instructed on exercises focused on muscle strength and flexibility; 5 days/week for 6 weeks at home)</td>
<td>61</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) (Regular activities until surgery)</td>
<td>61</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Matassi,F., 2014</td>
<td>High</td>
<td>Knee Society Score-Function- Function (All follow-ups)</td>
<td>1 years</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Patients instructed on exercises focused on muscle strength and flexibility; 5 days/week for 6 weeks at home)</td>
<td>61</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) (Regular activities until surgery)</td>
<td>61</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>McKay,C., 2012</td>
<td>High</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)- Function (50-foot walk test s)</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>10</td>
<td>11.38(5.95)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>12</td>
<td>12.63(3.51)</td>
<td>Mean Difference</td>
<td>-1.25(-5.44,2.94)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>McKay,C., 2012</td>
<td>High</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)- Function (50-foot walk test s)</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>9</td>
<td>14.23(7.55)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>13.11(3.30)</td>
<td>Mean Difference</td>
<td>1.12(-4.22,6.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)-Function (50-foot walk test s)</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>7</td>
<td>11.8(5.60)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>11.82(2.97)</td>
<td>Mean Difference</td>
<td>-0.02(-4.56,4.52)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)-Function ( )</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>10</td>
<td>26.86(24.89)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>12</td>
<td>23.28(11.70)</td>
<td>Mean Difference</td>
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<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>9</td>
<td>30.53(24.85)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>26.72(30.53)</td>
<td>Mean Difference</td>
<td>3.81(-21.12,28.74)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)-Function ( )</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>7</td>
<td>26.99(26.73)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>22.18(10.98)</td>
<td>Mean Difference</td>
<td>4.81(-16.13,25.75)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Function likert version (0-68) ( )</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>10</td>
<td>28.5(12.57)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>12</td>
<td>30.5(13.68)</td>
<td>Mean Difference</td>
<td>-2(-12.98,8.98)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
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<td>Outcome Details</td>
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<td>Mean1/P1 (SD1)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>High Quality</td>
<td>Womac-Function likert version (0-68) ( )</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>7</td>
<td>13.1(11.56)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>14.33(15.42)</td>
<td>Mean Difference</td>
<td>-1.23(-14.06,11.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)-Function (50-foot walk test s)</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>10</td>
<td>11.38(5.95)</td>
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<td>Mean Difference</td>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)-Function (50-foot walk test s)</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>9</td>
<td>14.23(7.55)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>13.11(3.30)</td>
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<td>Mean Difference</td>
<td>-0.02(-4.56,4.52)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>

**McKay,C., 2012**

**High Quality**

**Womac-Function likert version (0-68) ( )**

**Duration**: 2.8 months

**Treatment 1 (Details)**: Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)

**Group1 N**: 7

**Mean1/P1 (SD1)**: 13.1(11.56)

**Treatment 2 (Details)**: Pre-Op: No Structured Exercise program (control) (Upper-body control program)

**Group2 N**: 10

**Mean2/P2 (SD2)**: 14.33(15.42)

**Effect Measure**: Mean Difference

**Result (95% CI)**: -1.23(-14.06,11.60)

**Favored Treatment**: Not Significant (P-value>.05)
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)-Function ( )</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
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<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
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<td>McKay,C., 2012</td>
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<td>Time To Complete Functional Task (Time To Walk 10 Feet, Time To Climb Stairs, Other)-Function ( )</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>7</td>
<td>26.99(26.73)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>22.18(10.98)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Function likert version (0-68) ( )</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>10</td>
<td>28.5(12.57)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>12</td>
<td>30.5(13.68)</td>
<td>Mean Difference</td>
<td>-2(-12.98,8.98)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Function likert version (0-68) ( )</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>9</td>
<td>18.1(11.85)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>19.17(15.01)</td>
<td>Mean Difference</td>
<td>-1.07(-13.17,11.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Function likert version (0-68) ( )</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>7</td>
<td>13.1(11.56)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper-body control program)</td>
<td>10</td>
<td>14.33(15.42)</td>
<td>Mean Difference</td>
<td>-1.23(-14.06,11.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Villadsen,A., 2014</td>
<td>High Quality</td>
<td>Koos-Function, Daily Living-Function ( )</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>2.6(1.90)</td>
<td>Pre-Op: No Structured Exercise program (control) (Basic instruction on procedure and exercises normally given)</td>
<td>40</td>
<td>-0.9(1.90)</td>
<td>Mean Difference</td>
<td>3.5(2.67,4.33)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Villadsen,A., 2014</td>
<td>High Quality</td>
<td>Koos-Function, Sports And Recreational Activities-Function ( )</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>-1.7(2.10)</td>
<td>Pre-Op: No Structured Exercise program (control) (Basic instruction on procedure and exercises normally given)</td>
<td>40</td>
<td>0.5(1.80)</td>
<td>Mean Difference</td>
<td>-2.2(-3.05,-1.35)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Villadsen,A., 2014</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function (Chair stands (s))</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>-3(0.50)</td>
<td>Pre-Op: No Structured Exercise program (control) (Basic instruction on procedure and exercises normally given)</td>
<td>40</td>
<td>-1.1(0.50)</td>
<td>Mean Difference</td>
<td>-1.9(-2.12,-1.68)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Villadsen,A., 2014</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function (20-m walk, self chosen pace (s))</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>-1.3(0.40)</td>
<td>Pre-Op: No Structured Exercise program (control) (Basic instruction on procedure and exercises normally given)</td>
<td>40</td>
<td>-0.9(0.50)</td>
<td>Mean Difference</td>
<td>-0.4(-0.60,-0.20)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
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<td>Villadsen, A., 2014</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function (20-m walk, max pace (s))</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>-0.5(0.50)</td>
<td>Pre-Op: No Structured Exercise program (control)</td>
<td>40</td>
<td>-0.4(0.50)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)- Function (knee bands/30 sec)</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>2.2(1.10)</td>
<td>Pre-Op: No Structured Exercise program (control)</td>
<td>40</td>
<td>-2(1.30)</td>
<td>Mean Difference</td>
<td>4.2(3.67,4.73)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Rooks, D.S., 2006</td>
<td>Moderate Quality</td>
<td>Womac- Function likert version (0-68) (      )</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>26.2(9.20)</td>
<td>Pre-Op: No Structured Exercise program (control)</td>
<td>15</td>
<td>23.1(11.90)</td>
<td>Mean Difference</td>
<td>3.1(-4.61,10.81)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Rooks, D.S., 2006</td>
<td>Moderate Quality</td>
<td>Womac- Function likert version (0-68) (      )</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>27.7(11.60)</td>
<td>Pre-Op: No Structured Exercise program (control)</td>
<td>15</td>
<td>25(11.90)</td>
<td>Mean Difference</td>
<td>2.7(-5.86,11.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Rooks, D.S., 2006</td>
<td>Moderate Quality</td>
<td>Womac- Function likert version (0-68) (      )</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>16.3(7.10)</td>
<td>Pre-Op: No Structured Exercise program (control)</td>
<td>15</td>
<td>15.3(11.40)</td>
<td>Mean Difference</td>
<td>1(-5.86,7.86)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate</td>
<td>Womac-Function likert version (0-68)</td>
<td>6 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>9.9(9.00)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>1.4(11.90)</td>
<td>Mean Difference</td>
<td>8.5(0.85,16.15)</td>
<td>Significant (P-value&lt;.05)</td>
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<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate</td>
<td>Sf-36 Physical Functioning-</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>45.5(18.60)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>43.7(18.80)</td>
<td>Mean Difference</td>
<td>1.8(-11.82,15.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Rooks,D.S., 2006</td>
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<td>Sf-36 Physical Functioning-</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>34(21.50)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>40.2(19.40)</td>
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<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
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<td>49.9(15.00)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
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<td>53.1(26.30)</td>
<td>Mean Difference</td>
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<td>Sf-36 Physical Functioning-</td>
<td>6 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
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<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
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<td>66.1(26.60)</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Weidenhielm, L., 1993</td>
<td>Moderate</td>
<td>Range Of Motion (overall) - Function</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>19</td>
<td>119(12.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
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<td>118(15.00)</td>
<td>Mean Difference</td>
<td>1(-7.50,9.50)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Duration</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Range Of Motion (overall) - Function ( )</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>19</td>
<td>113(12.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>20</td>
<td>108(18.00)</td>
<td>Mean Difference</td>
<td>5(-4.56,14.56)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>Stability-Function ( )</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>19</td>
<td>73.68%</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>20</td>
<td>70.00%</td>
<td>RR</td>
<td>(,...)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Stability-Function ( )</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>19</td>
<td>89.47%</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>20</td>
<td>95.00%</td>
<td>RR</td>
<td>(,...)</td>
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<td>Huang,S.W., 2012</td>
<td>Low Quality</td>
<td>Ambulation (walking) ( )</td>
<td>5 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
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<td>. %</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Huang,S.W., 2012</td>
<td>Low Quality</td>
<td>Ambulation (walking) ( )</td>
<td>5 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
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<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>. %</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Huang,S.W., 2012</td>
<td>Low Quality</td>
<td>Ambulation (walking) ( )</td>
<td>5 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>. %</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Huang,S.W., 2012</td>
<td>Low Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>1 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>30(11.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>30(12.00)</td>
<td>Mean Difference</td>
<td>0(-2.90,2.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Huang,S.W., 2012</td>
<td>Low Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
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<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>76(22.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>74(20.00)</td>
<td>Mean Difference</td>
<td>2(-3.28,7.28)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Topp,R., 2009 Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Sit to stand, repetitions in 30 seconds)</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>10.39(0.72)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>28</td>
<td>9.79(0.69)</td>
<td>Mean Difference</td>
<td>0.6(0.22,0.98)</td>
<td>Treatment 1 Significant (P-value&lt;0.05)</td>
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<tr>
<td>Topp,R., 2009 Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Sit to stand, repetitions in 30 seconds)</td>
<td>1 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>12.08(0.83)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>28</td>
<td>12.08(0.83)</td>
<td>Mean Difference</td>
<td>0(-0.44,0.44)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Topp,R., 2009 Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Sit to stand, repetitions in 30 seconds)</td>
<td>1 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>11.46(0.69)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
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<td>10.36(0.67)</td>
<td>Mean Difference</td>
<td>1.1(,..)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Topp,R., 2009 Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Sit to stand, repetitions in 30 seconds)</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>12.87(0.82)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
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<td>11.25(0.79)</td>
<td>Mean Difference</td>
<td>1.62(1.19,2.05)</td>
<td>Treatment 1 Significant (P-value&lt;0.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (6-minute walk (Distance))</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>1254(64.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>28</td>
<td>1237(62.00)</td>
<td>Mean Difference</td>
<td>17(-16.65,50.65)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (6-minute walk (Distance))</td>
<td>1 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>1282(59.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>28</td>
<td>1185.18(56.00)</td>
<td>Mean Difference</td>
<td>96.82(66.09,127.55)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (6-minute walk (Distance))</td>
<td>1 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>1191(51.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>28</td>
<td>1166.71(49.00)</td>
<td>Mean Difference</td>
<td>24.29(-2.43,51.01)</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (6-minute walk (Distance))</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>1337(58.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
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<td>1365(56.00)</td>
<td>Mean Difference</td>
<td>-28(-58.45,2.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Ascend stairs)</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>11.22(1.06)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>28</td>
<td>9.78(1.02)</td>
<td>Mean Difference</td>
<td>1.44(0.88,2.00)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Ankle strength)</td>
<td>1 weeks</td>
<td>Pre-Op: Structured Exercise</td>
<td>26</td>
<td>10.63(1.12)</td>
<td>Pre-Op: No Structured Exercise</td>
<td>28</td>
<td>10.36(1.08)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)- Function (Ascend stairs)</td>
<td>1 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>28</td>
<td>11.98(1.36)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
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<td>10.39(1.31)</td>
<td>Mean Difference</td>
<td>1.59(0.89,2.29)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)- Function (Ascend stairs)</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>8.44(0.81)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
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<td>7.45(0.77)</td>
<td>Mean Difference</td>
<td>0.99(0.57,1.41)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Matassi,F., 2014</td>
<td>High Quality</td>
<td>Days- Length Of Stay ( )</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Patients instructed on exercises focused on muscle strength and flexibility; 5 days/week for 6 weeks at home)</td>
<td>61</td>
<td>9.1(2.10)</td>
<td>Pre-Op: No Structured Exercise program (control) (Regular activities until surgery)</td>
<td>61</td>
<td>9.9(2.30)</td>
<td>Mean Difference</td>
<td>-0.8(-1.58,-0.02)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Huang,S.W., 2012</td>
<td>Low Quality</td>
<td>Length Of Recovery- Length Of Stay ( )</td>
<td>5 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>7(2.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>8(1.00)</td>
<td>Mean Difference</td>
<td>-1(-1.39,-0.61)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Huang,S.W., 2012</td>
<td>Low Quality</td>
<td>Medical cost (1000 NTD) ( )</td>
<td>5 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>123.7(5.20)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>125.8(4.40)</td>
<td>Mean Difference</td>
<td>-2.1(-3.31,-0.89)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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### TABLE 13: PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM VERSUS NO PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM: PAIN

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<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<tbody>
<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20) ()</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>10</td>
<td>8.7(3.77)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper body control program)</td>
<td>12</td>
<td>9(4.41)</td>
<td>Mean Difference</td>
<td>-0.3(-3.72,3.12)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20) ()</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>9</td>
<td>5.6(2.72)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper body control program)</td>
<td>10</td>
<td>4.92(4.50)</td>
<td>Mean Difference</td>
<td>0.68(-2.63,3.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20) ()</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>7</td>
<td>4.4(3.20)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper body control program)</td>
<td>10</td>
<td>3.58(4.40)</td>
<td>Mean Difference</td>
<td>0.82(-2.79,4.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20) ()</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>10</td>
<td>8.7(3.77)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper body control program)</td>
<td>12</td>
<td>9(4.41)</td>
<td>Mean Difference</td>
<td>-0.3(-3.72,3.12)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20) ()</td>
<td>1.4 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>9</td>
<td>5.6(2.72)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper body control program)</td>
<td>10</td>
<td>4.92(4.50)</td>
<td>Mean Difference</td>
<td>0.68(-2.63,3.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>McKay,C., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20) ()</td>
<td>2.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Lower body experimental program)</td>
<td>7</td>
<td>4.4(3.20)</td>
<td>Pre-Op: No Structured Exercise program (control) (Upper body control program)</td>
<td>10</td>
<td>3.58(4.40)</td>
<td>Mean Difference</td>
<td>0.82(-2.79,4.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Villadsen,A., 2014</td>
<td>High Quality</td>
<td>Koos-Pain-Pain ( )</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>3(1.60)</td>
<td>Pre-Op: No Structured Exercise program (control) (Basic instruction on procedure and exercises normally given)</td>
<td>40</td>
<td>0.8(1.60)</td>
<td>Mean Difference</td>
<td>2.2(1.50,2.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate Quality</td>
<td>Womac-Pain Likert Version (0-20) ( )</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>7.4(2.30)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>6.8(4.00)</td>
<td>Mean Difference</td>
<td>0.6(-1.76,2.96)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate Quality</td>
<td>Womac-Pain Likert Version (0-20) ( )</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>7.3(0.70)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>7.5(5.00)</td>
<td>Mean Difference</td>
<td>-0.2(-2.76,2.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate Quality</td>
<td>Womac-Pain Likert Version (0-20) ( )</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>4.7(2.40)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>5(3.40)</td>
<td>Mean Difference</td>
<td>-0.3(-2.43,1.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate Quality</td>
<td>Womac-Pain Likert Version (0-20) ( )</td>
<td>6 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>9.9(9.00)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>1.4(11.90)</td>
<td>Mean Difference</td>
<td>8.5(0.85,16.15)</td>
<td>Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate Quality</td>
<td>SF-36 Bodily Pain- Pain ( )</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>47.5(17.80)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>55.9(22.10)</td>
<td>Mean Difference</td>
<td>-8.4(-22.96,6.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Rooks,D.S., 2006</td>
<td>Moderate Quality</td>
<td>SF-36 Bodily Pain- Pain ( )</td>
<td>Baseline</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>42.1(16.60)</td>
<td>Pre-Op: No Structured Exercise program</td>
<td>15</td>
<td>56.7(21.40)</td>
<td>Mean Difference</td>
<td>-14.6(-28.49,-0.71)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Rooks, D.S., 2006</td>
<td>Moderate Quality</td>
<td>Sf-36 Bodily Pain- Pain ( )</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>59.8(16.40)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>68.1(16.60)</td>
<td>Mean Difference</td>
<td>-8.3(-20.32,3.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Rooks, D.S., 2006</td>
<td>Moderate Quality</td>
<td>Sf-36 Bodily Pain- Pain ( )</td>
<td>6 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Exercise group)</td>
<td>14</td>
<td>71.2(19.30)</td>
<td>Pre-Op: No Structured Exercise program (control) (Education group)</td>
<td>15</td>
<td>68.1(25.10)</td>
<td>Mean Difference</td>
<td>3.1(-13.13,19.33)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain (Pain at walking)</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>19</td>
<td>3.5(2.30)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>20</td>
<td>3.1(1.10)</td>
<td>Mean Difference</td>
<td>0.4(-0.74,1.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain (Pain at walking)</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>19</td>
<td>1.4(2.00)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>20</td>
<td>1.1(1.30)</td>
<td>Mean Difference</td>
<td>0.3(-0.76,1.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Huang, S.W., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain ( )</td>
<td>1 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>4.5(1.30)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>4.4(1.20)</td>
<td>Mean Difference</td>
<td>0.1(-0.21,0.41)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Huang, S.W., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain ( )</td>
<td>5 Days</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>126</td>
<td>2.4(0.70)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>117</td>
<td>2.5(0.60)</td>
<td>Mean Difference</td>
<td>-0.1(-0.26,0.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Topp, R., 2009</td>
<td>Very Low Quality</td>
<td>( )</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ( )</td>
<td>26</td>
<td>3.96(0.45)</td>
<td>Pre-Op: No Structured Exercise program (control) ( )</td>
<td>28</td>
<td>4.13(0.44)</td>
<td>Mean Difference</td>
<td>-0.17(-0.41,0.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>( )</td>
<td>1 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>9.82(0.80)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>4.91(0.45)</td>
<td>Mean Difference</td>
<td>4.91(4.56,5.26)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>( )</td>
<td>1 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>2.2(0.39)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>2.2(0.39)</td>
<td>Mean Difference</td>
<td>0(-0.21,0.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>( )</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>1.62(0.29)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>1.06(0.28)</td>
<td>Mean Difference</td>
<td>0.56(0.41,0.71)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain during 6-minute walk)</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>4.22(0.43)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>5.2(0.41)</td>
<td>Mean Difference</td>
<td>-0.98(-1.20,-0.76)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain during 6-minute walk)</td>
<td>1 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>4.77(0.45)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>6.8(0.43)</td>
<td>Mean Difference</td>
<td>-2.03(-2.27,-1.79)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain during 6-minute walk)</td>
<td>1 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>2.17(0.37)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>2.36(0.35)</td>
<td>Mean Difference</td>
<td>-0.19(-0.38,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain during 6-minute walk)</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>1.53(0.34)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>1.38(0.33)</td>
<td>Mean Difference</td>
<td>0.15(-0.03,0.33)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Topp.R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when ascending stairs)</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>3.85(0.49)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>4.62(0.47)</td>
<td>Mean Difference</td>
<td>-0.77(-1.03,-0.51)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when ascending stairs)</td>
<td>1 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>4.34(0.51)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>5.54(0.50)</td>
<td>Mean Difference</td>
<td>-1.2(-1.47,-0.93)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when ascending stairs)</td>
<td>1 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>2.03(0.37)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>2.14(0.35)</td>
<td>Mean Difference</td>
<td>-0.11(-0.30,0.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when ascending stairs)</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>1.33(0.31)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>1.26(0.30)</td>
<td>Mean Difference</td>
<td>0.07(-0.09,0.23)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when descending stairs)</td>
<td>Intra-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>4.64(0.47)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>5.26(0.44)</td>
<td>Mean Difference</td>
<td>-0.62(-0.86,-0.38)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when descending stairs)</td>
<td>1 weeks</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>4.58(0.51)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>5.65(0.48)</td>
<td>Mean Difference</td>
<td>-1.07(-1.33,-0.81)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when descending stairs)</td>
<td>1 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>1.83(0.37)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>2.43(0.35)</td>
<td>Mean Difference</td>
<td>-0.6(-0.79,-0.41)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Topp,R., 2009</td>
<td>Very Low Quality</td>
<td>(Pain when descending stairs)</td>
<td>3 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt ()</td>
<td>26</td>
<td>1.42(0.37)</td>
<td>Pre-Op: No Structured Exercise program (control) ()</td>
<td>28</td>
<td>1.45(0.35)</td>
<td>Mean Difference</td>
<td>-0.03(-0.22,0.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
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</tr>
<tr>
<td>-----------------</td>
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<td>---------------</td>
<td>-----------------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Villadsen,A., 2014</td>
<td>High Quality</td>
<td>Koos-Quality Of Life-Quality Of Life( )</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>3.8(1.90)</td>
<td>Pre-Op: No Structured Exercise program (control) (Basic instruction on procedure and exercises normally given)</td>
<td>40</td>
<td>-2.5(1.90)</td>
<td>Mean Difference</td>
<td>6.3(5.47,7.13)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
</tbody>
</table>

**TABLE 14: PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM VERSUS NO PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM: QUALITY OF LIFE**
### TABLE 15: PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM VERSUS NO PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM: STIFFNESS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matassi,F., 2014</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia-Other ( )</td>
<td>Post-Op</td>
<td>Pre-Op: Structured Exercise Program Or Pt (Patients instructed on exercises focused on muscle strength and flexibility; 5 days/week for 6 weeks at home)</td>
<td>61</td>
<td>8.20%</td>
<td>Pre-Op: No Structured Exercise program (control) (Regular activities until surgery)</td>
<td>61</td>
<td>4.92%</td>
<td>RR</td>
<td>1.67(0.42,6.67)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
**TABLE 16: PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM VERSUS NO PRE-OPERATIVE STRUCTURE EXERCISE PROGRAM: OTHER**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Villadsen, A., 2014</td>
<td>High Quality</td>
<td>Koos-Symptoms - Other ()</td>
<td>1.8 months</td>
<td>Pre-Op: Structured Exercise Program Or Pt (8 week neuromuscular exercise program)</td>
<td>41</td>
<td>4.9(1.90)</td>
<td>Pre-Op: No Structured Exercise program (control) (Basic instruction on procedure and exercises normally given)</td>
<td>40</td>
<td>0.5(1.80)</td>
<td>Mean Difference</td>
<td>4.4(3.59,5.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
DELAYED TOTAL KNEE ARTHROPLASTY
Moderate evidence supports that an eight month delay to total knee arthroplasty (TKA) does not worsen outcomes.

**Strength of Recommendation: Moderate Evidence**
*Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.*

**RATIONALE**
There was one high quality study (Tuominen, U., 2010) that addressed the question of worsening of outcomes or an increase in complications on delayed cases of KA among adult patients with osteoarthritis, compared to cases without delay after having failed non-surgical management.

This study evaluated the effects of waiting time on health related quality of life, knee pain and physical function. The study also addressed the use and costs of medication of patients awaiting TKA. The mean waiting time was 94 days among those patients short waiting times versus 239 days (mean of 8 months) among those with non-fixed waiting times groups, respectively. Those in the short waiting time group had higher weekly costs of medication at admission, and reached better quality of life 3 months earlier than those in the other group, but the latter had better quality of life after operation.

**RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION**
The study does not speak to the effects in outcomes in longer delays, nor does it subcategorize patients at higher risk of permanent disability or injury from delay.

**FUTURE RESEARCH**
Continued research addressing sex-specific issues, and subgroup analysis on the effects of risk modification may further clarify this matter in addition to addressing complications and functionality. The work group also supports future research examining the potential societal cost of delaying arthroplasty when the patient is otherwise ready to proceed with surgery (missed work, etc.) as well as the effect of surgical delay on the patient’s pain and suffering during the delay period.
RESULTS

SUMMARY OF FINDINGS TABLE 18: DELAYED TOTAL KNEE ARTHROPLASTY (EARLY FOLLOW-UP < 90 DAYS)

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Favors Delayed TKA</td>
<td></td>
</tr>
<tr>
<td>• Favors Early TKA</td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Composite</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRQoL 15D</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee Society Score-Function</td>
<td>○</td>
</tr>
<tr>
<td>Ambulation (walking)</td>
<td></td>
</tr>
<tr>
<td>Stair climbing</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee Society Score-Pain</td>
<td>○</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
</tr>
</tbody>
</table>

SUMMARY OF FINDINGS TABLE 19: DELAYED TOTAL KNEE ARTHROPLASTY (LATE FOLLOW-UP > 90 DAYS)

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Favors Delayed TKA</td>
<td></td>
</tr>
<tr>
<td>• Favors Early TKA</td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee Society Score-Function</td>
<td>○</td>
</tr>
<tr>
<td>Ambulation (walking)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee Society Score-Pain</td>
<td>○</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
</tr>
</tbody>
</table>
### QUALITY EVALUATION TABLE 10: DELAYED TOTAL KNEE ARTHROPLASTY

#### Quality Chart Key

- **●**: No Flaw in Domain of Interest
- **○**: Flaw in Domain of Interest
- **★**: Half flaw in domain of interest

#### QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuominen, U., 2010</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
</tbody>
</table>
### DETAILED DATA TABLES

#### TABLE 17: - DELAYED TOTAL KNEE ARTHROPLASTY VERSUS EARLY TOTAL KNEE ARTHROPLASTY: COMPOSITE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuominen.U., 2010</td>
<td>High Quality</td>
<td>HRQoL 15D( )</td>
<td>3 months</td>
<td>Early Ka( )</td>
<td>119</td>
<td>0.813(0.12)</td>
<td>Delayed Ka( )</td>
<td>170</td>
<td>0.837(0.11)</td>
<td>Mean Difference</td>
<td>-0.024(-0.05,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tuominen.U., 2010</td>
<td>High Quality</td>
<td>HRQoL 15D( )</td>
<td>1 years</td>
<td>Early Ka( )</td>
<td>119</td>
<td>0.813(0.14)</td>
<td>Delayed Ka( )</td>
<td>170</td>
<td>0.852(0.10)</td>
<td>Mean Difference</td>
<td>-0.039(-0.07,-0.01)</td>
<td>Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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<td>----------------</td>
<td>----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Tuominen, U., 2010</td>
<td>High Quality</td>
<td>Knee Society Score-Function ( )</td>
<td>3 months</td>
<td>Early Ka( )</td>
<td>119</td>
<td>62.78(25.58)</td>
<td>Delayed Ka( )</td>
<td>170</td>
<td>63.86(25.22)</td>
<td>Mean Difference</td>
<td>-1.08(-7.04,4.88)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Tuominen, U., 2010</td>
<td>High Quality</td>
<td>Knee Society Score-Function ( )</td>
<td>1 years</td>
<td>Early Ka( )</td>
<td>119</td>
<td>73.5(23.32)</td>
<td>Delayed Ka( )</td>
<td>170</td>
<td>74.63(22.28)</td>
<td>Mean Difference</td>
<td>-1.13(-6.49,4.23)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
</tbody>
</table>
### TABLE 19: DELAYED TOTAL KNEE ARTHROPLASTY VERSUS EARLY TOTAL KNEE ARTHROPLASTY: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuominen, U., 2010</td>
<td>High Quality</td>
<td>Knee Society Score - Pain ( )</td>
<td>3 months</td>
<td>Early Ka( )</td>
<td>119</td>
<td>32.7 (13.03)</td>
<td>Delayed Ka( )</td>
<td>170</td>
<td>34.07 (13.49)</td>
<td>Mean Difference</td>
<td>-1.37 (-4.47, 1.73)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Tuominen, U., 2010</td>
<td>High Quality</td>
<td>Knee Society Score - Pain ( )</td>
<td>1 years</td>
<td>Early Ka( )</td>
<td>119</td>
<td>36.27 (13.15)</td>
<td>Delayed Ka( )</td>
<td>170</td>
<td>36.95 (12.83)</td>
<td>Mean Difference</td>
<td>-0.68 (-3.73, 2.37)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
</tbody>
</table>
PERIPHERAL NERVE BLOCKADE (PNB)

Strong evidence supports that peripheral nerve blockade for total knee arthroplasty (TKA) decreases postoperative pain and opioid requirements.

Strength of Recommendation: Strong Evidence ★★★★★
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

RATIONALE

There were seven high-quality (McNamee 2001, Good 2007, Kadic 2009, Xie 2012, Chan 2012, Moghtadaei 2014, Liu 2014) and three low-quality (Lau 1998, Beaupre 2012, Kim 2012) studies evaluating whether the use of peripheral nerve blockade reduces complications or improves outcomes in adult patients undergoing knee arthroplasty compared to no peripheral nerve block use.

Three high-quality studies (Chan 2012, Moghtadaei 2014, Liu 2014) demonstrated significantly lower VAS pain scores and opioid requirements during the postoperative period when peripheral nerve blockade was compared to parenteral opioids alone.

One high-quality study (Chan 2012) demonstrated improvement in overall range-of-motion and a reduction in opioid-related side effects with the use of peripheral nerve blockade when compared to no peripheral nerve block use. Another high-quality study (Liu 2014) demonstrated that peripheral nerve block use improved the Quality of Recovery (e.g., Emotive, Nociceptive and Cognitive domains) during the immediate postoperative period.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

The risks associated with peripheral nerve blockade may include bleeding, infection, and associated neural injury. Although rare, these potential risks need to be balanced with the documented benefits of peripheral nerve blockade. Depending upon clinical circumstances, peripheral nerve blockade may also be associated with postoperative motor weakness. Under these conditions, care must be taken to minimize the risk of patient falls or delayed mobilization during the hospitalization.

FUTURE RESEARCH

Additional prospective studies are needed to evaluate the long-term (>24-hour) analgesic benefits of peripheral nerve blockade; as well as their impact on functional outcomes. Future studies are also needed to compare peripheral nerve blockade to other modalities of perioperative analgesia (e.g., periarthicular injection, neuraxial anesthesia). Future studies comparing the effectiveness of a single perioperative peripheral nerve block versus continuous infusion should be performed for standard outcomes. In addition, research should be done to evaluate effectiveness of combination sciatic and femoral nerve blocks compared to other peripheral block methods.
**RESULTS**

**SUMMARY OF FINDINGS**

**TABLE 8: PERIPHERAL NERVE BLOCKADE PAIN AT FIRST DAY**

<table>
<thead>
<tr>
<th>Summary of Findings - Pain in First Day</th>
<th>High Quality</th>
<th>Low Quality</th>
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<tbody>
<tr>
<td>• Favors PNB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Favors No PNB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Not Significant</td>
<td></td>
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<table>
<thead>
<tr>
<th>Pain</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Vas Pain (10cm)- Pain</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Womac-Pain Likert Version (0-20)</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Postoperative Pain Control**

| Morphine consumption (mg)              |              | ☐           |
### SUMMARY OF FINDINGS TABLE 9: PERIPHERAL NERVE BLOCK

<table>
<thead>
<tr>
<th>Complications</th>
<th>High Quality</th>
<th>Low Quality</th>
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<tr>
<td>Adverse Events</td>
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<td>Blood Loss</td>
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<td>Dizziness</td>
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<tr>
<td>Intra-Op Blood Pressure and Heart Rate</td>
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<tr>
<td>Morphine Related Side-Effects</td>
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<tr>
<td>Nausea and Vomiting</td>
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<tr>
<td>Urinary Retention</td>
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<td>Composite</td>
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<tr>
<td>Knee Society Score</td>
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<tr>
<td>Function</td>
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<td></td>
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<tr>
<td>Ambulation (walking distance)</td>
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<td>Knee Society Function</td>
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<tr>
<td>Quality of Recovery (QoR-40)</td>
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<td>Range of Motion (Extension)</td>
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<td>Range of Motion (Flexion)</td>
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<td>Range of Motion (Overall)</td>
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<td>WOMAC Function VAS version (0-100)</td>
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<td>Length of Stay</td>
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<td>Length of Hospital Stay</td>
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<td>Other Outcomes</td>
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<td>Patient Satisfaction</td>
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<tr>
<td>Quality of Recovery (QoR-40) Overall</td>
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<td>Quality of Recovery (QoR-40) Cognitive</td>
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<td>Quality of Recovery (QoR-40) Emotive-Anxiety</td>
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<td>Quality of Recovery (QoR-40) Emotive-Depression</td>
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<td>Quality of Recovery (QoR-40) Nociceptive-Pain</td>
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<tr>
<td>Quality of Recovery (QoR-40) Nociceptive-Nausea</td>
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<tr>
<td>Pain</td>
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<tr>
<td>VAS Pain (10 cm)</td>
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<tr>
<td>VAS Pain (100mm)</td>
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<tr>
<td>WOMAC Pain Likert Version (0-20)</td>
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<tr>
<td>Post-op Pain Control</td>
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<tr>
<td>Morphone Consumption</td>
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<tr>
<td>Narcotic Consumption</td>
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<td>Sufentanil Consumption</td>
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<tr>
<td>Stiffness</td>
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<tr>
<td>WOMAC Stiffness VAS version (0-100)</td>
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<td></td>
</tr>
</tbody>
</table>
**QUALITY EVALUATION TABLE 5: PERI-OPERATIVE PERIPHERAL NERVE BLOCK**

**Quality Chart Key**

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- ◔ = Half flaw in domain of interest

### QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaupre, L.A., 2012</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td></td>
<td>Include</td>
<td>Low Quality</td>
</tr>
<tr>
<td>Kim, J.H., 2012</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>◔</td>
<td>●</td>
<td></td>
<td>Include</td>
<td>Low Quality</td>
</tr>
<tr>
<td>Lau, H.P., 1998</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>◔</td>
<td>●</td>
<td></td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

### QE – Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
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<td>Albrecht, E., 2014</td>
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<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Chan, M.H., 2012</td>
<td>●</td>
<td>●</td>
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<td>◔</td>
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<td>Good, R.P., 2007</td>
<td>◔</td>
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<td>Liu, J., 2014</td>
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<td>McMeniman, T.J., 2010</td>
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<td>Widmer,B.J., 2012</td>
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<td>High Quality</td>
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<td>Include</td>
<td>High Quality</td>
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## DETAILED DATA TABLES

**TABLE 20: PERI-OPERATIVE PERIPHERAL NERVE BLOCK VERSUS NO PERI-OPERATIVE PERIPHERAL NERVE BLOCK: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>complications other (No morphine related side effect)</td>
<td>Discharge</td>
<td>Peripheral Nerve Block (Post-op PNB)</td>
<td>21</td>
<td>71.43%</td>
<td>No Peripheral Nerve Block (No Post-op PNB)</td>
<td>21</td>
<td>57.14%</td>
<td>RR</td>
<td>1.25 (0.79, 1.98)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>complications other (No morphine related side effect)</td>
<td>Discharge</td>
<td>Peripheral Nerve Block (Post-op PNB)</td>
<td>21</td>
<td>71.43%</td>
<td>No Peripheral Nerve Block (No Pre-op PNB)</td>
<td>20</td>
<td>85.00%</td>
<td>RR</td>
<td>0.84 (0.61, 1.17)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>complications other (No morphine related side effect)</td>
<td>Discharge</td>
<td>Peripheral Nerve Block (Pre-op PNB)</td>
<td>20</td>
<td>95.00%</td>
<td>No Peripheral Nerve Block (No Post-op PNB)</td>
<td>21</td>
<td>57.14%</td>
<td>RR</td>
<td>1.66 (1.13, 2.44)</td>
<td>Treatment 1 Significant (P-value &lt; .05)</td>
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<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>complications other (No morphine related side effect)</td>
<td>Discharge</td>
<td>Peripheral Nerve Block (Pre-op PNB)</td>
<td>20</td>
<td>95.00%</td>
<td>No Peripheral Nerve Block (No Pre-op PNB)</td>
<td>20</td>
<td>85.00%</td>
<td>RR</td>
<td>1.12 (0.91, 1.38)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Good,R.P., 2007</td>
<td>High Quality</td>
<td>complications other (Adverse Events)</td>
<td>3 Days</td>
<td>Peripheral Nerve Block (40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>22</td>
<td>54.55%</td>
<td>No Peripheral Nerve Block (40-mL solution of 0.9% normal saline before surgery)</td>
<td>20</td>
<td>60.00%</td>
<td>RR</td>
<td>0.91 (0.54, 1.53)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Postoperative nausea and vomiting( )</td>
<td>1 Days</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>10.00%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>10.00%</td>
<td>RR</td>
<td>1.00(0.27,3.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Postoperative nausea and vomiting( )</td>
<td>1 hours</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>2.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>5.00%</td>
<td>RR</td>
<td>0.50(0.05,5.30)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Postoperative nausea and vomiting( )</td>
<td>12 hours</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>7.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>7.50%</td>
<td>RR</td>
<td>1.00(0.21,4.66)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Kim,J.H., 2012</td>
<td>Low</td>
<td>Postoperative nausea and vomiting( )</td>
<td>2 Days</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>0.00%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>0.00%</td>
<td>RD 0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Low</td>
<td>Postoperative nausea and vomiting( )</td>
<td>2 hours</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>12.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>15.00%</td>
<td>RR 0.83(0.28,2.51)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Kim,J.H., 2012</td>
<td>Low</td>
<td>Postoperative nausea and vomiting( )</td>
<td>6 hours</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>2.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>7.50%</td>
<td>RR 0.33(0.04,3.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<td>Low Quality</td>
<td>complications other(Dizziness)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>2.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>0.00%</td>
<td>RD</td>
<td>0.03(-0.02,0.07)</td>
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<td>1 hours</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>0.00%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>5.00%</td>
<td>RD</td>
<td>-0.05(-0.12,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>complications other(Dizziness)</td>
<td>12 hours</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>2.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>5.00%</td>
<td>RR</td>
<td>0.50(0.05,5.30)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
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<td>Favored Treatment</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low</td>
<td>complications other(Dizziness)</td>
<td>2 Days</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>2.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>2.50%</td>
<td>RR</td>
<td>1.00(0.06,15.44)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low</td>
<td>complications other(Dizziness)</td>
<td>2 hours</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>0.00%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>5.00%</td>
<td>RD</td>
<td>-0.05(-0.12,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low</td>
<td>complications other(Dizziness)</td>
<td>6 hours</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>12.50%</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>15.00%</td>
<td>RR</td>
<td>0.83(0.28,2.51)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Lau,H.P., 1998</td>
<td>Low Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Intra-Op</td>
<td>Peripheral Nerve Block(40ml 2% xylocaine and 10ml 0.5% marcaine)</td>
<td>20</td>
<td>530(,)</td>
<td>Neuraxial anesthesia or epidural/spinal (2.75-3.25ml 0.5% bupivacaine with propofol infusion 3.5mg/kg/hr)</td>
<td>20</td>
<td>550(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lau,H.P., 1998</td>
<td>Low Quality</td>
<td>complications other(Urinary retention (n))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(40ml 2% xylocaine and 10ml 0.5% marcaine)</td>
<td>20</td>
<td>0(,)</td>
<td>Neuraxial anesthesia or epidural/spinal (2.75-3.25ml 0.5% bupivacaine with propofol infusion 3.5mg/kg/hr)</td>
<td>20</td>
<td>10(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Liu,J., 2014</td>
<td>High Quality</td>
<td>complications other(Intra-operative blood pressure and heart rate)</td>
<td>Intra-Op</td>
<td>Peripheral Nerve Block(Receive d midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia(General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Xie,Z., 2012</td>
<td>High Quality</td>
<td>Nausea and Vomiting(Nausea on a 6 point Likert scale (0-5) - Any)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Pre-op 3-in-1 PNB with high-dose bupivacaine (30-mL 0.5% bupivacaine with 1:200 000 epinephrine))</td>
<td>34</td>
<td>61.76%</td>
<td>No Peripheral Nerve Block(Pre-op placebo nerve block (30ml normal saline))</td>
<td>32</td>
<td>43.75%</td>
<td>RR</td>
<td>1.41(0.88,2.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Xie.Z., 2012</td>
<td>High Quality</td>
<td>Nausea and Vomiting(Nausea on a 6 point Likert scale (0-5) - Any)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Pre-op 3-in-1 PNB with low-dose bupivacaine (30-mL 0.25% bupivacaine with 1:200 000 epinephrine))</td>
<td>33</td>
<td>57.58%</td>
<td>No Peripheral Nerve Block(Pre-op placebo nerve block (30ml normal saline))</td>
<td>32</td>
<td>43.75%</td>
<td>RR</td>
<td>1.32(0.81,2.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Xie.Z., 2012</td>
<td>High Quality</td>
<td>Nausea and Vomiting(Nausea on a 6 point Likert scale (0-5) - Any)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Pre-op 3-in-1 PNB with high-dose bupivacaine (30-mL 0.5% bupivacaine with 1:200 000 epinephrine))</td>
<td>34</td>
<td>23.53%</td>
<td>No Peripheral Nerve Block(Pre-op placebo nerve block (30ml normal saline))</td>
<td>32</td>
<td>18.75%</td>
<td>RR</td>
<td>1.25(0.49,3.22)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Xie.Z., 2012</td>
<td>High Quality</td>
<td>Nausea and Vomiting(Nausea on a 6 point Likert scale (0-5) - Any)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Pre-op 3-in-1 PNB with low-dose bupivacaine (30-mL 0.25% bupivacaine with 1:200 000 epinephrine))</td>
<td>33</td>
<td>24.24%</td>
<td>No Peripheral Nerve Block(Pre-op placebo nerve block (30ml normal saline))</td>
<td>32</td>
<td>18.75%</td>
<td>RR</td>
<td>1.29(0.50,3.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kadic,L., 2009</td>
<td>High Quality</td>
<td>Knee Society Score-Knee( )</td>
<td>3 months</td>
<td>Peripheral Nerve Block( )</td>
<td>21</td>
<td>83.8(12.80)</td>
<td>No Peripheral Nerve Block( )</td>
<td>17</td>
<td>83.2(13.20)</td>
<td>Mean Difference</td>
<td>0.6(-7.73,8.93)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference</td>
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<td>Treatment 1</td>
<td>Treatment 2</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Beauspre,L.A., 2012</td>
<td>Range of Motion(flexion) - Function</td>
<td>preemptive multimodal analgesia with added femoral nerve block</td>
<td>preemptive multimodal analgesia without added femoral nerve block</td>
<td>Mean Difference</td>
<td>5.9 (-1.06, 12.86)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Beauspre,L.A., 2012</td>
<td>Range of Motion(flexion) - Function</td>
<td>preemptive multimodal analgesia with added femoral nerve block</td>
<td>preemptive multimodal analgesia without added femoral nerve block</td>
<td>Mean Difference</td>
<td>3.9 (-4.73, 12.53)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beauspre,L.A., 2012</td>
<td>Range of Motion(flexion) - Function</td>
<td>preemptive multimodal analgesia with added femoral nerve block</td>
<td>preemptive multimodal analgesia without added femoral nerve block</td>
<td>Mean Difference</td>
<td>1.6 (-4.95, 8.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Chan,M.H., 2012</td>
<td>Range Of Motion(overall) - Function</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>No Peripheral Nerve Block(No Post-op PNB)</td>
<td>Mean Difference</td>
<td>6.6(-0.62,13.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Chan,M.H., 2012</td>
<td>Range Of Motion(overall) - Function</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>Mean Difference</td>
<td>7.7(1.4 4,13.96)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Chan,M.H., 2012</td>
<td>Range Of Motion(overall) - Function</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>No Peripheral Nerve Block(No Post-op PNB)</td>
<td>Mean Difference</td>
<td>3(-4.53,10 .53)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
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<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Range Of Motion(overall) - Function(ROM)</td>
<td>2 Days</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>20</td>
<td>68.5(11.90)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>20</td>
<td>65.8(11.80)</td>
<td>Mean Difference</td>
<td>2.7(-4.64,10.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Range Of Motion(overall) - Function(ROM)</td>
<td>3 Days</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>20</td>
<td>86.0(8.2)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>20</td>
<td>83.5(9.90)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Good,R.P., 2007</td>
<td>High Quality</td>
<td>Ambulation (walking)(Ambulation Distances Based on Graded Scale O (worst score) to 4 (best score))</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>22</td>
<td>1.8(1.00)</td>
<td>No Peripheral Nerve Block(40-mL solution of 0.9% normal saline before surgery)</td>
<td>20</td>
<td>1.7(1.00)</td>
<td>Mean Difference</td>
<td>0.1(-0.51,0.71)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Good,R.P., 2007</td>
<td>High Quality</td>
<td>Ambulation (walking)(Ambulation Distances Based on Graded Scale O (worst score) to 4 (best score))</td>
<td>2 Days</td>
<td>Peripheral Nerve Block(40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>22</td>
<td>3.3(0.70)</td>
<td>No Peripheral Nerve Block(40-mL solution of 0.9% normal saline before surgery)</td>
<td>20</td>
<td>3.1(0.90)</td>
<td>Mean Difference</td>
<td>0.2(-0.29,0.69)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Good, R.P., 2007</td>
<td>High Quality</td>
<td>Ambulation (walking) (Ambulation Distances Based on Graded Scale 0 (worst score) to 4 (best score))</td>
<td>3 Days</td>
<td>Peripheral Nerve Block (40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>22</td>
<td>3.5(0.70)</td>
<td>No Peripheral Nerve Block (40-mL solution of 0.9% normal saline before surgery)</td>
<td>20</td>
<td>3.5(0.70)</td>
<td>Mean Difference</td>
<td>0(-0.42, 0.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Good, R.P., 2007</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (Degrees)</td>
<td>2 Days</td>
<td>Peripheral Nerve Block (40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>22</td>
<td>-14(5.00)</td>
<td>No Peripheral Nerve Block (40-mL solution of 0.9% normal saline before surgery)</td>
<td>20</td>
<td>-15(4.00)</td>
<td>Mean Difference</td>
<td>1(-1.73, 3.73)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Good, R.P., 2007</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (Degrees)</td>
<td>3 Days</td>
<td>Peripheral Nerve Block (40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>19</td>
<td>-13(5.00)</td>
<td>No Peripheral Nerve Block (40-mL solution of 0.9% normal saline before surgery)</td>
<td>19</td>
<td>-14(3.00)</td>
<td>Mean Difference</td>
<td>1(-1.62, 3.62)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Good, R.P., 2007</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Degrees)</td>
<td>2 Days</td>
<td>Peripheral Nerve Block (40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>22</td>
<td>58 (15.00)</td>
<td>No Peripheral Nerve Block (40-mL solution of 0.9% normal saline before surgery)</td>
<td>20</td>
<td>54 (11.00)</td>
<td>Mean Differece</td>
<td>4 (-3.91, 11.91)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Good, R.P., 2007</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Degrees)</td>
<td>3 Days</td>
<td>Peripheral Nerve Block (40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>19</td>
<td>67 (16.00)</td>
<td>No Peripheral Nerve Block (40-mL solution of 0.9% normal saline before surgery)</td>
<td>19</td>
<td>62 (10.00)</td>
<td>Mean Differece</td>
<td>5 (-3.48, 13.48)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Kadic, L., 2009</td>
<td>High Quality</td>
<td>Knee Society Score - Function</td>
<td>3 months</td>
<td>Peripheral Nerve Block ( )</td>
<td>21</td>
<td>61.2 (29.30)</td>
<td>No Peripheral Nerve Block ( )</td>
<td>17</td>
<td>58.5 (21.20)</td>
<td>Mean Differece</td>
<td>2.7 (-13.38, 18.78)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Kadic, L., 2009</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>3 Days</td>
<td>Peripheral Nerve Block ( )</td>
<td>16</td>
<td>. %</td>
<td>No Peripheral Nerve Block ( )</td>
<td>16</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Kadic, L., 2009</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>3 Days</td>
<td>Peripheral Nerve Block ( )</td>
<td>16</td>
<td>. %</td>
<td>No Peripheral Nerve Block ( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Kadic, L., 2009</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>3 months</td>
<td>Peripheral Nerve Block ( )</td>
<td>21</td>
<td>. %</td>
<td>No Peripheral Nerve Block ( )</td>
<td>16</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Kadic, L., 2009</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>3 months</td>
<td>Peripheral Nerve Block ( )</td>
<td>21</td>
<td>. %</td>
<td>No Peripheral Nerve Block ( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Kadic,L., 2009</td>
<td>High</td>
<td>Range of Motion(flexion) - Function</td>
<td>4 Days</td>
<td>Peripheral Nerve Block()</td>
<td>16</td>
<td>.%</td>
<td>No Peripheral Nerve Block()</td>
<td>16</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Kadic,L., 2009</td>
<td>High</td>
<td>Range of Motion(flexion) - Function</td>
<td>5 Days</td>
<td>Peripheral Nerve Block()</td>
<td>16</td>
<td>.%</td>
<td>No Peripheral Nerve Block()</td>
<td>16</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kadic,L., 2009</td>
<td>High</td>
<td>Range of Motion(flexion) - Function</td>
<td>6 Days</td>
<td>Peripheral Nerve Block()</td>
<td>16</td>
<td>.%</td>
<td>No Peripheral Nerve Block()</td>
<td>16</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kadic,L., 2009</td>
<td>High</td>
<td>Womac-function averaged VAS Version (0-100)</td>
<td>3 months</td>
<td>Peripheral Nerve Block()</td>
<td>21</td>
<td>80.4(10.50)</td>
<td>No Peripheral Nerve Block()</td>
<td>17</td>
<td>71.8(19.50)</td>
<td>Mean Difference</td>
<td>8.6(-1.70,18.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Effect Measure</td>
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<tr>
<td>Liu,J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40(PQRS - Modified ADL domain)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Received midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia (General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Moghtadaei,M., 2014</td>
<td>High Quality</td>
<td>Range Of Motion(overall) - Function(degrees)</td>
<td>3 months</td>
<td>Peripheral Nerve Block(Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>112.2(14.40)</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(300 mg ropivacaine, 30mg ketorolac, and 0.5mg ephedrine diluted to a volume of 150cc and locally injected intra- and peri-articularly intra-op)</td>
<td>18</td>
<td>114.4(11.50)</td>
<td>Mean Difference</td>
<td>-2.2(-10.71,6.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Moghtadaei, M., 2014</td>
<td>High Quality</td>
<td>Range Of Motion (overall) - Function (degrees)</td>
<td>Discharge</td>
<td>Peripheral Nerve Block (Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>66.9 (9.90)</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic) (300 mg ropivacaine, 30 mg ketorolac, and 0.5 mg ephedrine diluted to a volume of 150 cc and locally injected intra- and peri-articularly intra-op)</td>
<td>18</td>
<td>69.5 (8.90)</td>
<td>Mean Difference</td>
<td>-2.6 (-8.75, 3.55)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Moghtadaei, M., 2014</td>
<td>High Quality</td>
<td>Days- Length Of Stay</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>. %</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic) (300 mg ropivacaine, 30mg ketorolac, and 0.5mg ephedrine diluted to a volume of 150cc and locally injected intra- and peri-articularly intra-op)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Group2 N</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Patient satisfaction (Rate of satisfaction with postoperative analgesia (0-100))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>67(.)</td>
<td>40</td>
<td>68(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Patient satisfaction (Rate of satisfaction with surgical anesthesia (0-100))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>71(.)</td>
<td>40</td>
<td>65(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Patient willingness to recommend the same surgical anesthesia to others</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>90.00%</td>
<td>40</td>
<td>75.00%</td>
<td>RR</td>
<td>1.20 (0.98, 1.48)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Liu, J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40 (PQRS - Physiology domain)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Receive midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia (General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt; .05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<tr>
<td>Moghtadai,M. , 2014</td>
<td>High Quality</td>
<td>Patient satisfaction(Satisfaction Level (1-4, 1=very good) after 48 hours)</td>
<td>2 Days</td>
<td>Peripheral Nerve Block(Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>. %</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(300 mg ropivacaine, 30mg ketorolac, and 0.5mg ephedrine diluted to a volume of 150cc and locally injected intra- and peri-articular intra-op)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Liu,J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40 (PQRS - Physiology domain)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Receive d midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia (General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value &lt; .05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Liu,J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40(PQRS – emotive-anxiety)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Received midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia(General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
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<tr>
<td>Liu, J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40 (PQRS – emotive-depression)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Receive midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia (General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<tr>
<td>Liu J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR) - 40 (PQRS – Nociceptive-Pain)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Receive midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia (General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Treatment 2 (Details)</td>
<td>Group2</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Liu,J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40(PQRS – Nociceptive-Nausea)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Received midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>General anesthesia(General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Liu, J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40 (PQRS – Cognitive Domain)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Receive d midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 μg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia (General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 μg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Liu,J., 2014</td>
<td>High Quality</td>
<td>Quality of Recovery (QoR)-40 (PQRS – Overall)</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Receive midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>105</td>
<td>. %</td>
<td>General anesthesia (General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>108</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Beaupre,L.A., 2012</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>3 months</td>
<td>preemptive multimodal analgesia with added femoral nerve block( )</td>
<td>19</td>
<td>1.1(1.90)</td>
<td>preemptive multimodal analgesia without added femoral nerve block( )</td>
<td>20</td>
<td>2(2.20)</td>
<td>Mean Difference</td>
<td>-0.9 (-2.24, 0.44)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beaupre,L.A., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>6 weeks</td>
<td>preemptive multimodal analgesia with added femoral nerve block( )</td>
<td>19</td>
<td>2.8(2.20)</td>
<td>preemptive multimodal analgesia without added femoral nerve block( )</td>
<td>20</td>
<td>2.9(2.4)</td>
<td>Mean Difference</td>
<td>-0.1 (-1.6, 1.4)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beaupre,L.A., 2012</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>2 weeks</td>
<td>preemptive multimodal analgesia with added femoral nerve block( )</td>
<td>19</td>
<td>4(2.60)</td>
<td>preemptive multimodal analgesia without added femoral nerve block( )</td>
<td>20</td>
<td>4.4(2.40)</td>
<td>Mean Difference</td>
<td>-0.4 (-2.02, 1.22)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain(Pain at rest)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Post-op PNB)</td>
<td>21</td>
<td>1.6(1.30)</td>
<td>No Peripheral Nerve Block(No Post-op PNB)</td>
<td>21</td>
<td>3.8(1.30)</td>
<td>Mean Difference</td>
<td>-2.2(-2.99,-1.41)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain(Pain at rest)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Post-op PNB)</td>
<td>21</td>
<td>1.6(1.30)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>20</td>
<td>3.9(1.20)</td>
<td>Mean Difference</td>
<td>-2.3(-3.07,-1.53)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain(Pain at rest)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>20</td>
<td>1.9(1.20)</td>
<td>No Peripheral Nerve Block(No Post-op PNB)</td>
<td>21</td>
<td>3.8(1.30)</td>
<td>Mean Difference</td>
<td>-1.9(-2.67,-1.13)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain(Pain at rest)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>20</td>
<td>1.9(1.20)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>20</td>
<td>3.9(1.20)</td>
<td>Mean Difference</td>
<td>-2(-2.74,-1.26)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<tr>
<td>Good,R.P., 2007</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain(ranging from O (no pain) to 10 (worst possible pain))</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(40 mL of 0.50% bupivacaine hydrochloride with epinephrine 1:200,000 before surgery)</td>
<td>22</td>
<td>4.7(1.80)</td>
<td>No Peripheral Nerve Block(40-mL solution of 0.9% normal saline before surgery)</td>
<td>20</td>
<td>5.3(1.70)</td>
<td>Mean Differe ne</td>
<td>-0.6(-1.66,0.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>1 hours</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>12 hours</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>2 Days</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>2 hours</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>6 hours</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>McNamee,D.A., 2001</td>
<td>High Quality</td>
<td>Vas Pain (100mm)- Pain (VAS Pain Scores)</td>
<td>2 Days</td>
<td>Peripheral Nerve Block (2 mg· kg-1 of ropivacaine 7.5 mg· ml-1 divided equally between the femoral and sciatic nerves.)</td>
<td>25</td>
<td>. %</td>
<td>No Peripheral Nerve Block (No peripheral nerve blockade but the area was prepared and a dressing applied to the appropriate sites)</td>
<td>25</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
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<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Moghtadaei,M. , 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>. %</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(300 mg ropivacaine, 30mg ketorolac, and 0.5mg ephedrine diluted to a volume of 150cc and locally injected intra- and peri-articularly intra-op)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Moghtadaei, M., 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>12 hours</td>
<td>Peripheral Nerve Block(Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>. %</td>
<td>Peri-articular local infiltration (anesthetic and/ or anti-inflammatory and or/ analgesic)(300 mg ropivacaine, 30mg ketorolac, and 0.5mg ephedrine diluted to a volume of 150cc and locally injected intra- and peri-articularly intra-op)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Moghtadaei,M., 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>6 hours</td>
<td>Peripheral Nerve Block(Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>. %</td>
<td>Peri-articular local infiltration (anesthetic and/ or anti-inflammatory and or/ analgesic)(300 mg ropivacaine, 30mg ketorolac, and 0.5mg ephedrine diluted to a volume of 150cc and locally injected intra- and peri-articularly intra-op)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Xie,Z., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20)(Pain measured on a 6-point Likert scale (0-5))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Pre-op 3-in-1 PNB with high-dose bupivacaine (30-mL 0.5% bupivacaine with 1:200 000 epinephrine))</td>
<td>.</td>
<td>. %</td>
<td>No Peripheral Nerve Block(Pre-op placebo nerve block (30ml normal saline))</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Xie,Z., 2012</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20) (Pain measured on a 6-point Likert scale (0-5))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block (Pre-op 3-in-1 PNB with low-dose bupivacaine (30-mL 0.25% bupivacaine with 1:200 000 epinephrine))</td>
<td>.</td>
<td>. %</td>
<td>No Peripheral Nerve Block (Pre-op placebo nerve block (30ml normal saline))</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Result (95% CI)</td>
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<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(Accumulative morphine consumption)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Post-op PNB)</td>
<td>21</td>
<td>13.3(8.24)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>21</td>
<td>28.32(12.48)</td>
<td>Mean Difference</td>
<td>-15.02(-21.42, -8.62)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(Accumulative morphine consumption)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>20</td>
<td>18.24(12.68)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>21</td>
<td>28.32(12.48)</td>
<td>Mean Difference</td>
<td>-10.08(-17.79, -2.37)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(Accumulative morphine consumption)</td>
<td>6 hours</td>
<td>Peripheral Nerve Block(Post-op PNB)</td>
<td>21</td>
<td>4.08(3.76)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>20</td>
<td>13.28(8.40)</td>
<td>Mean Difference</td>
<td>-4.38(-10.10, 1 .34)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chan,M.H., 2012</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(Accumulative morphine consumption)</td>
<td>6 hours</td>
<td>Peripheral Nerve Block(Pre-op PNB)</td>
<td>20</td>
<td>8.9(10.00)</td>
<td>No Peripheral Nerve Block(No Pre op PNB)</td>
<td>20</td>
<td>13.28(8.40)</td>
<td>Mean Difference</td>
<td>-9.2(-13.22, 5.18)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Perioperative Use Of Narcotics-Pain(Complete resolution time of IV PCA (min))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>264.5(,)</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>296.9(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Perioperative Use Of Narcotics-Pain(Duration of IV PCA use (min))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>3596.8(.)</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>3007.1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kim,J.H., 2012</td>
<td>Low Quality</td>
<td>Perioperative Use Of Narcotics-Pain(Remaining amount of IV PCA (ml))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(Femoral nerve block with 10ml of 1.5% mepivacaine, sciatic nerve block with 20ml of 1.5% mepivacaine)</td>
<td>40</td>
<td>1.4(.)</td>
<td>Neuraxial anesthesia or epidural/spinal (1.3ml of hyperbaric bupivacaine followed by 10ml 0.75% ropivacaine)</td>
<td>40</td>
<td>7.5(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lau,H.P., 1998</td>
<td>Low Quality</td>
<td>Perioperative Use Of Narcotics-Pain(Time until first dose of morphine (hrs))</td>
<td>Post-Op</td>
<td>Peripheral Nerve Block(40ml 2% xylocaine and 10ml 0.5% marcaine)</td>
<td>20</td>
<td>9.5(.)</td>
<td>Neuraxial anesthesia or epidural/spinal (2.75-3.25ml 0.5% bupivacaine with propofol infusion 3.5mg/kg/hr)</td>
<td>20</td>
<td>10(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Liu,J., 2014</td>
<td>High Quality</td>
<td>Additional Medication-Postoperative Pain Control(Sufentanil consumption, mg)</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Received midazolam (0.015–0.03 mg/kg) and fentanyl (0.8–2.0 µg/kg) titrated to provide conscious sedation before nerve block insertion; sciatic nerve block was performed in the same position after a twitch of hamstring, soleus, foot, or toes had been elicited using a similar current, and 15–25 mL of 0.35% ropivacaine was injected.)</td>
<td>General anesthesia(General anesthesia was induced with midazolam (0.015–0.03 mg/kg), fentanyl (1.8–3.5 µg/kg), etomidate (0.2–0.3 mg/kg), and rocuronium (0.4–0.6 mg/kg))</td>
<td>Mean Difference</td>
<td>-26(-28.56,-23.44)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>McNamee,D.A., 2001</td>
<td>High Quality</td>
<td>Morphine consumption (mg) (Consumption and Time to first morphine request)</td>
<td>2 Days</td>
<td>Peripheral Nerve Block (2 mg·kg⁻¹ of ropivacaine 7.5 mg·ml⁻¹ divided equally between the femoral and sciatic nerves.)</td>
<td>No Peripheral Nerve Block (No peripheral nerve blockade but the area was prepared and a dressing applied to the appropriate sites)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
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<td>Mean1 (SD1)</td>
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<td>Mean2 (SD2)</td>
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<tr>
<td>Moghtadaei, M., 2014</td>
<td>High Quality</td>
<td>Morphine consumption (mg)( )</td>
<td>1 Days</td>
<td>Peripheral Nerve Block(Post-op femoral nerve block with 20cc ropivacaine)</td>
<td>18</td>
<td>. %</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(300 mg ropivacaine, 30mg ketorolac, and 0.5mg ephedrine diluted to a volume of 150cc and locally injected intra- and peri-articularly intra-op)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Outcome Details</td>
<td>Duration</td>
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<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2 (SD2)</td>
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<td>Kadic,L., 2009</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>3 months</td>
<td>Peripheral Nerve Block( )</td>
<td>21</td>
<td>75.6(17.40)</td>
<td>No Peripheral Nerve Block( )</td>
<td>17</td>
<td>71.3(22.40)</td>
<td>Mean Difference</td>
<td>4.3(-8.69,17.29)</td>
<td>Not Significant (P-value&gt;.05)</td>
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PERI-ARTICULAR LOCAL ANESTHETIC INFILTRATION

Strong evidence supports that the use of peri-articular local anesthetic infiltration in total knee arthroplasty (TKA) decreases pain and opioid use compared to placebo.

Strength of Recommendation: Strong Evidence

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

RATIONALE

Five high quality studies (Nakai 2013, Koh 2011, Klasen 1999, Busch 2006, Chen 2012) compared peri-articular infiltration (PAI) to placebo (normal saline or no infiltration) for total knee arthroplasty. Improved function (Chen 2012), lower opioid consumption (Busch 2006, Chen 2012), improved patient satisfaction (Busch 2006), and lower visual analog scale (VAS) pain scores (Nakai 2013, Koh 2011, Busch 2006, Chen 2012) all favored peri-articular injection.

Twenty-seven high quality studies originally met the selection criteria. Comparisons between PAI and placebo, PAI and peripheral nerve blocks (femoral and/or sciatic nerve blocks), and PAI and epidural blocks were attempted. However, due to the heterogeneity of the studies, PAI could only be compared to placebo. The heterogeneity of the studies included differences in infiltration solution (long-acting local anesthetics, plus or minus ketorolac, plus or minus opioid, plus or minus corticosteroid), varying concentrations of infiltration solution and injections, single-injection or catheter peripheral nerve blocks, peripheral nerve blocks (femoral and/or sciatic), and epidural catheter infusions (local anesthetic, opioid, and rates).

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There is a risk of renal injury with ketorolac injection. There is a theoretical risk of increased infection rates injecting corticosteroids into a surgical field.

FUTURE RESEARCH

Standardization of peri-articular infiltration (PAI) solutions and peripheral nerve block (PNB) protocols are needed before comparisons of PAI and PNB can be truly compared with each other and to neuraxial anesthesia such as epidural infusions. The impact of periarticular injection for pain relief on day of surgery mobilization should also be further explored.
## Summary of Findings

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<th>Complications</th>
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<tr>
<td>complications other</td>
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<tr>
<td>Deep venous thrombosis</td>
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<tr>
<td>Nausea and Vomiting</td>
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<th>Function</th>
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<th>Other</th>
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<td>Morphine consumption (mg)</td>
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<td>Patient satisfaction</td>
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<td>Vas Pain (100mm) - Pain</td>
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<td>Vas Pain (10cm) - Pain</td>
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<th>Postoperative Pain Control</th>
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<td>Morphine consumption (mg)</td>
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</table>
QUALITY EVALUATION TABLE 22: PERI-ARTICULAR LOCAL INFILTRATION

Quality Chart Key

● = No Flaw in Domain of Interest
○ = Flaw in Domain of Interest
☑ = Half flaw in domain of interest

QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
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<tr>
<td>Busch, C.A., 2006</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Chen, Y., 2012</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Klasen, J.A., 1999</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
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<td>●</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Nakai, T., 2013</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
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DETAILED DATA TABLES

TABLE 28: PART 1 - PERI-ARTICULAR LOCAL INFILTRATION VERSUS SALINE: COMPLICATIONS
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chen,Y., 2012</td>
<td>High Quality</td>
<td>Nausea and Vomiting( )</td>
<td>NR</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(Magnesium sulphate 50 mg/kg and ropivacain 190 mg)</td>
<td>40</td>
<td>30.00%</td>
<td>No Local Infiltration(Normal saline)</td>
<td>40</td>
<td>45.00%</td>
<td>RR</td>
<td>(...)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen,Y., 2012</td>
<td>High Quality</td>
<td>Deep venous thrombosis( )</td>
<td>NR</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(Magnesium sulphate 50 mg/kg and ropivacain 190 mg)</td>
<td>40</td>
<td>0.00%</td>
<td>No Local Infiltration(Normal saline)</td>
<td>40</td>
<td>2.50%</td>
<td>RD</td>
<td>(...)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Groupe N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Klasen, J.A., 1999</td>
<td>High Quality</td>
<td>complications other (All)</td>
<td>NR</td>
<td>Local Infiltration (Patients were anaesthetized via lumbar subarachnoid block with a 26-6 needle)</td>
<td>.</td>
<td>. %</td>
<td>No Local Infiltration (Lumbar subarachnoid block was performed via the combined spinal-epidural anaesthesia technique with a 26-g needle)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Nakai, T., 2013</td>
<td>High Quality</td>
<td>Nausea and Vomiting (Postoperative nausea and vomiting (PONV))</td>
<td>Post-Op</td>
<td>Local Infiltration (Received intra-articular injection of a multimodal drug cocktail)</td>
<td>21</td>
<td>38.10%</td>
<td>No Local Infiltration (Did not receive multimodal drug cocktail therapy)</td>
<td>20</td>
<td>10.00%</td>
<td>RR</td>
<td>3.81 (0.92, 15.81)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Nakai, T., 2013</td>
<td>High Quality</td>
<td>Nausea and Vomiting (Postoperative nausea and vomiting (PONV))</td>
<td>Post-Op</td>
<td>Local Infiltration (Received localperiarticular injection of a multimodal drug cocktail)</td>
<td>19</td>
<td>15.79%</td>
<td>No Local Infiltration (Did not receive multimodal drug cocktail therapy)</td>
<td>20</td>
<td>10.00%</td>
<td>RR</td>
<td>1.58 (0.30, 8.43)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
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<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Chen,Y., 2012</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function(Time to perform a straight leg raise)</td>
<td>NR</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(Magnesium sulphate 50 mg/kg and ropivacain 190 mg)</td>
<td>40</td>
<td>22.2(2.77)</td>
<td>No Local Infiltration(Normal saline)</td>
<td>40</td>
<td>39.32(5.42)</td>
<td>Mean Difference</td>
<td>-17.12(-19.01, -15.23)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Chen,Y., 2012</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function(Time to reach a 90 knee flexion (days))</td>
<td>NR</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic)(Magnesium sulphate 50 mg/kg and ropivacain 190 mg)</td>
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<td>11.05(3.14)</td>
<td>No Local Infiltration(Normal saline)</td>
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<td>15.2(4.62)</td>
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<td>Nakai,T., 2013</td>
<td>High Quality</td>
<td>Range of Motion(flexion) - Function(Fl exion angles at week 1)</td>
<td>1 weeks</td>
<td>Local Infiltration(Received intra-articular injection of a multimodal drug cocktail)</td>
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<td>. %</td>
<td>No Local Infiltration(Received intra-articular injection of a multimodal drug cocktail)</td>
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<td>. %</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Ambulation (walking)(With walking cane)</td>
<td>Post-Op</td>
<td>Local Infiltration(Received intra-articular injection of a multimodal drug cocktail)</td>
<td>.</td>
<td>. %</td>
<td>No Local Infiltration(Received intra-articular injection of a multimodal drug cocktail)</td>
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<td>. %</td>
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<td>High Quality</td>
<td>Range of Motion(flexion) - Function(Fl exion angles at week 1)</td>
<td>1 weeks</td>
<td>Local Infiltration(Received intra-articular injection of a multimodal drug cocktail)</td>
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<td>. %</td>
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<td>. %</td>
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<td>Nakai,T., 2013</td>
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<td>Ambulation (walking)(With walking cane)</td>
<td>Post-Op</td>
<td>Local Infiltration(Received intra-articular injection of a multimodal drug cocktail)</td>
<td>.</td>
<td>. %</td>
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<td>. %</td>
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<td>NA</td>
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<td>Reference Title</td>
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<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain (Visual analog scores (VAS) for pain during activity)</td>
<td>4 hours</td>
<td>Local Infiltration (400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
<td>.</td>
<td>. %</td>
<td>Control (Peri-articular local infiltration) (Saline)</td>
<td>.</td>
<td>. %</td>
<td>Authored Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
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<tr>
<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain (Visual analog scores (VAS) for pain during activity)</td>
<td>1 Days</td>
<td>Local Infiltration (400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
<td>.</td>
<td>. %</td>
<td>Control (Peri-articular local infiltration) (Saline)</td>
<td>.</td>
<td>. %</td>
<td>Authored Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Chen,Y., 2012</td>
<td>High Quality</td>
<td>Vas Pain (100mm)-Pain( )</td>
<td>1 Days</td>
<td>Peri-articular local infiltration (anesthetic and/or anti-inflammatory and or/analgesic)(Magnesium sulphate 50 mg/kg and ropivacain 190 mg)</td>
<td>No Local Infiltration(Normal saline)</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Klasen,J.A., 1999</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain(Pain intensity)</td>
<td>1 Days</td>
<td>Local Infiltration(Patients were anaesthetized via lumbar subarachnoid block with a 26g needle)</td>
<td>No Local Infiltration(Lumbar subarachnoid block was performed via the combined spinal-epidural anaesthesia technique with a 26-g needle)</td>
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<td>2.3(3.20)</td>
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<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Groupe2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorited Treatment</td>
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<td>Koh, I.J., 2011</td>
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<td>1 Days</td>
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<td>45</td>
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<td>5.7 (2.60)</td>
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<td>Local Infiltration (Received intra-articular injection of a multimodal drug cocktail)</td>
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<td>. %</td>
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<td>Local Infiltration (Received intra-articular injection of a multimodal drug cocktail)</td>
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<td>. %</td>
<td>No Local Infiltration (Did not receive multimodal drug cocktail)</td>
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<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Vas Pain (10cm)-Pain (Mean VAS scores on the day of surgery)</td>
<td>1 Days</td>
<td>Local Infiltration (Received localperiartricular injection of a multimodal drug cocktail.)</td>
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<td>No Local Infiltration (Did not receive multimodal drug cocktail)</td>
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<td>Author Reported</td>
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<td>Not Significant (P-value &gt; .05)</td>
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<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>High Quality</td>
<td>Morphine consumption (mg)( )</td>
<td>2 Days</td>
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<td>. %</td>
<td>No Local Infiltration(Normal saline)</td>
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<td>Outcome Details</td>
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<td>Mean1/P 1 (SD1)</td>
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<td>Mean2/P 2 (SD2)</td>
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<td>Result (95% CI)</td>
<td>Favoured Treatment</td>
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<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(Consumption of patient-controlled analgesia (PCA) in milligrams)</td>
<td>6 hours</td>
<td>Local Infiltration(400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
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<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(Consumption of patient-controlled analgesia (PCA) in milligrams)</td>
<td>12 hours</td>
<td>Local Infiltration(400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
<td>.</td>
<td>. %</td>
<td>Control (Peri-articular local infiltration)(Saline)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Grou p1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Grou p2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<tr>
<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Morphine consumption (mg) (Consumption of patient-controlled analgesia (PCA) in milligrams)</td>
<td>1 Day s</td>
<td>Local Infiltration (400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
<td>.</td>
<td>. %</td>
<td>Control (Peri-articular local infiltration)(Saline)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Morphine consumption (mg) (Consumption of patient-controlled analgesia (PCA) in milligrams)</td>
<td>1.4 months</td>
<td>Local Infiltration (400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
<td>.</td>
<td>. %</td>
<td>Control (Peri-articular local infiltration)(Saline)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group p1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group p2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favoured Treatment</td>
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</tr>
<tr>
<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Patient satisfaction (Visual analog scores (VAS) for patient satisfaction)</td>
<td>4 hours</td>
<td>Local Infiltration (400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
<td>.</td>
<td>. %</td>
<td>Control (Peri-articular local infiltration) (Saline)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Patient satisfaction (Visual analog scores (VAS) for patient satisfaction)</td>
<td>1 Days</td>
<td>Local Infiltration (400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
<td>.</td>
<td>. %</td>
<td>Control (Peri-articular local infiltration) (Saline)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favoured Treatment</td>
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<tr>
<td>Busch, C.A., 2006</td>
<td>High Quality</td>
<td>Patient satisfaction(Visual analog scores (VAS) for patient satisfaction)</td>
<td>1.4 months</td>
<td>Local Infiltration(400 mg of ropivacaine, 30 mg of Toradol (ketorolac), 5 mg of epimorphine, and 0.6 mL of epinephrine (1:1000).)</td>
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<td>. %</td>
<td>Control (Peri-articular local infiltration)(Saline)</td>
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<td>. %</td>
<td>Author Reported</td>
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<td>Koh, I.J., 2011</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(Fentanyl consumption via IV-PCA pump (?g))</td>
<td>1 Days</td>
<td>Local Infiltration(Peri-articular injections)</td>
<td>45</td>
<td>169.4(27 3.90)</td>
<td>No Local Infiltration( )</td>
<td>42</td>
<td>262.3(20 0.20)</td>
<td>Mean Difference</td>
<td>-92.9(-193.25, 7.45)</td>
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</table>
NEURAXIAL ANESTHESIA

Moderate evidence supports that neuraxial anesthesia could be used in total knee arthroplasty (TKA) to improve select perioperative outcomes and complication rates compared to general anesthesia.

Strength of Recommendation: Moderate Evidence★★★★

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

RATIONALE


Two high-quality studies (Nielson PT 1990, Jorgensen 1991) and one low-quality (Sharrock 1991) study demonstrated significantly lower rates of deep venous thrombosis (DVT) compared to general anesthesia. Of note, the two high-quality studies did not utilize any form of perioperative prophylactic anticoagulation; and the low-quality study utilized postoperative aspirin therapy only. Neither study used warfarin or low-molecular weight heparin as part of their postoperative DVT prophylactic regimen. Four additional low- (Stundner 2012, Memtsoudis 2013) quality studies demonstrated significant reductions in overall postoperative complications with neuraxial anesthesia; including reductions in blood transfusion rates, pulmonary compromise, pulmonary embolism, pneumonia, mechanical ventilation rates, acute renal failure and composite infectious complications.

Two high-quality studies demonstrated improved short-term functional outcomes after neuraxial anesthesia. Specifically, Williams-Russo (1996) demonstrated improved short-term range-of-motion (flexion) and short-term ambulation (days until unassisted stair climbing) compared to general anesthesia. Nielson WR (1990) demonstrated improved short-term cognitive function (Wechsler Memory Scale; Controlled Oral Word Association) compared to general anesthesia.

One low-quality study (Memtsoudis) demonstrated a significant reduction in 30-day mortality in patients undergoing neuraxial anesthesia compared to general anesthesia.

RISKS AND HARMs OF IMPLEMENTING THIS RECOMMENDATION

Neuraxial anesthesia should not be performed in patients with known contraindications to the technique.

FUTURE RESEARCH

Additional comparative multicenter (high-quality) prospective studies evaluating the impact of intraoperative anesthetic technique on perioperative complications and outcomes are needed to further clarify if unique patient cohorts (e.g., patients with cardiopulmonary disease, obstructive sleep apnea, obesity) may benefit from neuraxial anesthesia. Future studies comparing the
effectiveness of neuraxial anesthesia with periarticular injections and/or peripheral nerve blockade should be performed.
RESULTS

SUMMARY OF FINDINGS TABLE 7: NEURAXIAL ANESTHESIA

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
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<tr>
<td>● Favors Neuraxial anesthesia</td>
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<td>● Favors General anesthesia</td>
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<tr>
<td>○ Not Significant</td>
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<td>Complications other</td>
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<td>Deep venous thrombosis</td>
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<td>Need Transfusion- Complications</td>
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<td>Wound Complications</td>
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<tr>
<td>Blood Loss</td>
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<td>Blood transfusion %</td>
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<td>Drainage- Complications</td>
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<td>Pulmonary embolism</td>
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<td>Cerebrovascular Event- Complications</td>
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<td>Ambulation (walking)</td>
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<td>Cognitive function</td>
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<td>Mortality- Mortality</td>
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</table>

Summary of Findings:

- High Quality:
  - Favors Neuraxial anesthesia
- Low Quality:
  - Favors General anesthesia
  - Not Significant

Complications Table:

- Deep venous thrombosis
- Need Transfusion- Complications
- Wound Complications
- Blood Loss
- Blood transfusion%
- Drainage- Complications
- Pulmonary embolism
- Cerebrovascular Event- Complications

Function:

- Range of Motion(flexion) - Function
- Ambulation (walking)
- Cognitive function

Length of Stay:

- Days- Length Of Stay
- Length Of Recovery- Length Of Stay

Length of Surgery:

- Length Of Surgery- Length Of Surgery

Mortality:

- Mortality- Mortality
### QUALITY EVALUATION TABLE 4: NEURAXIAL ANESTHIA

#### Quality Chart Key

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- ◇ = Half flaw in domain of interest

#### QE - Randomized

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<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
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<td>High Quality</td>
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<td>Nielsen, W.R., 1990</td>
<td>○</td>
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<tr>
<td>Williams-Russo, P., 1995</td>
<td>●</td>
<td>○</td>
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<td>Williams-Russo, P., 1996</td>
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<td>Include</td>
<td>High Quality</td>
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#### QE - Observational

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<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
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<tr>
<td>Beaupre, L.A., 2012</td>
<td>○</td>
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<td>Memtsoudis, S.G., 2013</td>
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<tr>
<td>Sharrock, N.E., 1991</td>
<td>○</td>
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<td>Stundner, O., 2012</td>
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### TABLE 33: NEURAXIAL ANESTHESIA VERSUS GENERAL ANESTHESIA: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jorgensen, L.N., 1991</td>
<td>High Quality</td>
<td>Deep venous thrombosis (Total)</td>
<td>1.4 weeks</td>
<td>Neuraxial anesthesia or epidural/spinal (2% mepivacaine 8-15 ml through lumbar extradural catheter)</td>
<td>17</td>
<td>17.65%</td>
<td>General anesthesia (Thiopentone 3-5 mg/kg, fentanyl 5 ug/kg, pancuronium 0.1 mg/kg, diazepam 0.2 mg/kg, and nitrous oxide/oxygen)</td>
<td>22</td>
<td>59.09%</td>
<td>RR</td>
<td>0.30 (0.10, 0.88)</td>
<td>Treatment 1 Significant (P-value &lt; 0.05)</td>
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<tr>
<td>Jorgensen, L.N., 1991</td>
<td>High Quality</td>
<td>Pulmonary embolism()</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (2% mepivacaine 8-15 ml through lumbar extradural catheter)</td>
<td>17</td>
<td>0.00%</td>
<td>General anesthesia (Thiopentone 3-5 mg/kg, fentanyl 5 ug/kg, pancuronium 0.1 mg/kg, diazepam 0.2 mg/kg, and nitrous oxide/oxygen)</td>
<td>22</td>
<td>4.55%</td>
<td>RD</td>
<td>-0.05 (-0.13, 0.04)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Mitchell, D., 1991</td>
<td>High Quality</td>
<td>Deep venous thrombosis (DVT/PE)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Local anesthetic via epidural catheter)</td>
<td>34</td>
<td>35.29%</td>
<td>General anesthesia (Tubocurarine, sodium thiopental, succinylcholine, and nitrous oxide in oxygen)</td>
<td>38</td>
<td>26.32%</td>
<td>RR</td>
<td>1.34 (0.67, 2.70)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Nielsen, P.T., 1990</td>
<td>High Quality</td>
<td>Deep venous thrombosis()</td>
<td>1.4 weeks</td>
<td>Neuraxial anesthesia or epidural/spinal (2% mepivacaine via lumbar epidural catheter)</td>
<td>13</td>
<td>15.38%</td>
<td>General anesthesia (Thiopental/diazepam/fentanyl, nitrous oxide/oxygen)</td>
<td>16</td>
<td>62.50%</td>
<td>RR</td>
<td>0.25 (0.07, 0.93)</td>
<td>Treatment 1 Significant (P-value &lt; 0.05)</td>
</tr>
<tr>
<td>Nielsen, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Controlled Oral Word Association, number of words)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>45 (12.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>36 (11.00)</td>
<td>Mean Difference</td>
<td>9 (3.17, 14.8 3)</td>
<td>Treatment 1 Significant (P-value &lt; 0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Sickness Impact Profile (SIP), Physical Dimension Score)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>15(11.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>16(7.00)</td>
<td>Mean Difference</td>
<td>-1(-5.84,3.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Sickness Impact Profile (SIP), Physical Dimension Score)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>10(11.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>12(7.00)</td>
<td>Mean Difference</td>
<td>-2(-6.84,2.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Sickness Impact Profile (SIP), Psychological Dimension Score)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>6(8.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
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<td>8(10.00)</td>
<td>Mean Difference</td>
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<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Sickness Impact Profile (SIP), Psychological Dimension Score)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>4(7.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>3(4.00)</td>
<td>Mean Difference</td>
<td>1(-2.02,4.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Adult Intelligence Scale - Revised, Visual IQ Score (WAIS-R VIQ))</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>101(16.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
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<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Adult Intelligence Scale - Revised, Visual IQ Score (WAIS-R VIQ))</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>103(15.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>96(14.00)</td>
<td>Mean Difference</td>
<td>7(-0.34,14.34)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Adult Intelligence Scale - Revised, Performance IQ Score (WAIS-R PIQ))</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
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<td>98(13.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>93(15.00)</td>
<td>Mean Difference</td>
<td>5(-1.94,11.94)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Adult Intelligence Scale - Revised, Performance IQ Score (WAIS-R PIQ))</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>102(10.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>95(15.00)</td>
<td>Mean Difference</td>
<td>7(0.87,13.13)</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
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<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Verbal Index Score)</td>
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<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>100.88(16.27)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
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<td>95.74(13.86)</td>
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<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Verbal Index Score)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>105.8(16.52)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>100.28(14.62)</td>
<td>Mean Difference</td>
<td>5.52(-2.42,13.46)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Visual Index Score)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>95.28(16.78)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
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<td>90.23(14.1 9)</td>
<td>Mean Difference</td>
<td>5.05(-2.89,12.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Visual Index Score)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>101.8(17.14)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>91.51(15.1 4)</td>
<td>Mean Difference</td>
<td>10.29(2.06, 18.52)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Attention/Concentration Index Score)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>98.08(14.66)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>92.1(16.05 )</td>
<td>Mean Difference</td>
<td>5.98(-1.66,13.62)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Attention/Concentration Index Score)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>101.8(14.64)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>93.08(16.1 3)</td>
<td>Mean Difference</td>
<td>8.72(1.07,1 6.37)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Delayed Index Score)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>97.92(13.90)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>91.26(11.5 3)</td>
<td>Mean Difference</td>
<td>6.66(0.12,1 3.20)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Wechsler Memory Scale - Revised, Delayed Index Score)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivacaine)</td>
<td>25</td>
<td>104.64(18.76 )</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>96.77(13.9 0)</td>
<td>Mean Difference</td>
<td>7.87(-0.68,16.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Nielson,W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Hand Preference Questionnaire, number of apraxic errors)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>0.32(0.40)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>0.5(1.01)</td>
<td>Mean Difference</td>
<td>-0.18(-0.53,0.17)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nielson,W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Hand Preference Questionnaire, number of apraxic errors)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>0.36(0.70)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>0.34(0.67)</td>
<td>Mean Difference</td>
<td>0.02(-0.33,0.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nielson,W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail A Time)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>38.04(12.83)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>46.97(22.96)</td>
<td>Mean Difference</td>
<td>-8.93(-17.72,-0.14)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Nielson,W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail A Time)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>36.8(9.22)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>42.68(16.72)</td>
<td>Mean Difference</td>
<td>-5.88(-12.25,0.49)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nielson,W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail A Errors)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>0.32(0.63)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>0.24(0.49)</td>
<td>Mean Difference</td>
<td>0.08(-0.21,0.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nielson,W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail A Errors)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>0.32(0.63)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>0.18(0.39)</td>
<td>Mean Difference</td>
<td>0.14(-0.14,0.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nielson,W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail B Time)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>125(80.48)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>148.3(77.65)</td>
<td>Mean Difference</td>
<td>-23.3(-63.16,16.56)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail B Time)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>105.76(33.32)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>132.46(77.56)</td>
<td>Mean Difference</td>
<td>-26.7(-54.33,0.93)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail B Errors)</td>
<td>Peri-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>1.12(1.42)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>1.08(1.26)</td>
<td>Mean Difference</td>
<td>0.04(-0.64,0.72)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Trail-making Test, Trail B Errors)</td>
<td>3 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>0.64(0.91)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>0.76(1.30)</td>
<td>Mean Difference</td>
<td>-0.12(-0.66,0.42)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Nielson, W.R., 1990</td>
<td>High Quality</td>
<td>Cognitive function (Controlled Oral Word Association, number of words)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Tetracaine or bupivicaine)</td>
<td>25</td>
<td>44(12.00)</td>
<td>General anesthesia (Thiopental, succinylcholine; N2O in oxygen, isoflurane, and fentanyl)</td>
<td>39</td>
<td>37(9.00)</td>
<td>Mean Difference</td>
<td>7(1.51,12.49)</td>
<td>Treatment 1 Significant (P-value&lt;0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Williams-Russo, P., 1995</td>
<td>High Quality</td>
<td>Cognitive function (Boston Naming Test, Controlled Word Association, Wechsler Adult Intelligence Scale Revised - Digit Symbol, Trail Making Tests, Digit Span, Benton Visual Retention, Benton Visual Recognition, and Mattis-Kovner Verbal and Verbal Recognition)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaïne 0.75% via epidural catheter)</td>
<td>134</td>
<td>.(4.50)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O)</td>
<td>128</td>
<td>.(4.40)</td>
<td>Mean Difference</td>
<td>.(...)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Williams-Russo, P., 1995</td>
<td>High Quality</td>
<td>Cognitive function (Boston Naming Test, Controlled Word Association, Wechsler Adult Intelligence Scale Revised - Digit Symbol, Trail Making Tests, Digit Span, Benton Visual Retention, Benton Visual Recognition, and Mattis-Kovner Verbal Recall and Verbal Recognition)</td>
<td>1 weeks</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaine 0.75% via epidural catheter)</td>
<td>134</td>
<td>. %</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O)</td>
<td>128</td>
<td>. %</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Williams-Russo, P., 1995</td>
<td>High Quality</td>
<td>Cognitive function (Boston Naming Test, Controlled Word Association, Wechsler Adult Intelligence Scale Revised - Digit Symbol, Trail Making Tests, Digit Span, Benton Visual Retention, Benton Visual Recognition, and Mattis-Kovner Verbal Recall and Verbal Recognition)</td>
<td>5.9 months</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaine 0.75% via epidural catheter)</td>
<td>114</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O)</td>
<td>117</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt; .05)</td>
<td></td>
</tr>
<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Deep venous thrombosis (Incidence of DVT)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>39.85%</td>
<td>RR</td>
<td>0.82(0.62,1.09)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>Cerebrovascular Event Complications (Cerebrovascular event)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.07%</td>
<td>RR</td>
<td>0.68(0.43,1.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>complications other (Pulmonary compromise)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.39%</td>
<td>RR</td>
<td>0.55(0.45,0.67)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
<td></td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(Cardiac (nonmyocardial infarction))</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>6.43%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>6.27%</td>
<td>RR</td>
<td>1.03 (0.98, 1.08)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>pulmonary embolism(Pulmonary embolism)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>0.39%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.55%</td>
<td>RR</td>
<td>0.71 (0.58, 0.86)</td>
<td>Treatment 1 Significant (P-value &lt; 0.05)</td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(Blood product transfusion)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>14.59%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>16.62%</td>
<td>RR</td>
<td>0.88 (0.85, 0.90)</td>
<td>Treatment 1 Significant (P-value &lt; 0.05)</td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>Mortality-Mortality(30-day mortality)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>0.08%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.13%</td>
<td>RR</td>
<td>0.66 (0.43, 1.00)</td>
<td>Treatment 1 Significant (P-value &lt; 0.05)</td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(Pneumonia)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>0.74%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.84%</td>
<td>RR</td>
<td>0.88 (0.76, 1.01)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(Acute renal failure)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>1.13%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>1.55%</td>
<td>RR</td>
<td>0.73 (0.65, 0.82)</td>
<td>Treatment 1 Significant (P-value &lt; 0.05)</td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(Gastrointestinal complications)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>0.66%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.67%</td>
<td>RR</td>
<td>0.99 (0.85, 1.15)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Memtsoudis, S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(Acute myocardial infarction)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>0.23%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.25%</td>
<td>RR</td>
<td>0.93 (0.72, 0.21)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean 1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean 2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Memtsoudis,S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(Mechanical ventilation)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>0.46%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>0.67%</td>
<td>RR</td>
<td>0.68(0.57,0.82)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Memtsoudis,S.G., 2013</td>
<td>Low Quality</td>
<td>complications other(All infections)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>28426</td>
<td>3.09%</td>
<td>General anesthesia (General anesthesia)</td>
<td>194682</td>
<td>3.86%</td>
<td>RR</td>
<td>0.80(0.75,0.86)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Sharrock,N.E., 1991</td>
<td>Low Quality</td>
<td>Deep venous thrombosis(DVT unilateral arthroplasty)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Epidural anesthesia was performed with fifteen to twenty five ml of 0.75 percent bupivacaine or 2 percent lidocaine with epinephrine)</td>
<td>206</td>
<td>56.31%</td>
<td>General anesthesia (General anesthesia)</td>
<td>171</td>
<td>42.11%</td>
<td>RR</td>
<td>1.34(1.08,1.65)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Sharrock,N.E., 1991</td>
<td>Low Quality</td>
<td>Deep venous thrombosis(DVT bilateral arthroplasty)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Epidural anesthesia was performed with fifteen to twenty five ml of 0.75 percent bupivacaine or 2 percent lidocaine with epinephrine)</td>
<td>71</td>
<td>78.87%</td>
<td>General anesthesia (General anesthesia)</td>
<td>93</td>
<td>64.52%</td>
<td>RR</td>
<td>1.22(1.01,1.48)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>Wound Complications (Wound infection)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>0.09%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>0.10%</td>
<td>RR</td>
<td>0.91(0.12,6.93)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>pulmonary embolism(Pulmonary embolism)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>1.50%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>0.90%</td>
<td>RR</td>
<td>1.67(0.99,2.81)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>complications other(Cardiac non-myocardial infection))</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>5.16%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>5.90%</td>
<td>RR</td>
<td>0.88(0.67,1.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>complications other(Pneumonia)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>0.66%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>0.90%</td>
<td>RR</td>
<td>0.73(0.34,1.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>complications other(All infections)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>3.19%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>4.50%</td>
<td>RR</td>
<td>0.71(0.50,1.00)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>complications other(Mechanical ventilation)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>0.47%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>0.90%</td>
<td>RR</td>
<td>0.52(0.21,1.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>complications other(Acute renal failure)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>1.88%</td>
<td>General anesthesia (General anesthesia)</td>
<td>125667</td>
<td>2.70%</td>
<td>RR</td>
<td>0.69(0.45,1.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>complications other(Gastrointestinal complication)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>1.13%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>1.30%</td>
<td>RR</td>
<td>0.87(0.48,1.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>complications other(Acute myocardial infarction)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>0.19%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>0.40%</td>
<td>RR</td>
<td>0.47(0.11,1.94)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Ambulation (walking) (Days until assisted transfer in and out of bed)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>6.6(2.90)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>6.9(3.40)</td>
<td>Mean Difference</td>
<td>-0.3(-1.08,0.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Ambulation (walking) (Days until walking with walker, assisted)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>2.7(1.00)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>2.7(1.10)</td>
<td>Mean Difference</td>
<td>0(-0.26,0.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Ambulation (walking) (Days until walking with walker, unassisted)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>5.8(2.70)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>6.1(3.00)</td>
<td>Mean Difference</td>
<td>-0.3(-1.01,0.41)</td>
<td>Not Significant (P-value&gt;.05)</td>
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**TABLE 34: NEURAXIAL ANESTHESIA VERSUS GENERAL ANESTHESIA: FUNCTION**
<table>
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<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Ambulation (walking) (Days until walking with cane, assisted)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>7.2(3.10)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>7.4(2.90)</td>
<td>Mean Difference</td>
<td>-0.2(-0.94,0.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Ambulation (walking) (Days until walking with cane, unassisted)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>10.4(4.70)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>11.1(4.60)</td>
<td>Mean Difference</td>
<td>-0.7(-1.85,0.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Ambulation (walking) (Days until walking up stairs, assisted)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>7.9(3.10)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>9.5(4.90)</td>
<td>Mean Difference</td>
<td>-1.6(-2.62,-0.58)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Ambulation (walking) (Days until walking up stairs, unassisted)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>10.9(4.80)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>11.8(4.70)</td>
<td>Mean Difference</td>
<td>-0.9(-2.07,0.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Days until 90 degree flexion)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivacaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>6.9(2.10)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>7.8(3.20)</td>
<td>Mean Difference</td>
<td>-0.9(-1.57,-0.23)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Mitchell,D., 1991</td>
<td>High Quality</td>
<td>Days- Length Of Stay (Hospital Days)</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Local anesthetic via epidural catheter)</td>
<td>34</td>
<td>10.4(,)</td>
<td>General anesthesia (Tubocurarine, sodium thiopental, succinyllchoine, and nitrous oxide in oxygen)</td>
<td>38</td>
<td>11(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Williams-Russo, P., 1995</td>
<td>High Quality</td>
<td>Days- Length Of Stay ( )</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaine 0.75% via epidural catheter)</td>
<td>134</td>
<td>12.7(5.30)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O)</td>
<td>128</td>
<td>12.7(4.30)</td>
<td>Mean Difference</td>
<td>0(-1.17,1.17)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Williams-Russo, P., 1996</td>
<td>High Quality</td>
<td>Days- Length Of Stay ( )</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaine 0.75% via epidural catheter)</td>
<td>133</td>
<td>12.1(4.50)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O and isoflurane)</td>
<td>120</td>
<td>12.7(4.30)</td>
<td>Mean Difference</td>
<td>-0.6(-1.68,0.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>Length Of Recovery- Length Of Stay (Length of stay, median (IQR))</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>. %</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Williams-Russo, P., 1995</td>
<td>High Quality</td>
<td>Length Of Surgery- Length Of Surgery (Time in min.)</td>
<td>Intra-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaaine 0.75% via epidural catheter)</td>
<td>134</td>
<td>85(33.00)</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O)</td>
<td>128</td>
<td>88(32.00)</td>
<td>Mean Difference</td>
<td>-3(-10.87, 4.87)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Williams-Russo, P., 1995</td>
<td>High Quality</td>
<td>Mortality- Mortality( )</td>
<td>Post-Op</td>
<td>Neuraxial anesthesia or epidural/spinal (Lidocaine 2% or Bupivicaine 0.75% via epidural catheter)</td>
<td>134</td>
<td>0.75%</td>
<td>General anesthesia (Thiopental, fentanyl, and vecuronium; inhaled N2O)</td>
<td>128</td>
<td>0.78%</td>
<td>RR</td>
<td>0.96(0.06,15.11)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>Mortality- Mortality(In-hospital mortality)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>0.09%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>0.10%</td>
<td>RR</td>
<td>0.91(0.12,6.93)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stundner,O., 2012</td>
<td>Low Quality</td>
<td>Mortality- Mortality(30-day Mortality)</td>
<td>NA</td>
<td>Neuraxial anesthesia or epidural/spinal (Neuraxial anesthesia)</td>
<td>1066</td>
<td>0.09%</td>
<td>General anesthesia (General anesthesia)</td>
<td>12567</td>
<td>0.10%</td>
<td>RR</td>
<td>0.91(0.12,6.93)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
TOURNIQUETS

A. TOURNIQUET: BLOOD LOSS REDUCTION
Moderate evidence supports that the use of a tourniquet in total knee arthroplasty (TKA) decreases intraoperative blood loss.

Strength of Recommendation: Moderate Evidence ★★★★★
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

B. TOURNIQUET: POSTOPERATIVE PAIN REDUCTION
Strong evidence supports that tourniquet use in total knee arthroplasty (TKA) increases short term post-operative pain.

Strength of Recommendation: Strong Evidence ★★★★★
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

C. TOURNIQUET: POSTOPERATIVE FUNCTION
Limited evidence supports that tourniquet use in total knee arthroplasty (TKA) decreases short term post-operative function.

Strength of Recommendation: Limited Evidence ★★★★
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

RATIONALE
With regard to pain, two high quality studies (Liu 2014 and Ledin 2012) and another moderate quality study (Ejaz 2014) showed decreased pain in the no tourniquet group in the very early postoperative period that was not significant after four days (Ledin 2012 and Liu 2014) and eight weeks (Ejaz 2014) respectively.

One high quality study (Ledin 2012) and one moderate quality (Aglietti 2000) found increased intraoperative blood loss in the no tourniquet patients. However, Ledin 2012 found no increased total bleeding when hemoglobin dilution was measured and Aglietti 2000 found no difference when overall total blood loss was tabulated.

One high quality study (Liu 2014) showed better quadriceps function in the no tourniquet group but equivalent Oxford Knee Scores and range of motion. One moderate quality (Ejaz 2014) study demonstrated better Knee Injury and Osteoarthritis Outcomes (KOOS) subscores and early range of motion to week eight postoperatively in the no tourniquet group, where differences then became statistically insignificant.
RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION
There is increased risk of acute intraoperative blood loss without a tourniquet. The possibility of poor fixation at the cement-bone interface exists.

FUTURE RESEARCH
Continued prospective multicenter randomized studies with and without use of a tourniquet may show difference if more detailed patient reported outcomes instruments are utilized. Studies that included gradation of use of tourniquet or select times during the operation when utilized may demonstrate when tourniquet may be most beneficial. The work group also supports more high quality studies that take into consideration tourniquet use in the context of modern blood conservation protocols such as the addition of tranexamic acid.
### Results

#### Summary of Findings Table 23: Tourniquets Versus No Tourniquet

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors Tourniquet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Favors No Tourniquet</td>
<td></td>
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<tr>
<td>○ Not Significant</td>
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<td>Deep venous thrombosis</td>
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<td>Manipulation Under Anesthesia- Other</td>
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<td>Koos-Function, Daily Living- Function</td>
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<td>Koos-Function, Sports And Recreational Activities- Function</td>
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<td>Koos-Symptoms- Other</td>
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<td>Knee Society Score-Pain- Pain</td>
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<td>Vas Pain (100mm)- Pain</td>
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<tr>
<td>Vas Pain (10cm)- Pain</td>
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<tbody>
<tr>
<td>Koos-Quality Of Life- Quality Of Life</td>
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<td>Reoperation- Reoperation</td>
<td>○</td>
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</table>

#### Quality Evaluation Table 13: Tourniquets

**Quality Chart Key**

- = No Flaw in Domain of Interest
- = Flaw in Domain of Interest
- = Half flaw in domain of interest
### DETAILED DATA TABLES

#### TABLE 38: TOURNIQUET VERSUS NO TOURNIQUET: BLOOD LOSS AND NEED FOR TRANSFUSION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<tr>
<td>Aglietti,P., 2000</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (ml during post operative period only)</td>
<td>During 1st Post-op hour</td>
<td>Tourniquet(tourniquet routinely was deflated intraoperatively after the components were cemented in place so that hemostasis could be obtained)</td>
<td>10</td>
<td>290(54)</td>
<td>No Tourniquet( )</td>
<td>10</td>
<td>145(50.00)</td>
<td>Mean Difference</td>
<td>145 (96.11, 193.89)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Aglietti,P., 2000</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Intra-Op</td>
<td>Tourniquet(tourniquet routinely was deflated intraoperatively after the components were cemented in place so that hemostasis could be obtained)</td>
<td>10</td>
<td>350(12.00)</td>
<td>No Tourniquet( )</td>
<td>10</td>
<td>482(97.40)</td>
<td>Mean Difference</td>
<td>-132(-192.83,-71.17)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Intra-Op</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>140(32.70)</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>280(52.00)</td>
<td>Mean Difference</td>
<td>-140(-161.44,-118.56)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ledin,H., 2012</td>
<td>High Quality</td>
<td>Blood Loss - Complications (overt bleeding)</td>
<td>Perioperative</td>
<td>Tourniquet(110 mm wide, which was inflated to 275 mmHg during the entire operation)</td>
<td>25</td>
<td>317(,)</td>
<td>No Tourniquet( )</td>
<td>23</td>
<td>615(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------------</td>
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<td>---------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Aglietti,P., 2000</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (total blood loss intraoperative + post operative)</td>
<td>1 hours</td>
<td>Tourniquet(tourniquet routinely was deflated intraoperatively after the components were cemented in place so that hemostasis could be obtained)</td>
<td>10</td>
<td>640(120.00)</td>
<td>No Tourniquet(                  )</td>
<td>10</td>
<td>627(142.00)</td>
<td>Mean Difference</td>
<td>13(-102.23,128.23)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ledin,H., 2012</td>
<td>High Quality</td>
<td>Blood Loss - Complications (total blood loss measured by hemoglobin dilution method)</td>
<td>NR</td>
<td>Tourniquet(110 mm wide, which was inflated to 275 mmHg during the entire operation)</td>
<td>25</td>
<td>1184(346.00)</td>
<td>No Tourniquet(                  )</td>
<td>23</td>
<td>1236(349.00)</td>
<td>Mean Difference</td>
<td>-52(-248.82,144.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Liu,D., 2014</td>
<td>High Quality</td>
<td>Drainage-Complications (                      )</td>
<td>Post-Op</td>
<td>Tourniquet(                      )</td>
<td>10</td>
<td>%</td>
<td>No Tourniquet(                  )</td>
<td>10</td>
<td>%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ledin,H., 2012</td>
<td>High Quality</td>
<td>Need Transfusion-Complications (                  )</td>
<td>Post-Op</td>
<td>Tourniquet(110 mm wide, which was inflated to 275 mmHg during the entire operation)</td>
<td>25</td>
<td>16.00%</td>
<td>No Tourniquet(                  )</td>
<td>23</td>
<td>13.04%</td>
<td>RR</td>
<td>1.23 (0.31, 4.9)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Liu,D., 2014</td>
<td>High Quality</td>
<td>Need Transfusion-Complications (                  )</td>
<td>Post-Op</td>
<td>Tourniquet(                      )</td>
<td>10</td>
<td>30.00%</td>
<td>No Tourniquet(                  )</td>
<td>10</td>
<td>0.00%</td>
<td>RD</td>
<td>0.30(0.02,0.58)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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### TABLE 39: TOURNIQUET VERSUS NO TOURNIQUET: OTHER COMPLICATIONS

<table>
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<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Manipulation Under Anesthesia-Other (need for MUA)</td>
<td>2 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>6.06%</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>0.00%</td>
<td>RD</td>
<td>0.06(-0.02,0.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ledin,H., 2012</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia-Other (need for)</td>
<td>4 Days</td>
<td>Tourniquet(110 mm wide, which was inflated to 275 mmHg during the entire operation)</td>
<td>25</td>
<td>4.00%</td>
<td>No Tourniquet( )</td>
<td>23</td>
<td>0.00%</td>
<td>RD</td>
<td>0.04(-0.04,0.12)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Deep venous thrombosis( )</td>
<td>Post-Op</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>6.06%</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>3.23%</td>
<td>RR</td>
<td>1.88(0.18,19.70)</td>
<td>Not Significant (P-value&gt;.05)</td>
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### TABLE 40: TOURNIQUET VERSUS NO TOURNIQUET: FUNCTION

<table>
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<tr>
<th>Reference</th>
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<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Daily Living-Function ( )</td>
<td>2 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Daily Living-Function ( )</td>
<td>6 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Daily Living-Function ( )</td>
<td>1 year</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Sports And Recreational Activities-Function ( )</td>
<td>2 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Sports And Recreational Activities-Function ( )</td>
<td>6 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Sports And Recreational Activities-Function ( )</td>
<td>1 year</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Ledin,H., 2012</td>
<td>High Quality</td>
<td>Vas Pain (100mm)- Pain ()</td>
<td>4 Days</td>
<td>Tourniquet(110 mm wide, which was inflated to 275 mmHg during the entire operation)</td>
<td>25</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>23</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Liu,D., 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>1 Days</td>
<td>Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Liu,D., 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>2 Days</td>
<td>Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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<tr>
<td>Liu,D., 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>3 Days</td>
<td>Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Liu,D., 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>4 Days</td>
<td>Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Liu,D., 2014</td>
<td>High Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>5 Days</td>
<td>Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>10</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>Post-Op</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>Discharge</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>5.5(1.60)</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>4.6(1.40)</td>
<td>Mean Difference 0.9(0.16,1.64)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
<td></td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain ()</td>
<td>2 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain-Pain ()</td>
<td>2 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain-Pain ()</td>
<td>6 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain-Pain ()</td>
<td>1 year</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
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</table>
### TABLE 42: TOURNIQUET VERSUS NO TOURNIQUET: QUALITY OF LIFE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejaz.A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Quality Of Life- Quality Of Life( )</td>
<td>2 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ejaz.A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Quality Of Life- Quality Of Life( )</td>
<td>6 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ejaz.A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Quality Of Life- Quality Of Life( )</td>
<td>1 year</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>------------------</td>
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<td>------------------</td>
</tr>
<tr>
<td>Ledin.H., 2012</td>
<td>High</td>
<td>Reoperation-Reoperation (revision due to loosening)</td>
<td>2 years</td>
<td>Tourniquet(110 mm wide, which was inflated to 275 mmHg during the entire operation)</td>
<td>25</td>
<td>4.00%</td>
<td>No Tourniquet( )</td>
<td>23</td>
<td>4.35%</td>
<td>RR</td>
<td>0.92(0.06,13.87)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>
### TABLE 44: TOURNIQUET VERSUS NO TOURNIQUET: OTHER OUTCOMES

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Symptoms-Other ()</td>
<td>2 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Symptoms-Other ()</td>
<td>6 months</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ejaz,A., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Symptoms-Other ()</td>
<td>1 year</td>
<td>Tourniquet( )</td>
<td>33</td>
<td>. %</td>
<td>No Tourniquet( )</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tbody>
</table>
TRANEXAMIC ACID

Strong evidence supports that, in patients with no known contraindications, treatment with tranexamic acid decreases postoperative blood loss and reduces the necessity of postoperative transfusions following total knee arthroplasty (TKA).

**Strength of Recommendation: Strong Evidence ★★★★★**

*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*

**RATIONALE**

Eight high quality studies (Antinolfi, 2013, Charoencholvanich, 2011, Gautam, 2011, Good, 2003, Ishida, 2011, Roy, 2012, Sa-Ngasoongsong, 2013, Sarzaeem, 2014, Pachauri, 2014) were reviewed to assess the impact of tranexamic acid administration on blood loss and transfusion rates post total knee arthroplasty. There was significant variability in dosing, route of administration, and timing of administration; when assessed collectively, however, the use of tranexamic acid did show improvement in blood loss related outcomes.

Using six of the high quality studies a meta-analysis was performed on rate of blood transfusions which demonstrated a 52% reduction in patients receiving tranexamic acid (Figure 1). Three high quality studies demonstrated an improvement in Hgb. One high quality study (Ishida 2011) demonstrated a reduction in swelling and one high quality (Sa-Ngasoongsong 2013) study found an improvement in WOMAC function scores out to 1 year.

**RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION**

Care must be taken when utilizing tranexamic acid in patients at high risk for complications such as thromboembolic disease, and color blindness as this has not been adequately studied. This is not an FDA approved use of this agent. The studies used to make this recommendation almost all have significant exclusion criteria, especially regarding patients with a history of VTE or at high risk for the same. There are also specific contraindications in the PDR for the FDA approved uses that include color blindness. The surgeon should be aware of the several common exclusion criteria in the literature, specific contraindications, the experience with this agent in other specialties, and the evolving case report literature before using this agent indiscriminately.

**FUTURE RESEARCH**

The studies used to make this recommendation almost all have significant exclusion criteria, and this must be considered by the practitioner implementing the recommendation. The most common exclusion criteria were thromboembolic disorders, cerebrovascular conditions, and cardiovascular disorders. As tranexamic acid is renally excreted, its use must be modified or reconsidered in patients with poor renal function. Use of tranexamic acid in joint replacement surgery should be considered “off-label” as it is not explicitly FDA approved for this usage. FDA contraindications for its approved usages include: patients with acquired defective color vision, patients with subarachnoid hemorrhage, patients with active intravascular clotting, and in patients with hypersensitivity to tranexamic acid (accessdata.fda.gov).
## RESULTS

### SUMMARY OF FINDINGS

#### TABLE 10: TRANEXAMIC ACID VERSUS PLACEBO

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Meta-Analysis</th>
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<tbody>
<tr>
<td>● Favors Tranexamic Acid</td>
<td>Sarraeen, M.M., 2014</td>
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<td>● Favors Placebo</td>
<td>Sa-Ngosoongson, P., 2013</td>
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<tr>
<td>○ Not Significant</td>
<td>Roy, S.P., 2012</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ishida, K., 2011</td>
<td></td>
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<tr>
<td></td>
<td>Good, L., 2003</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gautam, P.L., 2011</td>
<td></td>
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<tr>
<td></td>
<td>Antinolfi, P., 2013</td>
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</tbody>
</table>

### Complications

- Complications other
- Deep venous thrombosis
- Fall in HB, g/dL
- Infection - Complications
- VTE - Complications
- Blood transfusion %
- Need Transfusion - Complications
- Wound Complications
- Blood Loss
- Drainage - Complications
- Pulmonary embolism
- Hematocrit

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<tr>
<td>● Favors Tranexamic Acid</td>
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### Composite

- Fall in HB, g/dL
- Womac-overall - Composite Likert (0-96)

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</table>

### Function

- Range Of Motion(overall) - Function

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<tr>
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### Other

- Swelling - Other

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<tbody>
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<td></td>
</tr>
<tr>
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</table>
FIGURE 1 TRANEXAMIC ACID VERSUS PLACEBO – BLOOD TRANSFUSION %

NOTE: Weights are from random effects analysis

>0(...) means study risk ratio is estimable, but it still can contribute to the overall Mantel-Haenszel risk ratio
**TRANEXAMIC ACID**

**QUALITY EVALUATION TABLE 6: TRANEXAMIC ACID**

**Quality Chart Key**

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- ❶ = Half flaw in domain of interest

**QE - Intervention - Randomized**

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
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<td>○</td>
<td>Include</td>
<td>High Quality</td>
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<td>Good,L., 2003</td>
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<td>●</td>
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<td>○</td>
<td>Include</td>
<td>High Quality</td>
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<td>●</td>
<td>●</td>
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<td>●</td>
<td>Not best available evidence</td>
<td>Moderate Quality</td>
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### Detailed Data Tables

#### Table 45: Tranexamic Acid Versus Placebo: Complications

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favor Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (cc’s, .75 indicates evening)</td>
<td>0 days (morning)</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>245(155.50)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>313(105.50)</td>
<td>Mean Difference</td>
<td>-68(-150.36,14.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
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<td>High Quality</td>
<td>Blood Loss - Complications (cc’s, .75 indicates evening)</td>
<td>0 days (evening)</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>428(223.90)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>559.9(153.30)</td>
<td>Mean Difference</td>
<td>-131.9(-250.83,-12.97)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (cc’s, .75 indicates evening)</td>
<td>1 Days (in morning)</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>536(234.70)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>819(161.90)</td>
<td>Mean Difference</td>
<td>-283(-407.96,-158.04)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (cc’s, .75 indicates evening)</td>
<td>1 Days (in evening)</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>617.5(222.90)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>1011.5(180.30)</td>
<td>Mean Difference</td>
<td>-394(-519.65,-268.35)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (cc’s, .75 indicates evening)</td>
<td>2 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>658.5(211.40)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>1093(183.90)</td>
<td>Mean Difference</td>
<td>-434.5(-561.30,-307.66)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
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<td>High Quality</td>
<td>Fall in HB, g/dL(raw scores, not change scores)</td>
<td>0 days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>11.9(1.10)</td>
<td>No Tranexamic Acid (placebo)</td>
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<td>10.6(1.10)</td>
<td>Mean Difference</td>
<td>1.3(0.62,1.98)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
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<td>High Quality</td>
<td>Fall in HB, g/dL(raw scores, not change scores)</td>
<td>2 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>10.2(1.00)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>9.3(1.10)</td>
<td>Mean Difference</td>
<td>10.9(10.25,11.55)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Fall in HB, g/dL(raw scores, not change scores)</td>
<td>3 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>10.1(1.20)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>9.7(0.90)</td>
<td>Mean Difference</td>
<td>0.4(-0.26,1.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Antinolfi,P., 2013</td>
<td>High Quality</td>
<td>Fall in HB, g/dL (raw scores, not change scores)</td>
<td>4 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>9.7(0.80)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>9.9(1.00)</td>
<td>Mean Difference</td>
<td>-0.2(-0.76,0.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Antinolfi,P., 2013</td>
<td>High Quality</td>
<td>Fall in HB, g/dL (raw scores, not change scores)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>9.8(0.90)</td>
<td>No Tranexamic Acid (placebo)</td>
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<td>10.2(0.90)</td>
<td>Mean Difference</td>
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<td>High Quality</td>
<td>Fall in HB, g/dL (raw scores, not change scores)</td>
<td>1 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>10.9(1.40)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>9.5(1.00)</td>
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<td>1.4(0.65,2.15)</td>
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<td>High Quality</td>
<td>Hematocrit (raw scores, not change scores)</td>
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<td>20</td>
<td>36.1(3.50)</td>
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<td>32.3(3.60)</td>
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<td>3.8(1.60,6.00)</td>
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<td>High Quality</td>
<td>Hematocrit (raw scores, not change scores)</td>
<td>1 Days</td>
<td>Tranexamic Acid (500 mg)</td>
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<td>32.2(4.20)</td>
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<td>29.3(3.10)</td>
<td>Mean Difference</td>
<td>2.9(0.61,5.19)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>High Quality</td>
<td>Hematocrit (raw scores, not change scores)</td>
<td>2 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>30.1(3.00)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>28(3.10)</td>
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<td>2.1(0.21,3.99)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
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<td>High Quality</td>
<td>Hematocrit (raw scores, not change scores)</td>
<td>3 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>29.5</td>
<td>29.5(3.60)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>29.4(2.20)</td>
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<td>4 Days</td>
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<td>20</td>
<td>28.8(2.80)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>30(2.80)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Antinolfi,P., 2013</td>
<td>High Quality</td>
<td>Hematocrit (raw scores, not change scores)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>29.3(3.00)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>31(2.50)</td>
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<td>-1.7(-3.41,0.01)</td>
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<td>Blood transfusion % (units transfused)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>0.8(0.80)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>2.2(1.00)</td>
<td>Mean Difference</td>
<td>-1.4(-1.98, -.82)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Wound Complications (wound healing complications)</td>
<td>3 months</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>0.00%</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>10.00%</td>
<td>RD</td>
<td>-0.10(-0.23,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Deep venous thrombosis (symptomatic dvt)</td>
<td>3 months</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>0.00%</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Pulmonary embolism (symptomatic PE)</td>
<td>3 months</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>0.00%</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gautam, P.L., 2011</td>
<td>High Quality</td>
<td>Blood Loss - Complications (postoperative)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (received tranexamic acid 10 mg/kg IV, approximately half an hour before deflation of tourniquet and 3 hours after the first dose)</td>
<td>20</td>
<td>272.5(122.51)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>685(118.21)</td>
<td>Mean Difference</td>
<td>-412.5(-487.11,-337.89)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Gautam, P.L., 2011</td>
<td>High Quality</td>
<td>Blood Loss - Complications (total blood loss)</td>
<td>5 Days</td>
<td>Tranexamic Acid (received tranexamic acid 10 mg/kg IV, approximately half an hour before deflation of tourniquet and 3 hours after the first dose)</td>
<td>20</td>
<td>443(134.38)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>985.25(220.40)</td>
<td>Mean Difference</td>
<td>-542.25(-655.38,-429.12)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Gautam,P.L., 2011</td>
<td>High Quality</td>
<td>Fall in HB, g/dL( )</td>
<td>Post-Op</td>
<td>Tranexamic Acid (received tranexamic acid 10 mg/kg IV, approximately half an hour before deflation of tourniquet and 3 hours after the first dose)</td>
<td>20</td>
<td>11.11(1.56)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>10.42(1.42)</td>
<td>Mean Difference</td>
<td>0.69(-0.23,1.61)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Gautam,P.L., 2011</td>
<td>High Quality</td>
<td>Blood transfusion % ( )</td>
<td>5 Days</td>
<td>Tranexamic Acid (received tranexamic acid 10 mg/kg IV, approximately half an hour before deflation of tourniquet and 3 hours after the first dose)</td>
<td>.</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>.</td>
<td>. %</td>
<td>RR</td>
<td>0.47(0.24,0.89)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Gautam,P.L., 2011</td>
<td>High Quality</td>
<td>Blood transfusion % (multiple transfusions required)</td>
<td>5 Days</td>
<td>Tranexamic Acid (received tranexamic acid 10 mg/kg IV, approximately half an hour before deflation of tourniquet and 3 hours after the first dose)</td>
<td>20</td>
<td>0.00%</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>10.00%</td>
<td>RD</td>
<td>-0.10(-0.23,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Drainage-Complications ()</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Blood Loss - Complications (hidden blood loss)</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Blood transfusion % (red blood cells transfused)</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Blood transfusion % (number transfused)</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>11.11%</td>
<td>No Tranexamic Acid (placebo)</td>
<td>.</td>
<td>. %</td>
<td>RR</td>
<td>0.19(0.06,0.58)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Deep venous thrombosis (clinical symptoms of dvt)</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>7.41%</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>8.33%</td>
<td>RR</td>
<td>0.89(0.14,5.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Infection-Complications (wound infection)</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>.</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>0.00%</td>
<td>RD</td>
<td>0.04(-0.03,0.11)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Fall in HB, g/dL (raw post op hb)</td>
<td>1 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Fall in HB, g/dL (raw post op hb)</td>
<td>3 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Good,L., 2003</td>
<td>High Quality</td>
<td>Fall in HB, g/dL (raw post op hb)</td>
<td>5 Days</td>
<td>Tranexamic Acid (tranexamic acid 10 mg kg-1)</td>
<td>27</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>24</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Drainage-Complications ()</td>
<td>3 hours</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Drainage-Complications ()</td>
<td>6 hours</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Drainage-Complications ()</td>
<td>1 hours</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Fall in HB, g/dL ( )</td>
<td>1 Days</td>
<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Fall in HB, g/dL ( )</td>
<td>1 weeks</td>
<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Fall in HB, g/dL ( )</td>
<td>2 weeks</td>
<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Fall in HB, g/dL ( )</td>
<td>Post-Op</td>
<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Drainage-Complications ()</td>
<td>12 hours</td>
<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Drainage-Complications ()</td>
<td>1 Days</td>
<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Drainage-Complications ()</td>
<td>2 Days</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Blood transfusion % (allogenic blood transfusions)</td>
<td>2 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>0.00%</td>
<td>No Tranexamic Acid ()</td>
<td>.</td>
<td>. %</td>
<td>RD</td>
<td>-0.02(-0.06,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (supratellar girth cm)</td>
<td>1 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>1.6(1.20)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>2.5(1.20)</td>
<td>Mean Difference</td>
<td>-0.9(-1.37,-0.43)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (supratellar girth cm)</td>
<td>2 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>0.7(2.10)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>1.1(1.10)</td>
<td>Mean Difference</td>
<td>-0.4(-1.06,0.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (supratellar girth cm)</td>
<td>4 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>0.1(1.10)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>-0.1(1.30)</td>
<td>Mean Difference</td>
<td>0.2(-0.27,0.67)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (calf girth cm)</td>
<td>1 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>0.5(1.60)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>0.9(2.00)</td>
<td>Mean Difference</td>
<td>-0.4(-1.11,0.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (calf girth cm)</td>
<td>2 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>-1.1(1.40)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>-0.3(1.60)</td>
<td>Mean Difference</td>
<td>-0.8(-1.39,-.20)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (calf girth cm)</td>
<td>4 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>-1.2(1.30)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>-1(1.10)</td>
<td>Mean Difference</td>
<td>-0.2(-0.67,0.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (change from preoperative thigh girth cm)</td>
<td>1 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>1.1(2.00)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>1.4(1.70)</td>
<td>Mean Difference</td>
<td>-0.3(-1.03,0.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ishida,K., 2011</td>
<td>High</td>
<td>Swelling - Other (change from preoperative thigh girth cm)</td>
<td>2 weeks</td>
<td>Tranexamic Acid ()</td>
<td>50</td>
<td>-0.7(2.10)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>-0.6(1.90)</td>
<td>Mean Difference</td>
<td>-0.1(-0.88,0.68)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
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<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
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<td>Mean2/P2 (SD2)</td>
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<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>-1.8(2.10)</td>
<td>No Tranexamic Acid ( )</td>
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<td>-1.6(2.20)</td>
<td>Mean Difference</td>
<td>-0.2(-1.04,0.64)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Roy,S.P., 2012</td>
<td>High Quality</td>
<td>Drainage-Complications (measured between 0-6,6-48 hours. and total in 5 days)</td>
<td>6 hours</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>25</td>
<td>268.4(111.08 )</td>
<td>No Tranexamic Acid (placebo)</td>
<td>25</td>
<td>470(114.56)</td>
<td>Mean Difference</td>
<td>-201.6(-264.15,-139.05)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Roy,S.P., 2012</td>
<td>High Quality</td>
<td>Drainage-Complications (measured between 0-6,6-48 hours. and total in 5 days)</td>
<td>6 hours</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>25</td>
<td>151.6(82.10)</td>
<td>No Tranexamic Acid (placebo)</td>
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<td>400(180.27)</td>
<td>Mean Difference</td>
<td>-248.4(-326.05,-170.75)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
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<td>High Quality</td>
<td>Drainage-Complications (measured between 0-6,6-48 hours. and total in 5 days)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>25</td>
<td>401(82.44)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>25</td>
<td>870(201.04)</td>
<td>Mean Difference</td>
<td>-469(-554.18,-383.82)</td>
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<td>High Quality</td>
<td>Fall in HB, g/dL (day5-day0)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>25</td>
<td>1.94(0.98)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>25</td>
<td>3.04(1.33)</td>
<td>Mean Difference</td>
<td>-1.1(-1.75,-0.45)</td>
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<td>High Quality</td>
<td>Hematocrit (day5-day0)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>25</td>
<td>30.37(3.08)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>25</td>
<td>28.01(3.22)</td>
<td>Mean Difference</td>
<td>2.36(0.61,4.11)</td>
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<tr>
<td>Roy,S.P., 2012</td>
<td>High Quality</td>
<td>Blood transfusion % (number of patients transfused)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>25</td>
<td>8.00%</td>
<td>No Tranexamic Acid (placebo)</td>
<td>25</td>
<td>28.00%</td>
<td>RR</td>
<td>0.29(0.07,1.24)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>VTE-Complications (thromboembolic events)</td>
<td>5 Days</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>25</td>
<td>0.00%</td>
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<td>25</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Blood Loss - Complications ( )</td>
<td>Intra-Op</td>
<td>Tranexamic Acid (500 mg/5 ml)</td>
<td>No Tranexamic Acid (placebo)</td>
<td>Mean Difference</td>
<td>-84.4(-127.46,-41.34)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>complications other (re-clamp)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>RD</td>
<td>-0.13(-0.23,-0.03)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>complications other (re-dressing)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>RD</td>
<td>-0.07(-0.14,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Sa-Ngasoongsong, P., 2013</td>
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<td>VTE-Complications ( )</td>
<td>Peri-Op</td>
<td>Tranexamic Acid (500mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>RR</td>
<td>0.50(0.10,2.59)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>complications other (congestive heart failure)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (Drainage blood loss)</td>
<td>Peri-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>Mean Difference</td>
<td>-71.9(-180.93,37.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Fall in HB, g/dL( )</td>
<td>Peri-Op</td>
<td>Tranexamic Acid (500mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>Mean Difference</td>
<td>-0.7(-35.59,34.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (calculated total blood loss)</td>
<td>Peri-Op</td>
<td>Tranexamic Acid (500mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>Mean Difference</td>
<td>-112(-155.61,-68.39)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Fall in HB, g/dL( )</td>
<td>Peri-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>Mean Difference</td>
<td>-0.7(-35.59,34.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (calculated total blood loss)</td>
<td>Peri-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>No Tranexamic Acid ( )</td>
<td>Mean Difference</td>
<td>-89.5(-132.10,-46.90)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (Drainage blood loss)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500mg)</td>
<td>45</td>
<td>430.2(224.00 )</td>
<td>No Tranexamic Acid ()</td>
<td>45</td>
<td>546.9(273.00)</td>
<td>Mean Difference</td>
<td>-116.7(-219.88,-13.52)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Blood transfusion % ()</td>
<td>Peri-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>13.33%</td>
<td>No Tranexamic Acid ()</td>
<td>45</td>
<td>22.22%</td>
<td>RR</td>
<td>0.60(0.24,1.51)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>complications other (re-clamp)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>2.22%</td>
<td>No Tranexamic Acid ()</td>
<td>45</td>
<td>13.33%</td>
<td>RR</td>
<td>0.17(0.02,1.33)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
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<td>complications other (re-dressing)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>0.00%</td>
<td>No Tranexamic Acid ()</td>
<td>45</td>
<td>6.67%</td>
<td>RD</td>
<td>-0.07(-0.14,0.01)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>VTE-Complications ()</td>
<td>Post-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>2.22%</td>
<td>No Tranexamic Acid ()</td>
<td>45</td>
<td>8.89%</td>
<td>RR</td>
<td>0.25(0.03,2.15)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
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<td>complications other (congestive heart failure)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>2.22%</td>
<td>No Tranexamic Acid ()</td>
<td>45</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.07)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>Blood Loss - Complications ()</td>
<td>Post-Op</td>
<td>Tranexamic Acid (topical: the knee joint cavity irrigated with 3 g of TXA in 100 cc of saline just before suturing for 5 min)</td>
<td>50</td>
<td>743.2(116.50 )</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>860.5(152.20)</td>
<td>Mean Difference</td>
<td>-117.3(-170.43,-64.17)</td>
<td>Treatment 1 Significant (P-value&lt;0.05)</td>
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<tr>
<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>Fall in HB, g/dL(drop in HB (higher=greater drop))</td>
<td>Post-Op</td>
<td>Tranexamic Acid (topical: the knee joint cavity irrigated with 3 g of TXA in 100 cc of saline just before suturing for 5 min)</td>
<td>50</td>
<td>4.2(1.00)</td>
<td>No Tranexamic Acid ()</td>
<td>50</td>
<td>4.5(1.00)</td>
<td>Mean Difference</td>
<td>-0.3(-0.69,0.09)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>Need Transfusion-Complications (need for transfusion)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (topical: the knee joint cavity irrigated with 3 g of TXA in 100 cc of saline just before suturing for 5 min)</td>
<td>No Tranexamic Acid ()</td>
<td>RR</td>
<td>1.00(0.38,2.64)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>VTE-Complications (any thromboembolic event)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (topical: the knee joint cavity irrigated with 3 g of TXA in 100 cc of saline just before suturing for 5 min)</td>
<td>No Tranexamic Acid ()</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;0.05)</td>
<td></td>
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</tr>
<tr>
<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>Blood Loss -Complications ()</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500 mg of TXA in 100 cc of saline)</td>
<td>No Tranexamic Acid ()</td>
<td>Mean Difference</td>
<td>-383.7(-436.54,-330.86)</td>
<td>Treatment 1 Significant (P-value&lt;0.05)</td>
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<tr>
<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>Need Transfusion-Complications (need for transfusion)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500 mg of TXA in 100 cc of saline)</td>
<td>No Tranexamic Acid ()</td>
<td>RD</td>
<td>-0.14(-0.24,-0.04)</td>
<td>Treatment 1 Significant (P-value&lt;0.05)</td>
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<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>VTE-Complications (any thromboembolic event)</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500 mg of TXA in 100 cc of saline)</td>
<td>No Tranexamic Acid ()</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Sarzaeem, M.M., 2014</td>
<td>High Quality</td>
<td>Fall in HB, g/dL (drop in HB (higher=greater drop))</td>
<td>Post-Op</td>
<td>Tranexamic Acid (500 mg of TXA in 100 cc of saline)</td>
<td>No Tranexamic Acid ()</td>
<td>Mean Difference</td>
<td>-1.9(-2.27,-1.53)</td>
<td>Treatment 1 Significant (P-value&lt;0.05)</td>
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**TABLE 46: TRANEXAMIC ACID VERSUS PLACEBO: COMPOSITE**

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<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favorited Treatment</th>
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<tbody>
<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) (unclear if likert or vas)</td>
<td>3 months</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>35.8(7.6)</td>
<td>No Tranexamic Acid ( )</td>
<td>15.5</td>
<td>36.7(8.2)</td>
<td>Mean Difference</td>
<td>-0.9 (-4.21, 2.41)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) (unclear if likert or vas)</td>
<td>6 months</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>23.1(6.5)</td>
<td>No Tranexamic Acid ( )</td>
<td>45</td>
<td>25.6(6)</td>
<td>Mean Difference</td>
<td>-2.3 (-4.92, 0.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) (unclear if likert or vas)</td>
<td>1 years</td>
<td>Tranexamic Acid (250 mg)</td>
<td>45</td>
<td>15.1(6.2)</td>
<td>No Tranexamic Acid ( )</td>
<td>45</td>
<td>15.6(6.6)</td>
<td>Mean Difference</td>
<td>-0.4 (-3.08, 2.28)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) (unclear if likert or vas)</td>
<td>3 months</td>
<td>Tranexamic Acid (500 mg)</td>
<td>45</td>
<td>35.7(7.2)</td>
<td>No Tranexamic Acid ( )</td>
<td>15.5</td>
<td>36.7(8.2)</td>
<td>Mean Difference</td>
<td>-1.2 (-4.43, 2.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) (unclear if likert or vas)</td>
<td>6 months</td>
<td>Tranexamic Acid (500 mg)</td>
<td>45</td>
<td>23.5(6.6)</td>
<td>No Tranexamic Acid ( )</td>
<td>45</td>
<td>25.6(6)</td>
<td>Mean Difference</td>
<td>-1.9 (-4.54, 0.74)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Sa-Ngasoongsong, P., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) (unclear if likert or vas)</td>
<td>1 years</td>
<td>Tranexamic Acid (500 mg)</td>
<td>45</td>
<td>14.5(7.1)</td>
<td>No Tranexamic Acid ( )</td>
<td>45</td>
<td>15.6(6.6)</td>
<td>Mean Difference</td>
<td>-1 (-3.87, 1.87)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>-------------------------------------------</td>
<td>----------</td>
<td>----------------</td>
<td>---------------------------</td>
<td>----------</td>
<td>----------------</td>
<td>-------------------</td>
<td>-----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Range Of Motion (overall) - Function (recovery of during hospital stay)</td>
<td>During Hospital Stay</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Antinolfi, P., 2013</td>
<td>High Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>3 months</td>
<td>Tranexamic Acid (500 mg)</td>
<td>20</td>
<td>. %</td>
<td>No Tranexamic Acid (placebo)</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
</tbody>
</table>
**TABLE 48: TRANEXAMIC ACID VERSUS PLACEBO: REOPERATION**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ishida,K., 2011</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (at average of 21.5 month follow up)</td>
<td>1.7 years</td>
<td>Tranexamic Acid ( )</td>
<td>50</td>
<td>0.00 %</td>
<td>No Tranexamic Acid ( )</td>
<td>50</td>
<td>0.00%</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
</tbody>
</table>
ANTIBIOTIC BONE CEMENT
Limited evidence does not support the routine use of antibiotics in the cement for primary total knee arthroplasty (TKA).

Strength of Recommendation: Limited Evidence ★★☆☆☆
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

RATIONALE
Two moderate quality studies and one low quality registry review were considered. One moderate quality randomized study demonstrated a reduction in total knee arthroplasty infection in diabetic patients from 13.5% to 0% when cefuroxime was added to the cement. This study was performed in operating rooms without modern features (Chiu 2001). One moderate quality, randomized, prospective study demonstrated a reduction in revision total knee arthroplasty infection rates when vancomycin was added to the cement (Chiu 2009). A large Canadian registry study reviewing more than 36000 patients found no difference in revision rates for infection between those patients treated with or without antibiotics in the cement. Given two moderate quality studies that are not widely applicable to patients with osteoarthritis undergoing primary total knee arthroplasty and one low quality, although large, registry review demonstrating no benefit from routinely adding antibiotics to cement for primary total knee arthroplasty, it is the conclusion of the work group that limited evidence does not support the routine use of antibiotics in the cement for primary total knee arthroplasty. One study did provide some suggestion that antibiotics added to the cement may be of benefit in diabetic patients. (Chiu 2001).

Of note, the FDA approved indications for antibiotic loaded cement in total knee arthroplasty are limited to revision scenarios and do not include primary applications (http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpcd/classification.cfm?id=mbb).

RISKS AND HAZARDS OF IMPLEMENTING THIS RECOMMENDATION
Possible harms of adding antibiotics to the cement include a reaction to the antibiotics, development of antibiotic-resistant infections and increased costs. Antibiotics could potentially impact the mechanical properties of the cement. Because the evidence is limited, it is possible that with additional evidence it will become apparent that routinely omitting antibiotics misses an opportunity to reduce infection rates.

FUTURE RESEARCH
This is an ideal topic for a large, prospective, multi-centered randomized clinical trial. If appropriately risk adjusted, data from large registries could also be of value. These studies should focus on both routine use of antibiotics in the cement and use in high-risk patients.
## RESULTS
### SUMMARY OF FINDINGS TABLE 2: ANTIBIOTIC BONE CEMENT

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors Antibiotic Bone Cement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Favors Conventional Bone Cement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complications</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection- Complications</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Loosening- Complications</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of Stay</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Of Recovery- Length Of Stay</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

| Reoperation                          |                  |             |
|--------------------------------------|                  | ○           |

Chiu, F. Y., 2001
Chiu, F. Y., 2009
Bohm, E., 2013
**QUALITY EVALUATION TABLE 2: - ANITBIOTIC BONE CEMENT**

Quality Chart Key

- **●** = No Flaw in Domain of Interest
- **○** = Flaw in Domain of Interest
- **○○** = Half flaw in domain of interest

### QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bohm, E., 2013</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

### QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiu, F.Y., 2001</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Chiu, F.Y., 2009</td>
<td>○○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>

**DETAILED DATA TABLES**

**TABLE 49: - ANTIBIOTIC CEMENT VERSUS NO ANTIBIOTIC CEMENT: COMPLICATIONS**
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiu,F.Y., 2001</td>
<td>Moderate</td>
<td>Infection-Complications (deep wound infection)</td>
<td>Post-Op</td>
<td>Antibiotic Bone Cement (2 g of cefuroxime in 40 g of Simplex P cement)</td>
<td>41</td>
<td>0.00%</td>
<td>Conventional Bone Cement (Without Antibiotics) (Simplex P cement)</td>
<td>37</td>
<td>13.51%</td>
<td>RD</td>
<td>-0.14(-0.25, -0.02)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chiu,F.Y., 2009</td>
<td>Moderate</td>
<td>Infection-Complications (deep infection)</td>
<td>2 years</td>
<td>Antibiotic Bone Cement (1 g of vancomycin in 40 g of Simplex-P cement)</td>
<td>93</td>
<td>0.00%</td>
<td>Conventional Bone Cement (Without Antibiotics) (Simplex-P cement)</td>
<td>90</td>
<td>6.67%</td>
<td>RD</td>
<td>-0.07(-0.12,-0.02)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chiu,F.Y., 2009</td>
<td>Moderate</td>
<td>Infection-Complications (superficial)</td>
<td>2 years</td>
<td>Antibiotic Bone Cement (1 g of vancomycin in 40 g of Simplex-P cement)</td>
<td>93</td>
<td>0.00%</td>
<td>Conventional Bone Cement (Without Antibiotics) (Simplex-P cement)</td>
<td>90</td>
<td>1.11%</td>
<td>RD</td>
<td>-0.01(-0.03, 0.01)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Chiu,F.Y., 2009</td>
<td>Moderate</td>
<td>Infection-Complications (total wound infections)</td>
<td>2 years</td>
<td>Antibiotic Bone Cement (1 g of vancomycin in 40 g of Simplex-P cement)</td>
<td>93</td>
<td>0.00%</td>
<td>Conventional Bone Cement (Without Antibiotics) (Simplex-P cement)</td>
<td>90</td>
<td>7.78%</td>
<td>RD</td>
<td>-0.08(-0.13,-0.02)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chiu,F.Y., 2009</td>
<td>Moderate</td>
<td>Loosening-Complications (component loosening)</td>
<td>NR</td>
<td>Antibiotic Bone Cement (1 g of vancomycin in 40 g of Simplex-P cement)</td>
<td>93</td>
<td>0.00%</td>
<td>Conventional Bone Cement (Without Antibiotics) (Simplex-P cement)</td>
<td>.</td>
<td>.</td>
<td>.%</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
</tbody>
</table>
## TABLE 50: ANTIBIOTIC CEMENT VERSUS NO ANTIBIOTIC CEMENT: FUNCTION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiu,F.Y., 2009</td>
<td>Moderate Quality</td>
<td>Length Of Recovery-Length Of Stay (days)</td>
<td>NA</td>
<td>Antibiotic Bone Cement (1 g of vancomycin in 40 g of Simplex-P cement)</td>
<td>93</td>
<td>13(1.70)</td>
<td>Conventional Bone Cement (Without Antibiotics) (Simplex-P cement)</td>
<td>90</td>
<td>13(1.80)</td>
<td>Mean Difference</td>
<td>0(-0.51,0.51)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
TABLE 51: ANTIBIOTIC CEMENT VERSUS NO ANTIBIOTIC CEMENT: LENGTH OF STAY

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiu,F.Y., 2009</td>
<td>Moderate Quality</td>
<td>Length Of Recovery- Length Of Stay (days)</td>
<td>NA</td>
<td>Antibiotic Bone Cement (1 g of vancomycin in 40 g of Simplex-P cement)</td>
<td>93</td>
<td>13(1.70)</td>
<td>Conventional Bone Cement (Without Antibiotics) (Simplex-P cement)</td>
<td>90</td>
<td>13(1.80)</td>
<td>Mean Difference</td>
<td>0(-0.51,0.51)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
</tbody>
</table>
# TABLE 52: ANTIBIOTIC CEMENT VERSUS NO ANTIBIOTIC CEMENT: REOPERATION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bohm, E., 2013</td>
<td>Low Quality</td>
<td>Reoperation-Reoperation (revision)</td>
<td>2 years</td>
<td>Antibiotic Bone Cement (The most commonly used cement was Simplex1 (Stryker Orthopaedics, Mahwah, NJ, USA) (79%), followed by Palacos1 (Heraeus Medical, Hanau, Germany) (12%), CMW1 (DePuy Orthopaedics, Inc, Warsaw, IN, USA) (6%), and a mixture of others (3%))</td>
<td>.</td>
<td>. %</td>
<td>Conventional Bone Cement (Without Antibiotics)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported Hazard ratio</td>
<td>1.07 (.90,1.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
CRUCIATE RETAINING ARTHROPLASTY

Strong evidence supports no difference in outcomes or complications between posterior stabilized and posterior cruciate retaining arthroplasty designs.

Strength of Recommendation: Strong Evidence 🟣ADRGR

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

RATIONALE

Meta-analysis of included literature was unable to show a difference between the cruciate retaining and posterior stabilized designs with regard to complications, pain, function or patient reported outcomes.

There is one high quality prospective comparative study (Maruyama 2004) evaluating outcomes and ROM in consecutive patients having bilateral total knee arthroplasty who had one posterior stabilized (PS) implant and one posterior cruciate retaining (CR) implant. They found equivalent Knee Society Scores, but statistically improved ROM in the PS group. Another high quality study (Roh 2013) failed to show improved kinematics or improved clinical outcome with PCL retention in highly conforming mobile bearing total knee arthroplasty. A third high quality study (Cankaya 2014) investigated blood loss with CR and PS designs in a prospective randomized study of 100 patients. They found no difference in either perioperative blood loss or postoperative transfusion rates between the two types of designs.

A moderate quality study (Clark 2001) in patients without extreme pre-operative deformities showed no notable differences between PS and CR designs with regard to knee scores, ROM or patient reported outcomes instruments SF-12 and WOMAC. Likewise, four other moderate quality studies (Tanzer 2002, Catani 2004, Molt 2014, Ishii 2011) showed no differences between the CR and PS designs. Tanzer 2002 controlled for surgical technique by having a single surgeon perform a similar surgical technique for each design. Catani 2004 and Molt 2014 showed no statistical difference between designs with regard to tibial migration. Ishii 2011 found no difference between designs in range of motion.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no known harms associated with implementing this recommendation.

FUTURE RESEARCH

Continued comparative multicenter prospective studies between PCR and PS simultaneous or staged total knee arthroplasty may further clarify the cohort of patients (e.g. subgroups with high deformities) for whom PCR or PS designs would be more beneficial.
## RESULTS
### SUMMARY OF FINDINGS TABLE 29: CRUCIATE RETAINING ARTHROPLASTY

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors Cruciate Retaining Arthroplasty</td>
<td>Roh, Y.W., 2013</td>
<td>Tanzer, M., 2002</td>
<td></td>
</tr>
</tbody>
</table>

### Complications
- Complications other
- Infection - Complications
- Manipulation Under Anesthesia - Other
- Womac-overall - Composite averaged VAS version (0-100)
- Pulmonary embolism

### Composite
- Womac-overall - Composite averaged VAS version (0-100)

### Function
- Knee Society Score - Function
- Range of Motion (extension) - Function
- Range of Motion (flexion) - Function
- Range Of Motion (overall) - Function
- Koos-Function, Daily Living - Function
- Koos-Function, Sports And Recreational Activities - Function
- Ambulation (walking)

### Other
- Koos-Symptoms - Other

### Pain
- Knee Society Score - Pain

### Quality of Life
- Koos-Quality Of Life - Quality Of Life

### Reoperation
- Reoperation - Reoperation
FIGURE 2  NO CRUCIATE RETAINING ARTHROPLASTY VERSUS CRUCIATE RETAINING ARTHROPLASTY - FUNCTION AT 2 YEARS

reference

NOTE: Weights are from random effects analysis
Overall  (I-squared = 0.0%, p = 0.793)
Roh,Y.W., 2013
Molt,M., 2014
Tanzer,M., 2002
Catani,F., 2004

SMD (95% CI)  Weight

-0.11 (-0.73, 0.51)  18.85
-0.05 (-0.48, 0.37)  40.56
0.13 (-0.45, 0.70)  21.89
0.27 (-0.35, 0.89)  18.69
0.04 (-0.23, 0.31)  100.00

NOTE: Weights are from random effects analysis
QUALITY EVALUATION TABLE 19: CRUCIATE RETAINING ARTHROPLASTY

Quality Chart Key

● = No Flaw in Domain of Interest
○ = Flaw in Domain of Interest
★ = Half flaw in domain of interest

QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Udomkiat, P., 2000</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Not best available evidence</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cankaya, D., 2014</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Catani, F., 2004</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Clark, C.R., 2001</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Ishii, Y., 2011</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Maruyama, S., 2004</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Molt, M., 2014</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Roh, Y.W., 2013</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Tanzer, M., 2002</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>
## DETAILED DATA TABLES

### TABLE 53: CRUCIATE RETAINING ARTHROPLASTY VERSUS POSTERIOR STABILIZE ARTHROPLASTY: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maruyama,S., 2004</td>
<td>High Quality</td>
<td>Infection-Complications (superficial wound infection)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>0.00%</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>5.00%</td>
<td>RD</td>
<td>-0.05(-0.15,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Roh,Y.W., 2013</td>
<td>High Quality</td>
<td>complications other (total complications)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (PCL retaining)</td>
<td>42</td>
<td>7.14%</td>
<td>Posterior Stabilized Tka Design (PCL substituting)</td>
<td>44</td>
<td>0.00%</td>
<td>RD</td>
<td>0.07(-0.01,0.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Catani,F., 2004</td>
<td>Moderate Quality</td>
<td>manipulation Under Anesthesia- Other (underwent MUA due to severe lack of knee range of motion)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>5.00%</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>0.00%</td>
<td>RD</td>
<td>0.05(-0.05,0.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Clark,C.R., 2001</td>
<td>Moderate Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100) (unclear if likert or vass version used. cannot meta analyze)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>51</td>
<td>18.5(32.90)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>57</td>
<td>22.8(35.40)</td>
<td>Mean Difference</td>
<td>-4.3(-17.18,8.58)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Molt,M., 2014</td>
<td>Moderate Quality</td>
<td>Infection-Complications (superficial)</td>
<td>Post-Op</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>4.76%</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>3.85%</td>
<td>RR</td>
<td>1.24(0.08,18.64)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Molt,M., 2014</td>
<td>Moderate Quality</td>
<td>pulmonary embolism( )</td>
<td>Post-Op</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>4.76%</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>0.00%</td>
<td>RD</td>
<td>0.05(-0.04,0.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Cankaya,D., 2014</td>
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<td>Need for transfusion</td>
<td>5 days</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>50</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Roh,Y.W., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (PCL retaining)</td>
<td>42</td>
<td>15.9()</td>
<td>Posterior Stabilized Tka Design (PCL substituting)</td>
<td>44</td>
<td>17(10.7)</td>
<td>Mean Difference</td>
<td>-1.1(-5.27,3.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
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<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>. %</td>
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<td>High Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ( )</td>
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<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Range Of Motion (flexion) - Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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<td>High Quality</td>
<td>Range Of Motion (extension) - Function ( )</td>
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<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Roh,Y.W., 2013</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (PCL retaining)</td>
<td>42</td>
<td>83.1(16.6)</td>
<td>Posterior Stabilized Tka Design (PCL substituting)</td>
<td>44</td>
<td>84.6(13.6)</td>
<td>Mean Difference</td>
<td>-0.80 (-7.23, .63)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>High Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (PCL retaining)</td>
<td>42</td>
<td>124.3(9.1)</td>
<td>Posterior Stabilized Tka Design (PCL substituting)</td>
<td>44</td>
<td>124(11.9)</td>
<td>Mean Difference</td>
<td>0.3 (-4.26, 4.86)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Range Of Motion (maximum flexion) - Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (PCL retaining)</td>
<td>42</td>
<td>126.7(7.1)</td>
<td>Posterior Stabilized Tka Design (PCL substituting)</td>
<td>44</td>
<td>125.5(10.2)</td>
<td>Mean Difference</td>
<td>1.2 (-2.59, 4.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Moderate Quality</td>
<td>International Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>81(17)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>76(19)</td>
<td>Mean Difference</td>
<td>4.7(-2.76,12.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Catani,F., 2004</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>97(15)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>114(21.00)</td>
<td>Mean Difference</td>
<td>5(-6.54,16.54)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Ishii,Y., 2011</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (posterior cruciate retaining tka)</td>
<td>57</td>
<td>120(.)</td>
<td>Posterior Stabilized Tka Design (PCL sacrificing)</td>
<td>51</td>
<td>115(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ishii,Y., 2011</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design (posterior cruciate retaining tka)</td>
<td>57</td>
<td>120(.)</td>
<td>Posterior Stabilized Tka Design (PCL sacrificing)</td>
<td>51</td>
<td>120(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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<td>Ishii,Y., 2011</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>6 months</td>
<td>Cruciate Retaining Tka Design (posterior cruciate retaining tka)</td>
<td>57</td>
<td>105(.)</td>
<td>Posterior Stabilized Tka Design (PCL sacrificing)</td>
<td>51</td>
<td>105(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ishii,Y., 2011</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>3 months</td>
<td>Cruciate Retaining Tka Design (posterior cruciate retaining tka)</td>
<td>57</td>
<td>105(.)</td>
<td>Posterior Stabilized Tka Design (PCL sacrificing)</td>
<td>51</td>
<td>105(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Molt,M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Daily Living-Function ( )</td>
<td>3 months</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>74(14.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>72(19.00)</td>
<td>Mean Difference</td>
<td>2(-7.44,11.44)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Molt,M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Daily Living-Function ( )</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>86(15.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>79(20.00)</td>
<td>Mean Difference</td>
<td>7(-3.01,17.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Molt,M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Daily Living-Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>86(15.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>84(16.00)</td>
<td>Mean Difference</td>
<td>2(-6.89,10.89)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Molt,M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Function, Sports And Recreational Activities-Function ( )</td>
<td>3 months</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>31(22.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>29(14.00)</td>
<td>Mean Difference</td>
<td>2(-8.84,12.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Moderate Quality</td>
<td>Koos-Function, Sports And Recreational</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>39(22.00)</td>
<td>Posterior Stabilized</td>
<td>26</td>
<td>38(24.00)</td>
<td>Mean Difference</td>
<td>1(-12.18,14.18)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Molt, M., 2014</td>
<td>Moderate Quality</td>
<td>Activities-Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>40(27.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>46(22.00)</td>
<td>Mean Difference</td>
<td>-6(-20.31,8.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Moderate Quality</td>
<td>Koos-Function, Sports And Recreational Activities-Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>73(24.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>76(28.00)</td>
<td>Mean Difference</td>
<td>-3(-19.16,13.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Tanzer, M., 2002</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>96(15.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>99(8.00)</td>
<td>Mean Difference</td>
<td>-3(-10.45,4.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>1.4 months</td>
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<td>20</td>
<td>108(12.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>109(12.00)</td>
<td>Mean Difference</td>
<td>-1(-8.44,6.44)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>3 months</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>109(13.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>111(15.00)</td>
<td>Mean Difference</td>
<td>-2(-10.70,6.70)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Range of Motion (flexion) - Function ( )</td>
<td>5.9 months</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>110(11.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>110(14.00)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>112(13.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>111(17.00)</td>
<td>Mean Difference</td>
<td>1(-8.38,10.38)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Range of Motion (extension) - Function ( )</td>
<td>2 years</td>
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<td>20</td>
<td>.%</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tanzer, M., 2002</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>1.4 months</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>.%</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------</td>
<td>------------------------------------------------------</td>
<td>----------</td>
<td>----------------------------------------</td>
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<td>-----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Tanzer,M., 2002</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ()</td>
<td>3 months</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Tanzer,M., 2002</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ()</td>
<td>5.9 months</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tanzer,M., 2002</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ()</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tanzer,M., 2002</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ()</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tanzer,M., 2002</td>
<td>Moderate Quality</td>
<td>Ambulation (walking) (unlimited walking distance)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>20</td>
<td>50.00%</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>20</td>
<td>55.00%</td>
<td>RR</td>
<td>0.91 (0.5, 1.64)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tanzer,M., 2002</td>
<td>Moderate Quality</td>
<td>Ambulation (walking) (walk stairs without support)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>20</td>
<td>50.00%</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>20</td>
<td>45.00%</td>
<td>RR</td>
<td>1.11(0.58,2.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tbody>
</table>
### TABLE 56: CRUCIATE RETAINING ARTHROPLASTY VERSUS POSTERIOR STABILIZE ARTHROPLASTY: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molt, M., 2014</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain- Pain ( )</td>
<td>3 hours</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>72(20.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>71(20.00)</td>
<td>Mean Difference</td>
<td>1(-10.50,12.50)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Molt, M., 2014</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain- Pain ( )</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>86(14.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>80(19.00)</td>
<td>Mean Difference</td>
<td>6(-3.44,15.44)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Molt, M., 2014</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain- Pain ( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>87(18.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>87(14.00)</td>
<td>Mean Difference</td>
<td>0(-9.39,9.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Group1 Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Group2 Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>----------------------------------------</td>
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<td>----------------</td>
<td>----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Molt.M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Quality Of Life- Quality Of Life( )</td>
<td>3 months</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>56(19.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>58(22.00)</td>
<td>Mean Difference</td>
<td>-2(-13.73,9.73)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Molt.M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Quality Of Life- Quality Of Life( )</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>68(18.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>68(25.00)</td>
<td>Mean Difference</td>
<td>0(-12.31,12.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Molt.M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Quality Of Life- Quality Of Life( )</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>21</td>
<td>78(22.00)</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>26</td>
<td>79(20.00)</td>
<td>Mean Difference</td>
<td>-1(-13.15,11.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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<td>--------------------</td>
</tr>
<tr>
<td>Roh,Y.W., 2013</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (instability following falls leading to replacement of polyethylene insert with thicker insert)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (PCL retaining)</td>
<td>42</td>
<td>4.76%</td>
<td>Posterior Stabilized Tka Design (PCL substituting)</td>
<td>44</td>
<td>0.00%</td>
<td>RD</td>
<td>0.05(-0.02,0.11)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Roh,Y.W., 2013</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (sublaxation leading to resection of the PCL and insertion of thicker polyethylene insert)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design (PCL retaining)</td>
<td>42</td>
<td>2.38%</td>
<td>Posterior Stabilized Tka Design (PCL substituting)</td>
<td>44</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Catani,F., 2004</td>
<td>Moderate Quality</td>
<td>Reoperation- Reoperation (lateral release with resurfacing of the patellar in patients with anterior knee pain with a lateral subluxation of the patella)</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ( )</td>
<td>20</td>
<td>5.00%</td>
<td>Posterior Stabilized Tka Design ( )</td>
<td>20</td>
<td>10.00%</td>
<td>RR</td>
<td>0.50(0.05,5.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tbody>
</table>
### TABLE 59: CRUCIATE RETAINING ARTHROPLASTY VERSUS POSTERIOR STABILIZE ARTHROPLASTY: OTHER OUTCOMES

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molt, M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Symptoms-Other ()</td>
<td>3 months</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>21</td>
<td>67(18.00)</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>26</td>
<td>66(18.00)</td>
<td>Mean Difference</td>
<td>1(-9.35,11.35)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Molt, M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Symptoms-Other ()</td>
<td>1 years</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>21</td>
<td>76(19.00)</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>26</td>
<td>76(15.00)</td>
<td>Mean Difference</td>
<td>0(-9.96,9.96)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Molt, M., 2014</td>
<td>Moderate Quality</td>
<td>Koos-Symptoms-Other ()</td>
<td>2 years</td>
<td>Cruciate Retaining Tka Design ()</td>
<td>21</td>
<td>82(18.00)</td>
<td>Posterior Stabilized Tka Design ()</td>
<td>26</td>
<td>83(15.00)</td>
<td>Mean Difference</td>
<td>-1(-10.62,8.62)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
</tbody>
</table>
POLYETHYLENE TIBIAL COMPONENTS
Strong evidence supports use of either all-polyethylene or modular tibial components in knee arthroplasty (KA) because of no difference in outcomes.

Strength of Recommendation: Strong Evidence ★★★★★
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

RATIONALE

One high quality randomized controlled trial (Kalisvaart 2012) of cemented posterior-stabilized total knee arthroplasty demonstrated no differences in range of motion, functional outcomes, stair climbing, or revisions across three tibial designs (all-polyethylene fixed-bearing, modular metal-backed fixed-bearing, rotating-platform) at two and five years post-operatively.

In a high quality multicenter trial (Knee Arthroplasty Trial; Murray 2014) randomizing the use of all-polyethylene and modular metal-backed tibia components in the United Kingdom, 89% of patients received the allocated procedure. There were no differences in Oxford Knee Scores or rates of complications, reoperations, and revisions at ten years post-operatively. There was a trend towards the metal-backed group having better EQ-5D and Short Form-12 scores based on marginal estimates over the entire ten-year follow up period.

A third high quality randomized trial (Hyldahl 2001) in unicompartmental knee arthroplasty, with a focus on radiostereometric analysis (RSA) of component fixation, found no differences with respect to clinical results (Hospital for Special Surgery score) or migration of the comparative tibial components over a two-year follow-up period.

Five moderate quality (Adalberth 2001, Gioe 2000, Muller 2006, Norgren 2004, Adalberth 2000) randomized controlled trials with minimum two years of follow up demonstrated no differences with respect to clinical results (all studies used the Knee Society Score, except for Short Form-12 and Oxford Knee Score used in the study by Muller 2006) and range of motion between all-polyethylene and modular tibial components in total knee arthroplasty. Likewise, complications and reoperations were similar between groups in all studies, and equivalent component migration was measured in four studies utilizing RSA techniques (Adalberth 2001, Muller 2006, Norgren 2004, Adalberth 2000).

The practitioner must be aware that results in the literature may be implant specific, and that surgical technique and surgeon experience with particular methods are important factors in achieving durable results. The decision to use modularity versus a monolithic tibial design may be influenced by particular patient situations, such as metal hypersensitivity and severe bone loss. The practitioner should be aware of the advantages and disadvantages of the two treatments methods.
RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION
There are no known harms associated with implementing this recommendation

FUTURE RESEARCH
Continued comparative studies between modern all-polyethylene and modular metal-backed devices in knee arthroplasty will help to further define the utility of these component types, including evolving component designs (e.g. modular and monolithic) and newer materials (e.g. highly cross-linked and stabilized polyethylenes and porous metals). Future study should include larger patient numbers across specific patient subgroups that may help to identify patient-specific factors that may inform the decision to utilize a particular fixation technique, or to avoid complications associated with particular fixation strategies. Registry data and long-term studies (greater than ten years clinical follow up) should inform durability of particular components and may serve to analyze implant-specific complications and revision risk. Given some variability in the reported patient-reported outcome measures between treatment groups in particular high-quality studies, more clinical data may discern subtle differences in clinical outcomes based on the use of implant modularity. Issues of cost and cost-effectiveness should be incorporated into future clinical studies.
# RESULTS

## SUMMARY OF FINDINGS TABLE 34: ALL POLYETHYLENE TIBIAL COMPONENTS

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kalisvaart, M.M., 2012</td>
<td>Muller, S.D., 2006</td>
</tr>
<tr>
<td></td>
<td>Murray, D.W., 2014</td>
<td>Norgren, B., 2004</td>
</tr>
<tr>
<td></td>
<td>Hyldahl, H.C., 2001</td>
<td>Adalberth, G., 2000</td>
</tr>
<tr>
<td></td>
<td>Muller, S.D., 2006</td>
<td>Adalberth, G., 2001</td>
</tr>
<tr>
<td></td>
<td>Hyldahl, H.C., 2001</td>
<td>Adalberth, G., 2000</td>
</tr>
</tbody>
</table>

### Complications
- Complications other
- Deep venous thrombosis
- Infection-Complications
- Loosening-Complications
- Manipulation Under Anesthesia-Other
- Pulmonary embolism

### Composite
- Knee Society Score-Pain
- SF-12 overall score
- Oxford Knee Score

### Function
- Knee Society Score-Function
- Knee society score-stair climbing

### Mortality
- Mortality

### Pain
- Knee Society Score-Pain
- Knee society score-stair climbing

### Quality of Life
- EQ-5d
- SF-12 Physical Component Score
- SF-12 Mental Component Score

### Reoperation
- Infection-Complications
- Reoperation-Reoperation
**STUDY QUALITY TABLE**

**QUALITY EVALUATION TABLE 23: ALL POLYETHYLENE TIBIAL COMPONENTS**

**Quality Chart Key**

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- ⚫ = Half flaw in domain of interest

**QE - Intervention – Randomized**

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adalberth,G., 2000</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Adalberth,G., 2001</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Gioe,T.J., 2000</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Hyldahl,H.C., 2001</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Muller,S.D., 2006</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Norgren,B., 2004</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>

**DETAILED DATA TABLES**

**TABLE 60: ALL POLYETHYLENE TIBIAL COMPONENTS VERSUS METAL TIBIAL COMPONENTS: COMPLICATIONS**
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>complications other (patellar crepitus)</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>1.33%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>0.00%</td>
<td>RD</td>
<td>0.01(-0.01,0.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>complications other (knee stiffness)</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>0.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>2.63%</td>
<td>RD</td>
<td>-0.03(-0.06,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>Infection- Complications ( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>0.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>Loosening- Complications (aseptic loosening)</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>1.33%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>2.63%</td>
<td>RR</td>
<td>0.51(0.05,5.47)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>Infection- Complications ( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>0.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>complications other (patellar crepitus)</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>1.33%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>0.00%</td>
<td>RD</td>
<td>0.01(-0.01,0.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>complications other (knee stiffness)</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>0.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>2.63%</td>
<td>RD</td>
<td>-0.03(-0.06,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>complications other (need for other surgeries besides arthroplast (debridement or manipulation))</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>1.33%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>2.63%</td>
<td>RR</td>
<td>0.50(0.05,5.40)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Stability- Function (stability of tibial component measured by maximum migration)</td>
<td>4 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>. %</td>
<td>metal backed tibial components( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Stability- Function (stability of tibial component measured by maximum migration)</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>. %</td>
<td>metal backed tibial components( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Stability- Function (stability of tibial component measured by maximum migration)</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>. %</td>
<td>metal backed tibial components( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Infection- Complications (deep wound infection)</td>
<td>NR</td>
<td>All Polyethylene Tibial Component( )</td>
<td>.</td>
<td>. %</td>
<td>metal backed tibial components( )</td>
<td>.</td>
<td>. %</td>
<td>RR</td>
<td>-0.06(-0.17,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Manipulation Under Anesthesia- Other (mobization under anesthesia)</td>
<td>NR</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>5.88%</td>
<td>metal backed tibial components( )</td>
<td>17</td>
<td>0.00%</td>
<td>RD</td>
<td>0.06(-0.05,0.17)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Deep venous thrombosis( )</td>
<td>Post-Op</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>5.88%</td>
<td>metal backed tibial components( )</td>
<td>17</td>
<td>0.00%</td>
<td>RD</td>
<td>0.06(-0.05,0.17)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>pulmonary embolism( )</td>
<td>Post-Op</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>5.88%</td>
<td>metal backed tibial components( )</td>
<td>17</td>
<td>0.00%</td>
<td>RD</td>
<td>0.06(-0.05,0.17)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Adalberth,G., 2001</td>
<td>Moderate Quality</td>
<td>complications other (maximum migration mm)</td>
<td>4 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>20</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2001</td>
<td>Moderate Quality</td>
<td>complications other (maximum migration mm)</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>20</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2001</td>
<td>Moderate Quality</td>
<td>complications other (maximum migration mm)</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>.</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2001</td>
<td>Moderate Quality</td>
<td>Deep venous thrombosis( )</td>
<td>Post-Op</td>
<td>All Polyethylene Tibial Component( )</td>
<td>20</td>
<td>5.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>18</td>
<td>5.56%</td>
<td>RR</td>
<td>0.90(0.06,13.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2001</td>
<td>Moderate Quality</td>
<td>Manipulation Under Anesthesia- Other (required MUA)</td>
<td>1 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>20</td>
<td>0.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>18</td>
<td>5.56%</td>
<td>RD</td>
<td>-0.06(-0.16,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Norgren,B., 2004</td>
<td>Moderate Quality</td>
<td>Infection- Complications (deep infection)</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>12</td>
<td>8.33%</td>
<td>metal backed tibial components( )</td>
<td>11</td>
<td>0.00%</td>
<td>RD</td>
<td>0.08(-0.07,0.24)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>Loosening-Complications (aseptic loosening)</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>1.33%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>2.63%</td>
<td>RR</td>
<td>0.51(0.05,5.47)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Knee dislocation)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Septicaemia)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Con?rmed cerebrovascular accident)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Surgical complications)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>1.52%</td>
<td>RD</td>
<td>-1.52(-3.23,0.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Fall)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.51%</td>
<td>RD</td>
<td>-0.51(-1.50,0.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Infection- Complications (Con?rmed infection)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Manipulation under anaesthetic)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>201</td>
<td>1.00%</td>
<td>metal backed tibial components( )</td>
<td>196</td>
<td>0.00%</td>
<td>RD</td>
<td>1.00(-0.37,2.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Wound problem)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>201</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>196</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Group 1</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Musculoskeletal ligamentous (including imbalance))</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>201</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>196</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Patella complication)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>201</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>196</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Con?rmed infection)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>201</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>196</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Dislocation)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>201</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>196</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Prosthetic complication)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>201</td>
<td>0.00%</td>
<td>metal backed tibial components( )</td>
<td>196</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Any postoperative complications)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>17.33%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>15.23%</td>
<td>RR</td>
<td>1.14(0.73,1.78)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Proven wound infection)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.50%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.51%</td>
<td>RR</td>
<td>0.98(0.06,15.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Treated DVT or PE)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>2.48%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>1.52%</td>
<td>RR</td>
<td>1.63(0.39,6.71)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Con?med myocardial infarction)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.50%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.51%</td>
<td>RR</td>
<td>0.98(0.06,15.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Other serious complication)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>13.86%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>13.71%</td>
<td>RR</td>
<td>1.01(0.62,1.65)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Medical complications)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>6.93%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>8.12%</td>
<td>RR</td>
<td>0.85(0.43,1.70)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Suspicion of infection)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>3.96%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>2.03%</td>
<td>RR</td>
<td>1.95(0.60,6.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Skin complications)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.99%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>1.02%</td>
<td>RR</td>
<td>0.98(0.14,6.86)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Stiffness)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>0.99%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>0.51%</td>
<td>RR</td>
<td>1.95(0.18,21.34)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Suspected thrombolytic complications)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>1.49%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>1.02%</td>
<td>RR</td>
<td>1.46(0.25,8.66)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>complications other (Urinary complications)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component( )</td>
<td>202</td>
<td>1.49%</td>
<td>metal backed tibial components( )</td>
<td>197</td>
<td>1.02%</td>
<td>RR</td>
<td>1.46(0.25,8.66)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>
### TABLE 61: ALL POLYETHYLENE TIBIAL COMPONENTS VERSUS METAL TIBIAL COMPONENTS: COMPOSITE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>3 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>165</td>
<td>29.3(9.40)</td>
<td>metal backed tibial components( )</td>
<td>162</td>
<td>31(9.90)</td>
<td>Mean Difference</td>
<td>-1.7(-3.80,0.40)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>154</td>
<td>32.7(9.80)</td>
<td>metal backed tibial components( )</td>
<td>157</td>
<td>34.7(10.20)</td>
<td>Mean Difference</td>
<td>-2(-4.23,0.23)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>150</td>
<td>33.3(10.50)</td>
<td>metal backed tibial components( )</td>
<td>142</td>
<td>35.4(10.70)</td>
<td>Mean Difference</td>
<td>-2.1(-4.54,0.34)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>3 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>150</td>
<td>33.8(10.00)</td>
<td>metal backed tibial components( )</td>
<td>150</td>
<td>34.7(10.40)</td>
<td>Mean Difference</td>
<td>-0.9(-3.22,1.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>4 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>153</td>
<td>33.5(10.30)</td>
<td>metal backed tibial components( )</td>
<td>149</td>
<td>34.7(10.30)</td>
<td>Mean Difference</td>
<td>-1.2(-3.53,1.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>139</td>
<td>33.7(10.70)</td>
<td>metal backed tibial components( )</td>
<td>145</td>
<td>34.5(9.80)</td>
<td>Mean Difference</td>
<td>-0.8(-3.20,1.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>6 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>136</td>
<td>33.6(10.50)</td>
<td>metal backed tibial components( )</td>
<td>135</td>
<td>34(10.20)</td>
<td>Mean Difference</td>
<td>-0.4(-2.88,2.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>7 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>131</td>
<td>33.6(10.70)</td>
<td>metal backed tibial components( )</td>
<td>131</td>
<td>33.9(9.70)</td>
<td>Mean Difference</td>
<td>-0.3(-2.78,2.18)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>8 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>114</td>
<td>32.9(10.40)</td>
<td>metal backed tibial components( )</td>
<td>122</td>
<td>33.5(9.90)</td>
<td>Mean Difference</td>
<td>-0.6(-3.20,2.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>9 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>104</td>
<td>32(11.70)</td>
<td>metal backed tibial components( )</td>
<td>110</td>
<td>33(9.40)</td>
<td>Mean Difference</td>
<td>-1(-3.85,1.85)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score(    )</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component(    )</td>
<td>79</td>
<td>32.1(10.30)</td>
<td>metal backed tibial components(    )</td>
<td>81</td>
<td>32.5(10.10)</td>
<td>Mean Difference</td>
<td>-0.4(-3.59,2.79)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Muller,S.D., 2006</td>
<td>Moderate Quality</td>
<td>SF-12 overall score(    )</td>
<td>6 months</td>
<td>All Polyethylene Tibial Component(    )</td>
<td>21</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>19</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Muller,S.D., 2006</td>
<td>Moderate Quality</td>
<td>SF-12 overall score(    )</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component(    )</td>
<td>21</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>19</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Muller,S.D., 2006</td>
<td>Moderate Quality</td>
<td>SF-12 overall score(    )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component(    )</td>
<td>21</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>19</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Muller,S.D., 2006</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score(    )</td>
<td>6 months</td>
<td>All Polyethylene Tibial Component(    )</td>
<td>21</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>19</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Muller,S.D., 2006</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score(    )</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component(    )</td>
<td>21</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>19</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Muller,S.D., 2006</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score(    )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component(    )</td>
<td>21</td>
<td>. %</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>19</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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<td>---------------------</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>69.7(26.09)</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>77.4(23.44)</td>
<td>Mean Difference</td>
<td>-7.7(-15.61,0.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kalisvaart,M.M., 2012</td>
<td>High Quality</td>
<td>knee society score-stair climbing ( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>75</td>
<td>37.3(11.55)</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>39.9(10.00)</td>
<td>Mean Difference</td>
<td>-2.6(-6.05,0.85)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>3.9 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>. %</td>
<td>metal backed tibial components ( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>1 year</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>. %</td>
<td>metal backed tibial components ( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2000</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>17</td>
<td>. %</td>
<td>metal backed tibial components ( )</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Gioe,T.J., 2000</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>4 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>103</td>
<td>74.4(19.60)</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>97</td>
<td>72.1(22.10)</td>
<td>Mean Difference</td>
<td>2.3(-3.50,8.10)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Norgren,B., 2004</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>12</td>
<td>. %</td>
<td>metal backed tibial components ( )</td>
<td>11</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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## Table 63: All Polyethylene Tibial Components versus Metal Tibial Components: Mortality

<table>
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<th>Quality</th>
<th>Outcome Details</th>
<th>Duration Details</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>Mortality (mortality during hospital stay)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component()</td>
<td>Metal backed tibial components()</td>
<td>RD</td>
<td>0.50(-0.47,1.47)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration Details</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>Mortality (mortality during hospital stay)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component()</td>
<td>Metal backed tibial components()</td>
<td>RD</td>
<td>0.50(-0.47,1.47)</td>
<td>Not Significant (P-value&gt;.05)</td>
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### TABLE 64: ALL POLYETHYLENE TIBIAL COMPONENTS VERSUS METAL TIBIAL COMPONENTS: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favor Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalisvaart, M.M., 2012</td>
<td>High Quality</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>75</td>
<td>88.3(1158.00)</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>88.7(9.93)</td>
<td>Mean Difference</td>
<td>-0.4(-262.49,261.69)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>3 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>179</td>
<td>0.644(0.24)</td>
<td>metal backed tibial components( )</td>
<td>182</td>
<td>0.682(0.25)</td>
<td>Mean Difference</td>
<td>-0.04(-0.09,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>178</td>
<td>0.69(0.24)</td>
<td>metal backed tibial components( )</td>
<td>176</td>
<td>0.72(0.27)</td>
<td>Mean Difference</td>
<td>-0.03(-0.08,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>174</td>
<td>0.69(0.27)</td>
<td>metal backed tibial components( )</td>
<td>163</td>
<td>0.719(0.26)</td>
<td>Mean Difference</td>
<td>-0.03(-0.09,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>3 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>163</td>
<td>0.675(0.26)</td>
<td>metal backed tibial components( )</td>
<td>165</td>
<td>0.73(0.25)</td>
<td>Mean Difference</td>
<td>-0.05(-0.10,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>4 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>159</td>
<td>0.673(0.26)</td>
<td>metal backed tibial components( )</td>
<td>163</td>
<td>0.738(0.24)</td>
<td>Mean Difference</td>
<td>-0.06(-0.11,-0.01)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>153</td>
<td>0.638(0.30)</td>
<td>metal backed tibial components( )</td>
<td>149</td>
<td>0.717(0.24)</td>
<td>Mean Difference</td>
<td>-0.08(-0.14,-0.02)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>6 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>146</td>
<td>0.648(0.28)</td>
<td>metal backed tibial components( )</td>
<td>145</td>
<td>0.68(0.28)</td>
<td>Mean Difference</td>
<td>-0.03(-0.09,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>7 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>139</td>
<td>0.65(0.30)</td>
<td>metal backed tibial components( )</td>
<td>135</td>
<td>0.697(0.25)</td>
<td>Mean Difference</td>
<td>-0.05(-0.12,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>8 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>122</td>
<td>0.622(0.30)</td>
<td>metal backed tibial components( )</td>
<td>130</td>
<td>0.678(0.25)</td>
<td>Mean Difference</td>
<td>-0.06(-0.13,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>9 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>113</td>
<td>0.593(0.31)</td>
<td>metal backed tibial components( )</td>
<td>116</td>
<td>0.692(0.23)</td>
<td>Mean Difference</td>
<td>-0.1(-0.17,-0.03)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>83</td>
<td>0.625(0.30)</td>
<td>metal backed tibial components( )</td>
<td>88</td>
<td>0.65(0.24)</td>
<td>Mean Difference</td>
<td>-0.03(-0.11,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>3 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>180</td>
<td>37.8(9.20)</td>
<td>metal backed tibial components( )</td>
<td>178</td>
<td>38.9(10.10)</td>
<td>Mean Difference</td>
<td>-1.1(-3.11,0.91)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>172</td>
<td>38(10.00)</td>
<td>metal backed tibial components( )</td>
<td>176</td>
<td>40.4(11.00)</td>
<td>Mean Difference</td>
<td>-2.4(-4.62,-0.18)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>167</td>
<td>38.1(10.70)</td>
<td>metal backed tibial components( )</td>
<td>156</td>
<td>40.3(10.90)</td>
<td>Mean Difference</td>
<td>-2.2(-4.57,0.17)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>3 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>165</td>
<td>37.3(10.60)</td>
<td>metal backed tibial components( )</td>
<td>157</td>
<td>40.2(10.80)</td>
<td>Mean Difference</td>
<td>-2.9(-5.25,-0.55)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>4 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>157</td>
<td>37.2(10.90)</td>
<td>metal backed tibial components( )</td>
<td>158</td>
<td>39.4(10.30)</td>
<td>Mean Difference</td>
<td>-2.2(-4.55,0.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>149</td>
<td>36.7(11.10)</td>
<td>metal backed tibial components( )</td>
<td>148</td>
<td>39.1(10.80)</td>
<td>Mean Difference</td>
<td>-2.4(-4.90,0.10)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>6 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>141</td>
<td>36.8(10.60)</td>
<td>metal backed tibial components( )</td>
<td>143</td>
<td>37.5(11.00)</td>
<td>Mean Difference</td>
<td>-0.7(-3.22,1.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>7 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>136</td>
<td>35.8(11.70)</td>
<td>metal backed tibial components( )</td>
<td>134</td>
<td>37.8(10.80)</td>
<td>Mean Difference</td>
<td>-2(-4.70,0.70)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>8 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>121</td>
<td>35.8(11.00)</td>
<td>metal backed tibial components( )</td>
<td>130</td>
<td>36.6(10.50)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>9 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>114</td>
<td>34.4(11.30)</td>
<td>metal backed tibial components( )</td>
<td>114</td>
<td>37.6(10.90)</td>
<td>Mean Difference</td>
<td>-3.2(-6.10,-0.30)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>83</td>
<td>33.9(11.10)</td>
<td>metal backed tibial components( )</td>
<td>86</td>
<td>35.9(10.40)</td>
<td>Mean Difference</td>
<td>-2(-5.27,1.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>3 months</td>
<td>All Polyethylene Tibial Component( )</td>
<td>180</td>
<td>50(11.70)</td>
<td>metal backed tibial components( )</td>
<td>178</td>
<td>50.7(11.20)</td>
<td>Mean Difference</td>
<td>-0.7(-3.08,1.68)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>1 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>172</td>
<td>51.4(10.50)</td>
<td>metal backed tibial components( )</td>
<td>176</td>
<td>51.2(11.60)</td>
<td>Mean Difference</td>
<td>0.2(-2.13,2.53)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>167</td>
<td>51(10.20)</td>
<td>metal backed tibial components( )</td>
<td>156</td>
<td>51.4(10.20)</td>
<td>Mean Difference</td>
<td>-0.4(-2.63,1.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>3 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>165</td>
<td>50.4(10.20)</td>
<td>metal backed tibial components( )</td>
<td>157</td>
<td>50.1(10.30)</td>
<td>Mean Difference</td>
<td>0.3(-1.95,2.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Treatment 2 (Details)</td>
<td>Group2</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
<td></td>
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<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score</td>
<td>4 years</td>
<td>All Polyethylene Tibial Component</td>
<td>157</td>
<td>50.8(11.30) metal backed tibial components</td>
<td>158</td>
<td>Mean Difference</td>
<td>1.1(-1.41,3.61)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td></td>
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<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component</td>
<td>149</td>
<td>49.1(11.40) metal backed tibial components</td>
<td>148</td>
<td>Mean Difference</td>
<td>-0.3(-2.96,2.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td></td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score</td>
<td>6 years</td>
<td>All Polyethylene Tibial Component</td>
<td>141</td>
<td>49.2(11.70) metal backed tibial components</td>
<td>143</td>
<td>Mean Difference</td>
<td>-1.2(-3.83,1.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td></td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score</td>
<td>7 years</td>
<td>All Polyethylene Tibial Component</td>
<td>136</td>
<td>50.5(11.50) metal backed tibial components</td>
<td>134</td>
<td>Mean Difference</td>
<td>0.8(-1.90,3.50)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score</td>
<td>8 years</td>
<td>All Polyethylene Tibial Component</td>
<td>121</td>
<td>47.8(11.70) metal backed tibial components</td>
<td>130</td>
<td>Mean Difference</td>
<td>-1.1(-3.96,1.76)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td></td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score</td>
<td>9 years</td>
<td>All Polyethylene Tibial Component</td>
<td>114</td>
<td>50.3(10.90) metal backed tibial components</td>
<td>114</td>
<td>Mean Difference</td>
<td>2.8(-0.08,5.68)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td></td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component</td>
<td>83</td>
<td>49.9(12.00) metal backed tibial components</td>
<td>86</td>
<td>Mean Difference</td>
<td>1.8(-1.65,5.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tr>
</tbody>
</table>
TABLE 66: ALL POLYETHYLENE TIBIAL COMPONENTS VERSUS METAL TIBIAL COMPONENTS: REOPERATION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duratio n</th>
<th>Treatment 1 (Details)</th>
<th>Grou p 1 N</th>
<th>Mean1/ P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Grou p 2 N</th>
<th>Mean2/ P2 (SD2)</th>
<th>Effect Measu re</th>
<th>Result (95% CI)</th>
<th>Favored Treatme nt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalisvaart,M. M., 2012</td>
<td>High Quality</td>
<td>Reoperation- Reoperation ( )</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>75</td>
<td>1.33%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>76</td>
<td>2.63%</td>
<td>RR</td>
<td>0.51(0.05,5.47)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Any further knee surgery before hospital discharge)</td>
<td>During Hospital Stay/short term</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>201</td>
<td>1.99%</td>
<td>metal backed tibial component ( )</td>
<td>196</td>
<td>0.51%</td>
<td>RR</td>
<td>3.90(0.44,34.59)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring any further operation)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>203</td>
<td>10.34%</td>
<td>metal backed tibial component ( )</td>
<td>203</td>
<td>8%</td>
<td>RR</td>
<td>1.29 (0.69, 2.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring At least one minor operation)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>203</td>
<td>6.90%</td>
<td>metal backed tibial component ( )</td>
<td>203</td>
<td>8%</td>
<td>RR</td>
<td>0.86(0.43,1.71)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Debridement/exploration/washout)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>203</td>
<td>0.49%</td>
<td>metal backed tibial component ( )</td>
<td>203</td>
<td>0.5%</td>
<td>RR</td>
<td>0.98(0.06,15.57)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring MUA)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>203</td>
<td>2.46%</td>
<td>metal backed tibial component ( )</td>
<td>203</td>
<td>4%</td>
<td>RR</td>
<td>0.61(0.2,1.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Groupe1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Groupe2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Arthroscopy EUA/biopsy)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>203</td>
<td>2.96%</td>
<td>metal backed tibial component s()</td>
<td>203</td>
<td>3.5%</td>
<td>RR</td>
<td>0.84(0.29,2.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Drain abscess)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>203</td>
<td>0.49%</td>
<td>metal backed tibial component s()</td>
<td>203</td>
<td>0%</td>
<td>RD</td>
<td>.005(-.005,.015)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Exchange poly)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>203</td>
<td>0.99%</td>
<td>metal backed tibial component s()</td>
<td>203</td>
<td>0.5%</td>
<td>RR</td>
<td>1.96(0.18,21.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Removal of patella button)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>203</td>
<td>0.49%</td>
<td>metal backed tibial component s()</td>
<td>203</td>
<td>0%</td>
<td>RD</td>
<td>.005(-.005,.015)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Late patellar resurfacing)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>203</td>
<td>0.49%</td>
<td>metal backed tibial component s()</td>
<td>203</td>
<td>0%</td>
<td>RD</td>
<td>.005(-.005,.015)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Patella revision)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>203</td>
<td>0.00%</td>
<td>metal backed tibial component s()</td>
<td>203</td>
<td>0.5%</td>
<td>RD</td>
<td>-.005(-.015,.005)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W. , 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring at least one major operation)</td>
<td>10 years</td>
<td>All Polyethylene Tibial Component( )</td>
<td>203</td>
<td>3.45%</td>
<td>metal backed tibial component s()</td>
<td>203</td>
<td>1.5%</td>
<td>RR</td>
<td>2.29(0.6,8.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>-----------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>---------</td>
<td>----------------</td>
<td>---------------------</td>
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<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Above-knee amputation)</td>
<td>10 years</td>
<td>All Polyethyl ene Tibial Component( )</td>
<td>203</td>
<td>0.49%</td>
<td>metal backed tibial component s( )</td>
<td>203</td>
<td>0.5%</td>
<td>RR</td>
<td>0.98(0.06,15.57)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Revision for aseptic loosening)</td>
<td>10 years</td>
<td>All Polyethyl ene Tibial Component( )</td>
<td>203</td>
<td>0.99%</td>
<td>metal backed tibial component s( )</td>
<td>203</td>
<td>1%</td>
<td>RR</td>
<td>0.98(0.14,6.89)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Revision for instability)</td>
<td>10 years</td>
<td>All Polyethyl ene Tibial Component( )</td>
<td>203</td>
<td>0.49%</td>
<td>metal backed tibial component s( )</td>
<td>203</td>
<td>0%</td>
<td>RD</td>
<td>.005(-.005,.015)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Revision for pain)</td>
<td>10 years</td>
<td>All Polyethyl ene Tibial Component( )</td>
<td>203</td>
<td>0.99%</td>
<td>metal backed tibial component s( )</td>
<td>203</td>
<td>0%</td>
<td>RD</td>
<td>.01(-.004,.023)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Participants requiring Revision for malalignment)</td>
<td>10 years</td>
<td>All Polyethyl ene Tibial Component( )</td>
<td>203</td>
<td>0.49%</td>
<td>metal backed tibial component s( )</td>
<td>203</td>
<td>0%</td>
<td>RD</td>
<td>.005(-.005,.015)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (revision)</td>
<td>10 years</td>
<td>All Polyethyl ene Tibial Component( )</td>
<td>203</td>
<td>2.96%</td>
<td>metal backed tibial component s( )</td>
<td>203</td>
<td>1%</td>
<td>RR</td>
<td>2.94(0.6,14.4)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Adalberth,G., 2001</td>
<td>Moderate Quality</td>
<td>Reoperation- Reoperation (femoral neck fracture)</td>
<td>3.9 months</td>
<td>All Polyethyl ene Tibial Component( )</td>
<td>20</td>
<td>0.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>18</td>
<td>5.56%</td>
<td>RD</td>
<td>-0.06(-0.16,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Grou p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Grou p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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<td>----------</td>
<td>-----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Adalberth,G., 2001</td>
<td>Moderate Quality</td>
<td>Reoperation- Reoperation (operation for a severe ipsilateral patellar fracture after car accident)</td>
<td>3 months</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>20</td>
<td>0.00%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>18</td>
<td>5.56%</td>
<td>RD</td>
<td>-0.06 (-0.16, 0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Hyldahl, H.C.,2001</td>
<td>High Quality</td>
<td>Reoperation- Reoperation()</td>
<td>2 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>23</td>
<td>4.3%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>22</td>
<td>4.5%</td>
<td>RR</td>
<td>1.045 (0.070,15.70)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Gioe,T.J., 2000</td>
<td>Moderate Quality</td>
<td>Reoperation- Reoperation (revision)</td>
<td>5 years</td>
<td>All Polyethylene Tibial Component ( )</td>
<td>103</td>
<td>7.77%</td>
<td>Modular (Metal Or Polyethylene) Tibial Component (metal backed)</td>
<td>97</td>
<td>5.15%</td>
<td>RR</td>
<td>1.51 (0.51,4.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
PATELLAR RESURFACING

A. PATELLAR RESURFACING: PAIN AND FUNCTION
Strong evidence supports no difference in pain or function with or without patellar resurfacing in total knee arthroplasty.

Strength of Recommendation: Strong Evidence ★★★★★
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

B. PATELLAR RESURFACING: REOPERATIONS
Moderate evidence supports that patellar resurfacing in total knee arthroplasty (TKA) could decrease cumulative reoperations after 5 years when compared to no patellar resurfacing in total knee arthroplasty (TKA).

Strength of Recommendation: Moderate Evidence ★★★★
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

RATIONALE
Strong evidence from high quality studies show very similar outcomes and complications with both patella resurfacing and no resurfacing. Unresurfaced categories often included a variety of limited debridements or releases such as circumferential patella osteophyte debridement or electrocautery. A meta-analysis showed that only reoperation rate (all reoperations, although a significant number were patella-related) was statistically increased in knees without patella resurfacing. This was only significant when enough reoperation data was aggregated to include reoperation after five years.

The high quality KAT trial (Breeman 2011 and Murray 2014) favors resurfacing for reasons of decreased reoperation. Four moderate quality studies also favored resurfacing for different reasons. Waters 2003 demonstrated higher anterior knee pain following total knee arthroplasty without resurfacing. Wood 2002 showed higher incidence of anterior knee pain in the knees that had not been resurfaced. One moderate quality study (Barrack 2001) showed anterior knee pain was same for overall KSS, and pain and function subscores, but reoperation significantly more common without resurfacing. Schroeder-Boersch 1998 showed better task knee function scores with resurfacing. Newman 2000 showed increased need for secondary surgery in the unresurfaced group. Partio 1995 showed decreased anterior knee pain in the resurfaced knees.

On the other hand, two high quality study (Bourne 1995) showed improved total Knee Society Scores (KSS) and KSS function scores in patients without patellar resurfacing. Liu 2012 chose to reshape the patella (osteophyte debridement) and found no difference in total KSS and in pain and function subgroups, arguing to keep patella bone stock. Campbell 2006 was unable to recommend resurfacing because of no significant differences in outcomes or complications. The
KAT trial (Breeman 2011 and Murray 2014) found no statistically significant differences in EQ-5D score, SF-12 physical component scores and SF12 mental component scores.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION
Patellar arthroplasty in total knee arthroplasty has been associated with patella fracture or complications from patella insufficiency and the data suggests that this may increase over time. Not resurfacing the patella in the setting of total knee arthroplasty is associated with patella-related reoperations and all reoperations including infection and revision for which the association is not clearly understood.

FUTURE RESEARCH
Continued comparative large multicenter prospective studies between resurfaced and non-resurfaced patellae may elucidate superiority in more patient reported outcomes instruments. Also, future research should attempt to delineate which patients, with careful attention to age at total knee arthroplasty, may benefit from non-resurfacing of the patella.

RESULTS
SUMMARY OF FINDINGS TABLE 27: PATELLAR RESURFACING (EARLY FOLLOW-UP < 90 DAYS)

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Murray, D.W., 2014</td>
</tr>
<tr>
<td>● Favors Patellar Resurfacing</td>
<td></td>
</tr>
<tr>
<td>● Favors No Patellar Resurfacing</td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Composite</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxford Knee Score</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quality of Life</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EQ-5d</td>
<td>○</td>
</tr>
<tr>
<td>SF-12 Physical Component Score</td>
<td>○</td>
</tr>
<tr>
<td>SF-12 Mental Component Score</td>
<td>○</td>
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</tbody>
</table>
### SUMMARY OF FINDINGS TABLE 28: PATELLAR RESURFACING (LATE FOLLOW-UP > 90 DAYS)

#### SUMMARY OF FINDINGS

<table>
<thead>
<tr>
<th>Complications</th>
<th>High Quality</th>
<th>Moderate Quality</th>
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<tbody>
<tr>
<td>Manipulation Under Anesthesia</td>
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</tr>
<tr>
<td>Composite</td>
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<tr>
<td>Knee Society Score KSS</td>
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<td>○</td>
</tr>
<tr>
<td>Knee Society Score-Knee</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Oxford Knee Score</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Hospital for Special Surgery Knee Rating</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee Society Score-Function</td>
<td>Function</td>
<td>○</td>
</tr>
<tr>
<td>Range of Motion(extension) - Function</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Range of Motion(flexion) - Function</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Range Of Motion(overall) - Function</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Functional Task</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>SF-12 Physical Component- Function</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>SF-12 Mental Component- Function</td>
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<td>○</td>
</tr>
<tr>
<td>Length of Stay</td>
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<tr>
<td>Readmission- Length Of Stay</td>
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<td>○</td>
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<tr>
<td>Other</td>
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<td></td>
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<td>Womac-stiffness averaged VAS Version (0-100)</td>
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<td>○</td>
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<tr>
<td>Satisfaction</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee Society Score-Pain- Pain</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Womac-Pain averaged VAS Version (0-100)</td>
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<td>○</td>
</tr>
<tr>
<td>Anterior Knee Pain- Pain</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Global pain, %</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Knee pain scale</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Functional Task</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Quality of Life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>EQ-5d</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>SF-12 Physical Component Score</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>SF-12 Mental Component Score</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Euroqol-5d(Eq-5d) overall</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Reoperation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reoperation- Reoperation</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Reoperation due to anterior knee pain</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

---

#### Notes
- **High Quality**
  - Favoring Patellar Resurfacing
  - Favoring No Patellar Resurfacing
  - Not Significant

---

**References**
- Wood, D.J., 2002
- Liu, T.J., 2002
- Breeman, S., 2011
- Bourne, R.B., 1995
- Murray, D.W., 2014
- Waters, T.S., 2003
- Smit, Y.Q., 2012
- Smith, A.J., 2008
- Schroeder, Boersch H., 1998
- Partio, E., 1995
- Newman, John H., 2000
- Gildone, A., 2005
- Campbell, D.G., 2006
- Burnett, R.S., 2007
- Barrett, R.L., 2001
- Barrack, R.L., 2011
- Breeman, S., 2011
- Meta-Analysis
FIGURE 3 PATELLAR RESURFACING - REOPERATION STRATIFIED BY FOLLOW UP

<table>
<thead>
<tr>
<th>Reference</th>
<th>Meta</th>
<th>Events, %</th>
<th>Events, RR (95% CI)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood, D.J., 2002</td>
<td>reoperation for any reason</td>
<td>4</td>
<td>1.20 (0.55, 2.62)</td>
<td>53.66</td>
</tr>
<tr>
<td>Partio, E., 1995</td>
<td>reoperation for any reason</td>
<td>2</td>
<td>&gt; 0.00 (., .)</td>
<td>0.00</td>
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<tr>
<td>Smith, A.J., 2008</td>
<td>reoperation for any reason</td>
<td>4</td>
<td>1.19 (0.36, 3.96)</td>
<td>46.34</td>
</tr>
<tr>
<td>Barrack, R.L., 1997</td>
<td>revision due to anterior knee pain</td>
<td>2.5</td>
<td>&gt; 0.00 (., .)</td>
<td>0.00</td>
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<tr>
<td>Boume, R.B., 1995</td>
<td>reoperation due to anterior knee pain</td>
<td></td>
<td>&gt; 0.00 (., .)</td>
<td>0.00</td>
</tr>
<tr>
<td>Gildone, A., 2005</td>
<td>reoperation for any reason</td>
<td>2</td>
<td>(Excluded)</td>
<td>0.00</td>
</tr>
<tr>
<td>Subtotal (I-squared = 53.0%, p = 0.074)</td>
<td></td>
<td></td>
<td>1.20 (0.22, 6.40)</td>
<td>100.00</td>
</tr>
<tr>
<td>over 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Newman, John H., 2000</td>
<td>reoperation all for anterior knee pain</td>
<td>5</td>
<td>&gt; 0.00 (., .)</td>
<td>0.00</td>
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<tr>
<td>Burnett, R.S., 2004</td>
<td>Revision for any reason</td>
<td>10</td>
<td>0.33 (0.07, 1.49)</td>
<td>2.35</td>
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<tr>
<td>Campbell, D.G., 2006</td>
<td>reoperation for any reason</td>
<td>10</td>
<td>0.75 (0.22, 2.50)</td>
<td>3.69</td>
</tr>
<tr>
<td>Waters, T.S., 2003</td>
<td>reoperation due to anterior knee pain</td>
<td>5.3</td>
<td>0.26 (0.07, 0.92)</td>
<td>3.38</td>
</tr>
<tr>
<td>Barrack, R.L., 2001</td>
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<td>5</td>
<td>&gt; 0.00 (., .)</td>
<td>0.00</td>
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<tr>
<td>Murray, D.W., 2014</td>
<td>reoperation for any reason</td>
<td>10</td>
<td>0.80 (0.62, 1.02)</td>
<td>90.59</td>
</tr>
<tr>
<td>Subtotal (I-squared = 0.0%, p = 0.438)</td>
<td></td>
<td></td>
<td>0.75 (0.59, 0.95)</td>
<td>100.00</td>
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</table>

NOTE: Weights are from random effects analysis.
FIGURE 4 PATELLAR RESURFACING (SENSITIVITY ANALYSIS) - REOPERATION WITH BARRACK 1997 AND 2001 REMOVED SINCE REOPERATIONS FOR REASONS OTHER THAN ANTERIOR KNEE PAIN WERE EXCLUDED FROM THAT ANALYSIS.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Meta</th>
<th>N</th>
<th>RR (95% CI)</th>
<th>Treatment</th>
<th>Control</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 5 years</td>
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<td></td>
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</tr>
<tr>
<td>Wood, D.J., 2002</td>
<td></td>
<td></td>
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<td>9/92</td>
<td>55.72</td>
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<tr>
<td>Partio, E., 1995</td>
<td></td>
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<td>0.00 (., .)</td>
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<tr>
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<td></td>
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<td>1.19 (0.36, 3.96)</td>
<td>5/72</td>
<td>5/86</td>
<td>44.28</td>
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<tr>
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<td></td>
<td></td>
<td>0.00 (., .)</td>
<td>0/50</td>
<td>20/68</td>
<td>0.00</td>
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<tr>
<td>Gilmore, A., 2005</td>
<td></td>
<td></td>
<td>(Excluded)</td>
<td>0/28</td>
<td>0/28</td>
<td>0.00</td>
</tr>
<tr>
<td>Subtotal (I-squared = 45.7%, p = 0.137)</td>
<td></td>
<td></td>
<td>1.20 (0.31, 4.55)</td>
<td>20/325</td>
<td>35/322</td>
<td>100.00</td>
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</tbody>
</table>

over 5 years | | | | | | |
| Newman, John H., 2000 | | | 0.00 (., .) | 0/37 | 6/34 | 0.00 |
| Burnett, R.S., 2004 | | | 0.33 (0.07, 1.49) | 2/42 | 7/48 | 5.73 |
| Campbell, D.G., 2006 | | | 0.75 (0.22, 2.50) | 4/30 | 5/28 | 8.75 |
| Waters, T.S., 2003 | | | 0.26 (0.07, 0.92) | 3/243 | 11/231 | 8.07 |
| Murray, D.W., 2014 | | | 0.80 (0.62, 1.02) | 101/841 | 125/830 | 77.46 |
| Subtotal (I-squared = 8.9%, p = 0.356) | | | 0.69 (0.47, .998) | 110/1193 | 154/1171 | 100.00 |

NOTE: Weights are from random effects analysis.
**QUALITY EVALUATION TABLE 18: PATELLAR RESURFACING**

**Quality Chart Key**

- **●** = No Flaw in Domain of Interest
- **○** = Flaw in Domain of Interest
- **□** = Half flaw in domain of interest

### QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
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<td>●</td>
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<td></td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
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### QE - Intervention - Randomized

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<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
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<td>●</td>
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<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
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<td>○</td>
<td>●</td>
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<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>●</td>
<td>Include</td>
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<td>Burnett,R.S., 2004</td>
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<td>Moderate Quality</td>
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<td>Moderate Quality</td>
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<td>●</td>
<td>○</td>
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<td>○</td>
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<td>Moderate Quality</td>
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<td>Include</td>
<td>Moderate Quality</td>
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<td>Liu,Z.T., 2012</td>
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<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>Include</td>
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<td>○</td>
<td>●</td>
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<td>○</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
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<td>Partio,E., 1995</td>
<td>○</td>
<td>○</td>
<td>●</td>
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<td>○</td>
<td>○</td>
<td>●</td>
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<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Smith,A.J., 2008</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Sun,Y.Q., 2012</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
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<td>Moderate Quality</td>
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<tr>
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<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Wood,D.J., 2002</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
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</table>
### DETAILED DATA TABLES

#### TABLE 67: PATELLAR RESURFACING VERSUS NO PATELLAR RESURFACING: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeman,S., 2011</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia- Other (need MUA)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>2.09%</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>2.69%</td>
<td>RR</td>
<td>0.78(0.42,1.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>3 months</td>
<td>Resurfacing( )</td>
<td>661</td>
<td>31.2(9.60)</td>
<td></td>
<td></td>
<td></td>
<td>Mean Difference</td>
<td>0.7(-0.32,1.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>635</td>
<td>34.7(9.40)</td>
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<td></td>
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<td>Mean Difference</td>
<td>0.2(-0.88,1.28)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>556</td>
<td>35.6(9.80)</td>
<td></td>
<td></td>
<td></td>
<td>Mean Difference</td>
<td>0.4(-0.76,1.56)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>3 years</td>
<td>Resurfacing( )</td>
<td>609</td>
<td>35.5(10.10)</td>
<td></td>
<td></td>
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<td>Mean Difference</td>
<td>0.8(-0.36,1.96)</td>
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<td>Oxford Knee Score( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>610</td>
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<td></td>
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<td>Mean Difference</td>
<td>0.6(-0.59,1.79)</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>594</td>
<td>35(10.60)</td>
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<td>Mean Difference</td>
<td>0.4(-0.80,1.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>6 years</td>
<td>Resurfacing( )</td>
<td>550</td>
<td>35.1(10.50)</td>
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<td></td>
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<td>Mean Difference</td>
<td>0.2(-1.04,1.44)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>7 years</td>
<td>Resurfacing( )</td>
<td>530</td>
<td>34.6(11.00)</td>
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<td>Mean Difference</td>
<td>0.4(-0.91,1.71)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Oxford Knee Score( )</td>
<td>8 years</td>
<td>Resurfacing( )</td>
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<td>34(11.00)</td>
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<td>Oxford Knee Score( )</td>
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<td>Resurfacing( )</td>
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<td>Resurfacing( )</td>
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<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
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<td>Breeman,S., 2011 High Quality</td>
<td>Sf-12 Physical Component-Function ( )</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<td>5.9 months</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>65(18.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>63(23.00)</td>
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<td>Knee Society Score-Function-Function ( )</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>70(21.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>71(20.00)</td>
<td>Mean Difference</td>
<td>-1(-9.04,7.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>67(26.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>76(19.00)</td>
<td>Mean Difference</td>
<td>-9(-17.93,-0.07)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
<td></td>
</tr>
<tr>
<td>Bourne,R.B., 1995 High Quality</td>
<td>Range Of Motion (flexion) - Function (Knee flexion torque)</td>
<td>5.9 months</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>34(15.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>35(15.00)</td>
<td>Mean Difference</td>
<td>-1(-6.88,4.88)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Range Of Motion (flexion) - Function (Knee flexion torque)</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>38(14.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>42(18.00)</td>
<td>Mean Difference</td>
<td>-4(-10.4,2.4)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>Range Of Motion (flexion) - Function (Knee flexion torque)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>41(12.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>49(17.00)</td>
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<td>-8(-13.77,2.23)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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<td>Range Of Motion (extension) - Function (Knee extension torque)</td>
<td>5.9 months</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>56(18.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>63(28.00)</td>
<td>Mean Difference</td>
<td>-7(-16.23,2.23)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>1 years</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>65(18.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>76(29.00)</td>
<td>Mean Difference</td>
<td>-11(-20.46,1.54)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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</table>

**TABLE 69: PATELLAR RESURFACING VERSUS NO PATELLAR RESURFACING: FUNCTION**
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bourne,R.B., 1995</td>
<td>High</td>
<td>Range Of Motion (extension) - Function (Knee extension torque)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>50</td>
<td>70(21.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>74(23.00)</td>
<td>Mean Difference</td>
<td>-4 (-12.74, 4.74)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>3 years</td>
<td>Resurfacing( )</td>
<td>68</td>
<td>74.6(17.60)</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>64</td>
<td>72.4(19.10)</td>
<td>Mean Difference</td>
<td>2.2(-4.08,8.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>68</td>
<td>47.9(17.50)</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>64</td>
<td>43.8(16.20)</td>
<td>Mean Difference</td>
<td>4.1(-1.65,9.85)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>68</td>
<td>64.7(16.20)</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>64</td>
<td>67.5(16.90)</td>
<td>Mean Difference</td>
<td>-2.8 (-8.5, 2.9)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>68</td>
<td>75.8(17.60)</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>64</td>
<td>77.6(18.50)</td>
<td>Mean Difference</td>
<td>-1.8(-7.97,4.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>68</td>
<td>80(19.90)</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>64</td>
<td>76.5(17.60)</td>
<td>Mean Difference</td>
<td>3.5(-2.90,9.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>6 years</td>
<td>Resurfacing( )</td>
<td>68</td>
<td>79.6(18.30)</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>64</td>
<td>81.3(20.00)</td>
<td>Mean Difference</td>
<td>-1.7(-8.25,4.85)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>7 years</td>
<td>Resurfacing( )</td>
<td>68</td>
<td>83.8(16.30)</td>
<td>No Resurfacing (Control) (Reshaping)</td>
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<td>80.2(18.10)</td>
<td>Mean Difference</td>
<td>3.6(-2.29,9.49)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>91</td>
<td>65(28.50)</td>
<td>No Resurfacing (Control) ( )</td>
<td>127</td>
<td>70(32.50)</td>
<td>Mean Difference</td>
<td>-5(-13.14,3.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Barrack,R.L., 1997</td>
<td>Moderate</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>2.5 years</td>
<td>Resurfacing( )</td>
<td>58</td>
<td>110(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>60</td>
<td>113(.)</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Quality</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<tr>
<td>Barrack,R.L., 1997</td>
<td>Moderate Quality</td>
<td>Functional Task (Difficulty exiting from an automobile)</td>
<td>2.5 years</td>
<td>Resurfacing( )</td>
<td>58</td>
<td>7.9(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>60</td>
<td>8.2(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Barrack,R.L., 1997</td>
<td>Moderate Quality</td>
<td>Functional Task (Difficulty rising from a chair)</td>
<td>2.5 years</td>
<td>Resurfacing( )</td>
<td>58</td>
<td>8.9(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>60</td>
<td>8.7(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Barrack,R.L., 1997</td>
<td>Moderate Quality</td>
<td>Functional Task (Difficulty in stair climbing)</td>
<td>2.5 years</td>
<td>Resurfacing( )</td>
<td>58</td>
<td>7.7(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>60</td>
<td>7.9(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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<td>Barrack,R.L., 2001</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>44</td>
<td>73.5(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>44</td>
<td>80.7(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Barrack,R.L., 2001</td>
<td>Moderate Quality</td>
<td>Functional Task (Exiting an automobile)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>44</td>
<td>7.5(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>44</td>
<td>8.1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Barrack,R.L., 2001</td>
<td>Moderate Quality</td>
<td>Functional Task (Rising for a chair)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>44</td>
<td>8.1(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>44</td>
<td>8.1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Barrack,R.L., 2001</td>
<td>Moderate Quality</td>
<td>Functional Task (Stair-climbing)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>44</td>
<td>7.9(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>44</td>
<td>7.9(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Barrack,R.L., 2001</td>
<td>Moderate Quality</td>
<td>Reoperation- Reoperation (reoperation due to anterior knee pain)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>58</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>60</td>
<td>10.00%</td>
<td>RD</td>
<td>-0.10(-0.20,-0.03)</td>
<td>Significant (P-value&lt;.05)</td>
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<tr>
<td>Burnett,R.S., 2004</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>38</td>
<td>108.6(12.60)</td>
<td>No Resurfacing (Control) ( )</td>
<td>41</td>
<td>108.5(15.80)</td>
<td>Mean Difference</td>
<td>0.1(-6.18,6.38)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Burnett,R.S., 2004</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>38</td>
<td>58.7(24.70)</td>
<td>No Resurfacing (Control) ( )</td>
<td>41</td>
<td>59.5(25.30)</td>
<td>Mean Difference</td>
<td>-0.8(-11.83,10.23)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Campbell,D.G., 2006</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Campbell,D.G., 2006</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<td>-----------------</td>
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</tr>
<tr>
<td>Campbell,D.G., 2006</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Campbell,D.G., 2006</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>8 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
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<td>. %</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Campbell,D.G., 2006</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
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<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting out of a car)</td>
<td>1 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>3.1(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>3.2(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting out of a car)</td>
<td>3 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>4.4(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>4.5(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting out of a car)</td>
<td>6 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>6(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>6.2</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gildone,A., 2005</td>
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<td>Functional Task (VAS: perceived difficulty getting into a chair)</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>7.7(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>7.9(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Functional Task (VAS: perceived difficulty getting into a chair)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>7.9(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>8(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting into a chair)</td>
<td>1 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>3.3(.)</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>3.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Functional Task (VAS: perceived difficulty getting into a chair)</td>
<td>3 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>4.7(.)</td>
<td>No Resurfacing (Control) ( )</td>
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<td>4.7(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting into a chair)</td>
<td>6 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>6.2(.)</td>
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<td>6.7(.)</td>
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<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>1 years</td>
<td>Resurfacing( )</td>
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<td>7.0( )</td>
<td>No Resurfacing (Control) ( )</td>
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<td>7.4( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Functional Task (VAS: perceived difficulty getting into a chair)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>8.2( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>8.1( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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<tr>
<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting up/down stairs)</td>
<td>1 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>3.9( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>3.8( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting up/down stairs)</td>
<td>3 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>4.9( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>5.1( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Functional Task (VAS: perceived difficulty getting up/down stairs)</td>
<td>5.9 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>7.4( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>7.6( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting up/down stairs)</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>7.8( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>8.2( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Functional Task (VAS: perceived difficulty getting up/down stairs)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>8.4( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>8.40( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>1 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>54.1( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>56.3( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Gildone,A., 2005</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>3 months</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>80.4( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>78.6( )</td>
<td>Author Reported</td>
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<td>Knee Society Score-Function-Function ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>47</td>
<td>77.1( )</td>
<td>No Resurfacing (Control) ( )</td>
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<td>78.1( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Partio,E., 1995</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>47</td>
<td>112( )</td>
<td>No Resurfacing (Control) ( )</td>
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<td>108( )</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Schroeder,Boersch H., 1998</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-( )</td>
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<td>Resurfacing( )</td>
<td>20</td>
<td>76.5( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>19</td>
<td>68.3( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Schroeder,Boersch H., 1998</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-( )</td>
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<td>Resurfacing( )</td>
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<td>80( )</td>
<td>No Resurfacing (Control) ( )</td>
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<td>69.5( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Significant (P-value&lt;.05)</td>
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<td>Moderate Quality</td>
<td>Functional Task (Climbing stairs)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>20</td>
<td>39.5( )</td>
<td>No Resurfacing (Control) ( )</td>
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<td>32.1( )</td>
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<td>NA</td>
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<td>Smith,A.J., 2008</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>73</td>
<td>14.4(19.30)</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>18.6(19.50)</td>
<td>Mean Difference -4.2(-10.25,1.85)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Smith,A.J., 2008</td>
<td>Moderate Quality</td>
<td>Functional Task (Able to rise with ease without use of arms)</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>72</td>
<td>56.94%</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>62.79%</td>
<td>RR (. . .)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Smith,A.J., 2008</td>
<td>Moderate Quality</td>
<td>Functional Task (Ascent stair using no rail or rail for balance only)</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>72</td>
<td>56.94%</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>66.28%</td>
<td>RR (. . .)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Smith,A.J., 2008</td>
<td>Moderate Quality</td>
<td>Functional Task (Ascent leads with operated leg or in reciprocal manner)</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>72</td>
<td>84.72%</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>83.72%</td>
<td>RR (. . .)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Smith,A.J., 2008</td>
<td>Moderate Quality</td>
<td>Functional Task (Descent rail using no rail or rail for balance only)</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>72</td>
<td>50.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>60.47%</td>
<td>RR (. . .)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tr>
<tr>
<td>Smith,A.J., 2008</td>
<td>Moderate Quality</td>
<td>Functional Task (Stair decent leads with non operated leg or in reciprocal manner)</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>72</td>
<td>69.44%</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>76.74%</td>
<td>RR (. . .)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Sun,Y.Q., 2012</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>4.5 years</td>
<td>Resurfacing(Patelloplasty)</td>
<td>68</td>
<td>73.6(13.10)</td>
<td>No Resurfacing (Control) (Traditional)</td>
<td>64</td>
<td>61.9(16.50)</td>
<td>Mean Difference</td>
<td>11.7(6.60,16.80)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Sun,Y.Q., 2012</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>4.5 years</td>
<td>Resurfacing(Patelloplasty)</td>
<td>68</td>
<td>123.2(9.80)</td>
<td>No Resurfacing (Control) (Traditional)</td>
<td>64</td>
<td>119.7(12.80)</td>
<td>Mean Difference</td>
<td>3.5(-0.41,7.41)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>
# TABLE 70: PATELLAR RESURFACING VERSUS NO PATELLAR RESURFACING: LENGTH OF STAY

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
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<tbody>
<tr>
<td>Breeman, S., 2011</td>
<td>High Quality</td>
<td>Readmission- Length Of Stay ()</td>
<td>5 years</td>
<td>Resurfacing ()</td>
<td>861</td>
<td>12.08%</td>
<td>No Resurfacing (Control) ()</td>
<td>854</td>
<td>13.11%</td>
<td>RR</td>
<td>0.92 (0.72, 1.18)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>Mean Difference</td>
<td>-3.4(-6.56,-0.24)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>Mean Difference</td>
<td>1.8(-1.20,4.80)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>3 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>Mean Difference</td>
<td>-3.4(-6.40,-0.40)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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<tr>
<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>Mean Difference</td>
<td>-0.5(-2.92,1.92)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>Mean Difference</td>
<td>-0.6(-3.24,2.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>6 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>Mean Difference</td>
<td>-0.4(-3.26,2.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Liu,Z.T., 2012</td>
<td>High</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>7 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) (Reshaping)</td>
<td>Mean Difference</td>
<td>0.7(-2.04,3.44)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Barrack,R.L., 2001</td>
<td>Moderate</td>
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<td>5 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Burnett,R.S., 2004</td>
<td>Moderate</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Campbell,D.G., 2006</td>
<td>Moderate</td>
<td>Womac-Pain averaged VAS</td>
<td>8 years</td>
<td>Resurfacing( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Womac-Pain averaged VAS Version (0-100)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
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<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Campbell, D.G., 2006</td>
<td>Moderate Quality</td>
<td>Anterior Knee Pain-Pain ( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
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<td>35.00 %</td>
<td>No Resurfacing (Control) ( )</td>
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<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Campbell, D.G., 2006</td>
<td>Moderate Quality</td>
<td>Anterior Knee Pain-Pain ( )</td>
<td>8 years</td>
<td>Resurfacing( )</td>
<td>NR</td>
<td>29.00 %</td>
<td>No Resurfacing (Control) ( )</td>
<td>NR</td>
<td>33.00 %</td>
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<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Campbell, D.G., 2006</td>
<td>Moderate Quality</td>
<td>Anterior Knee Pain-Pain (No patellar pain)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>47.00 %</td>
<td>No Resurfacing (Control) ( )</td>
<td>30</td>
<td>43.00 %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Partio, E., 1995</td>
<td>Moderate Quality</td>
<td>Anterior Knee Pain-Pain ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>47</td>
<td>97.87%</td>
<td>No Resurfacing (Control) ( )</td>
<td>48</td>
<td>77.08%</td>
<td>RR</td>
<td>1.27(1.08,1.49)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Partio, E., 1995</td>
<td>Moderate Quality</td>
<td>Functional Task (no compression pain)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>47</td>
<td>91.49%</td>
<td>No Resurfacing (Control) ( )</td>
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<td>54.17%</td>
<td>RR</td>
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<td>Knee Society Score-Pain-Pain ( )</td>
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<td>Resurfacing( )</td>
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<td>45.3( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>19</td>
<td>42.5( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Schroeder, Boerch H., 1998</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>20</td>
<td>45( )</td>
<td>No Resurfacing (Control) ( )</td>
<td>19</td>
<td>40( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Smith, A.J., 2008</td>
<td>Moderate Quality</td>
<td>Knee pain scale( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>73</td>
<td>47.7(25.00)</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>48.7(23.20)</td>
<td>Mean Difference</td>
<td>-1(-8.55,6.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Sun,Y.Q., 2012</td>
<td>Moderate Quality</td>
<td>Global pain, %()</td>
<td>4.5 years</td>
<td>Resurfacing(Patelloplasty)</td>
<td>68</td>
<td>. %</td>
<td>No Resurfacing (Control) (Traditional)</td>
<td>64</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Sun,Y.Q., 2012</td>
<td>Moderate Quality</td>
<td>Anterior Knee Pain-Pain (VAS)</td>
<td>4.5 years</td>
<td>Resurfacing(Patelloplasty)</td>
<td>68</td>
<td>1.3(%)</td>
<td>No Resurfacing (Control) (Traditional)</td>
<td>64</td>
<td>1.4(%)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Waters,T.S., 2003</td>
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<td>Anterior Knee Pain-Pain ()</td>
<td>5.3 years</td>
<td>Resurfacing()</td>
<td>243</td>
<td>5.35%</td>
<td>No Resurfacing (Control) ()</td>
<td>231</td>
<td>25.11%</td>
<td>RR</td>
<td>0.21(0.12,0.38)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
## Table 72: Patellar Resurfacing Versus No Patellar Resurfacing: Quality of Life

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeman, S., 2011</td>
<td>High quality</td>
<td>Euroqol-5d(Eq-5d) overall ( )</td>
<td>5 years</td>
<td>Resurfacing ( )</td>
<td>861</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>3 months</td>
<td>Resurfacing ( )</td>
<td>737</td>
<td>0.703(0.23)</td>
<td>( )</td>
<td>739</td>
<td>0.687(0.24)</td>
<td>Mean Difference</td>
<td>0.02(0.00,0.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>1 year</td>
<td>Resurfacing ( )</td>
<td>734</td>
<td>0.744(0.23)</td>
<td>( )</td>
<td>725</td>
<td>0.732(0.25)</td>
<td>Mean Difference</td>
<td>0.01(-0.01,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>2 years</td>
<td>Resurfacing ( )</td>
<td>693</td>
<td>0.743(0.24)</td>
<td>( )</td>
<td>689</td>
<td>0.724(0.27)</td>
<td>Mean Difference</td>
<td>0.02(-0.01,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>3 years</td>
<td>Resurfacing ( )</td>
<td>679</td>
<td>0.733(0.25)</td>
<td>( )</td>
<td>667</td>
<td>0.706(0.28)</td>
<td>Mean Difference</td>
<td>0.03(0.00,0.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>4 years</td>
<td>Resurfacing ( )</td>
<td>661</td>
<td>0.717(0.27)</td>
<td>( )</td>
<td>647</td>
<td>0.688(0.29)</td>
<td>Mean Difference</td>
<td>0.03(0.00,0.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>5 years</td>
<td>Resurfacing ( )</td>
<td>641</td>
<td>0.718(0.26)</td>
<td>( )</td>
<td>611</td>
<td>0.701(0.27)</td>
<td>Mean Difference</td>
<td>0.02(-0.01,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>6 years</td>
<td>Resurfacing ( )</td>
<td>589</td>
<td>0.705(0.27)</td>
<td>( )</td>
<td>572</td>
<td>0.686(0.28)</td>
<td>Mean Difference</td>
<td>0.02(-0.01,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>7 years</td>
<td>Resurfacing ( )</td>
<td>573</td>
<td>0.695(0.28)</td>
<td>( )</td>
<td>550</td>
<td>0.677(0.29)</td>
<td>Mean Difference</td>
<td>0.02(-0.01,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>8 years</td>
<td>Resurfacing ( )</td>
<td>532</td>
<td>0.669(0.29)</td>
<td>( )</td>
<td>512</td>
<td>0.672(0.29)</td>
<td>Mean Difference</td>
<td>0(-0.04,0.04)</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
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</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>9 years</td>
<td>Resurfacing( )</td>
<td>490</td>
<td>0.667(0.30)</td>
<td>( )</td>
<td>475</td>
<td>0.659(0.28)</td>
<td>Mean Difference</td>
<td>0.01(-0.03,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>EQ-5d( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>443</td>
<td>0.665(0.29)</td>
<td>( )</td>
<td>424</td>
<td>0.647(0.30)</td>
<td>Mean Difference</td>
<td>0.02(-0.02,0.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>3 months</td>
<td>Resurfacing( )</td>
<td>719</td>
<td>39.4(9.40)</td>
<td>( )</td>
<td>708</td>
<td>38.7(9.10)</td>
<td>Mean Difference</td>
<td>0.7(-0.26,1.66)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>725</td>
<td>40.8(10.50)</td>
<td>( )</td>
<td>708</td>
<td>40.7(10.40)</td>
<td>Mean Difference</td>
<td>0.1(-0.98,1.18)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>694</td>
<td>40.7(11.00)</td>
<td>( )</td>
<td>675</td>
<td>40.8(10.40)</td>
<td>Mean Difference</td>
<td>-0.1(-1.24,1.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>3 years</td>
<td>Resurfacing( )</td>
<td>659</td>
<td>40.8(11.10)</td>
<td>( )</td>
<td>651</td>
<td>39.8(10.90)</td>
<td>Mean Difference</td>
<td>1(-0.19,2.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>652</td>
<td>39.7(11.40)</td>
<td>( )</td>
<td>641</td>
<td>39.2(10.90)</td>
<td>Mean Difference</td>
<td>0.5(-0.72,1.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>622</td>
<td>39.6(11.00)</td>
<td>( )</td>
<td>612</td>
<td>39.4(11.50)</td>
<td>Mean Difference</td>
<td>0.2(-1.06,1.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>6 years</td>
<td>Resurfacing( )</td>
<td>578</td>
<td>39.1(11.10)</td>
<td>( )</td>
<td>554</td>
<td>38.7(11.40)</td>
<td>Mean Difference</td>
<td>0.4(-0.91,1.71)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>7 years</td>
<td>Resurfacing( )</td>
<td>559</td>
<td>38.6(11.60)</td>
<td>( )</td>
<td>532</td>
<td>38.5(11.50)</td>
<td>Mean Difference</td>
<td>0.1(-1.27,1.47)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>8 years</td>
<td>Resurfacing( )</td>
<td>518</td>
<td>37.6(11.20)</td>
<td>( )</td>
<td>501</td>
<td>38.1(11.60)</td>
<td>Mean Difference</td>
<td>-0.5(-1.90,0.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>9 years</td>
<td>Resurfacing( )</td>
<td>478</td>
<td>37.6(11.30)</td>
<td>( )</td>
<td>459</td>
<td>37.9(11.40)</td>
<td>Mean Difference</td>
<td>-0.3(-1.76,1.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Physical Component Score( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>440</td>
<td>37.5(11.50)</td>
<td>( )</td>
<td>416</td>
<td>37.3(11.10)</td>
<td>Mean Difference</td>
<td>0.2(-1.32,1.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>3 months</td>
<td>Resurfacing( )</td>
<td>719</td>
<td>39.4(9.40)</td>
<td>( )</td>
<td>708</td>
<td>38.7(9.10)</td>
<td>Mean Difference</td>
<td>0.7(-0.26,1.66)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>1 years</td>
<td>Resurfacing( )</td>
<td>725</td>
<td>40.8(10.50)</td>
<td>( )</td>
<td>708</td>
<td>40.7(10.40)</td>
<td>Mean Difference</td>
<td>0.1(-0.98,1.18)</td>
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<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>694</td>
<td>40.7(11.00)</td>
<td>( )</td>
<td>675</td>
<td>40.8(10.40)</td>
<td>Mean Difference</td>
<td>-0.1(-1.24,1.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>3 years</td>
<td>Resurfacing( )</td>
<td>659</td>
<td>40.8(11.10)</td>
<td>( )</td>
<td>651</td>
<td>39.8(10.90)</td>
<td>Mean Difference</td>
<td>1(-0.19,2.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>4 years</td>
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<td>652</td>
<td>39.7(11.40)</td>
<td>( )</td>
<td>641</td>
<td>39.2(10.90)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
</tr>
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<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
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<td>Resurfacing( )</td>
<td>622</td>
<td>39.6(11.00)</td>
<td>( )</td>
<td>612</td>
<td>39.4(11.50)</td>
<td>Mean Difference</td>
<td>0.2(-1.06,1.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>6 years</td>
<td>Resurfacing( )</td>
<td>578</td>
<td>39.1(11.10)</td>
<td>( )</td>
<td>554</td>
<td>38.7(11.40)</td>
<td>Mean Difference</td>
<td>0.4(-0.91,1.71)</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
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<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
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<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>7 years</td>
<td>Resurfacing( )</td>
<td>559</td>
<td>38.6(11.60)</td>
<td>( )</td>
<td>532</td>
<td>38.5(11.50)</td>
<td>Mean Difference</td>
<td>0.1(-1.27,1.47)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>8 years</td>
<td>Resurfacing( )</td>
<td>518</td>
<td>37.6(11.20)</td>
<td>( )</td>
<td>501</td>
<td>38.1(11.60)</td>
<td>Mean Difference</td>
<td>-0.5(-1.90,0.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>9 years</td>
<td>Resurfacing( )</td>
<td>478</td>
<td>37.6(11.30)</td>
<td>( )</td>
<td>459</td>
<td>37.9(11.40)</td>
<td>Mean Difference</td>
<td>-0.3(-1.76,1.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>SF-12 Mental Component Score( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>440</td>
<td>37.5(11.50)</td>
<td>( )</td>
<td>416</td>
<td>37.3(11.10)</td>
<td>Mean Difference</td>
<td>0.2(-1.32,1.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Burnett,R.S., 2004</td>
<td>Moderate Quality</td>
<td>Patient satisfaction (Extremely satisfied or very satisfied)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>40</td>
<td>85.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>41</td>
<td>92.68%</td>
<td>RR</td>
<td>0.92(0.78,1.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Partio,E., 1995</td>
<td>Moderate Quality</td>
<td>Patient satisfaction (Enthusiastic)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>47</td>
<td>53.19%</td>
<td>No Resurfacing (Control) ( )</td>
<td>48</td>
<td>41.67%</td>
<td>RR</td>
<td>1.28(0.83,1.96)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Schroeder,Boersch H., 1998</td>
<td>Moderate Quality</td>
<td>Patient satisfaction (Excellent)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>20</td>
<td>60.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>19</td>
<td>52.63%</td>
<td>RR</td>
<td>1.14(0.65,1.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Breeman,S., 2011</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (reoperation for patellar fracture)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>0.23%</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(-0.00,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Breeman,S., 2011</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (late patellar resurfacing)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>0.81%</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>1.87%</td>
<td>RR</td>
<td>0.43(0.18,1.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Breeman,S., 2011</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (at least one major operation (one or two stage revision, or above the knee amputation))</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>862</td>
<td>1.62%</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>2.93%</td>
<td>RR</td>
<td>0.55(0.29,1.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Breeman,S., 2011</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (above knee amputation)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>0.23%</td>
<td>RD</td>
<td>-0.00(-0.01,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Breeman,S., 2011</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (at least one minor reoperation (wound closure, debridement/ washout, MUA, arthrolysis and quadricepsplasty, arthroscopy under anesthesia, exchange of cement spacer, polyethylene exchange, bone removal))</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>4.41%</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>5.85%</td>
<td>RR</td>
<td>0.75(0.50,1.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Bourne,R.B., 1995</td>
<td>High Quality</td>
<td>Reoperation due to anterior knee pain (reoperation due to anterior knee pain)</td>
<td>2 years</td>
<td>Resurfacing(Reoperation-Reoperation)</td>
<td>50</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>50</td>
<td>40.00%</td>
<td>RD</td>
<td>-4.00(-9.43,1.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favoured Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Breeman,S., 2011</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (reoperation for any reason)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>861</td>
<td>7.20%</td>
<td>No Resurfacing (Control) ( )</td>
<td>854</td>
<td>10.66%</td>
<td>RR</td>
<td>0.68(0.50,0.92)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (at least one revision)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>3.09%</td>
<td>( )</td>
<td>830</td>
<td>4.46%</td>
<td>RR</td>
<td>0.69(0.42,1.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (any patella related reoperation)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>1.78%</td>
<td>( )</td>
<td>830</td>
<td>1.81%</td>
<td>RR</td>
<td>0.99 (0.49, 2.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (late patellar resurfacing required)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>1.07%</td>
<td>( )</td>
<td>830</td>
<td>1.93%</td>
<td>RR</td>
<td>0.56(0.25,1.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (reoperation due to patella fracture)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>0.24%</td>
<td>( )</td>
<td>830</td>
<td>0.00%</td>
<td>RD</td>
<td>.002(-.001,.006)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (patella revision required)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>0.24%</td>
<td>( )</td>
<td>830</td>
<td>0.00%</td>
<td>RD</td>
<td>.002(-.001,.006)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (patella realignment required)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>0.12%</td>
<td>( )</td>
<td>830</td>
<td>0.00%</td>
<td>RD</td>
<td>.001(-.001,.004)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (removal of patella button required)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>0.12%</td>
<td>( )</td>
<td>830</td>
<td>0.00%</td>
<td>RD</td>
<td>.001(-.001,.004)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (required above knee amputation)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>0.00%</td>
<td>( )</td>
<td>830</td>
<td>0.24%</td>
<td>RD</td>
<td>-0.002(-0.006,0.001)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------</td>
<td>------------------------------------------------------</td>
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<td>----------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>High</td>
<td>Reoperation-Reoperation (reoperation for any reason)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>841</td>
<td>12.01%</td>
<td></td>
<td>830</td>
<td>15.06%</td>
<td>RR</td>
<td>0.80(0.62,1.02)</td>
<td>Not Significant (P- value&gt;.05)</td>
</tr>
<tr>
<td>Wood,D.J., 2002</td>
<td>High</td>
<td>Reoperation-Reoperation (Revisions and other reoperations)</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>128</td>
<td>11.72%</td>
<td>No Resurfacing (Control) ( )</td>
<td>92</td>
<td>9.78%</td>
<td>RR</td>
<td>(...)</td>
<td>Not Significant (P- value&gt;.05)</td>
</tr>
<tr>
<td>Barrack,R.L., 1997</td>
<td>Moderate</td>
<td>Reoperation-Reoperation (revision due to anterior knee pain)</td>
<td>2.5 years</td>
<td>Resurfacing( )</td>
<td>58</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>60</td>
<td>11.67%</td>
<td>RD</td>
<td>-0.12(-0.20,-0.04)</td>
<td>Treatment 1 Significant (P- value&lt;.05)</td>
</tr>
<tr>
<td>Barrack,R.L., 2001</td>
<td>Moderate</td>
<td>Reoperation-Reoperation (revision due to anterior knee pain)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>58</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>60</td>
<td>10.00%</td>
<td>RD</td>
<td>-0.10(-0.18,-0.02)</td>
<td>Treatment 1 Significant (P- value&lt;.05)</td>
</tr>
<tr>
<td>Burnett,R.S., 2004</td>
<td>Moderate</td>
<td>Reoperation-Reoperation ( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>42</td>
<td>4.76%</td>
<td>No Resurfacing (Control) ( )</td>
<td>48</td>
<td>14.58 %</td>
<td>RR</td>
<td>0.33(0.07,1.49)</td>
<td>Not Significant (P- value&gt;.05)</td>
</tr>
<tr>
<td>Burnett,R.S., 2007</td>
<td>Moderate</td>
<td>Reoperation-Reoperation (knees randomized )</td>
<td>10 years</td>
<td>Resurfacing(knees randomized )</td>
<td>32</td>
<td>10.5%</td>
<td>No Resurfacing (Control) ( )</td>
<td>32</td>
<td>7.00 %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P- value&gt;.05)</td>
</tr>
<tr>
<td>Campbell,D.G., 2006</td>
<td>Moderate</td>
<td>Reoperation-Reoperation (reoperation for any reason)</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>30</td>
<td>13.33%</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>17.86%</td>
<td>RR</td>
<td>0.75(0.22,2.50)</td>
<td>Not Significant (P- value&gt;.05)</td>
</tr>
<tr>
<td>Gildone,A., 2005</td>
<td>Moderate</td>
<td>Reoperation-Reoperation (reoperation for any reason)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>28</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>28</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P- value&gt;.05)</td>
</tr>
<tr>
<td>Newman,John H., 2000</td>
<td>Moderate</td>
<td>Reoperation-Reoperation (revision: subsequent)</td>
<td>5 years</td>
<td>Resurfacing( )</td>
<td>37</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>34</td>
<td>17.65%</td>
<td>RD</td>
<td>-0.18(-0.30,-0.05)</td>
<td>Treatment 1 Significant (P- value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-----------------------------------------------------</td>
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<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Partio, E., 1995</td>
<td>Moderate Quality</td>
<td>Reoperation-Reoperation (reoperation for any reason)</td>
<td>2 years</td>
<td>Resurfacing( )</td>
<td>47</td>
<td>0.00%</td>
<td>No Resurfacing (Control) ( )</td>
<td>48</td>
<td>2.08%</td>
<td>RD</td>
<td>-0.02(-0.06,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Smith, A.J., 2008</td>
<td>Moderate Quality</td>
<td>Reoperation-Reoperation (reoperation for any reason)</td>
<td>4 years</td>
<td>Resurfacing( )</td>
<td>72</td>
<td>6.94%</td>
<td>No Resurfacing (Control) ( )</td>
<td>86</td>
<td>5.81%</td>
<td>RR</td>
<td>1.18(0.35,3.91)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Waters, T.S., 2003</td>
<td>Moderate Quality</td>
<td>Reoperation-Reoperation (reoperation due to anterior knee pain)</td>
<td>5.3 years</td>
<td>Resurfacing( )</td>
<td>243</td>
<td>1.23%</td>
<td>No Resurfacing (Control) ( )</td>
<td>231</td>
<td>4.76%</td>
<td>RR</td>
<td>0.26(0.07,0.92)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
## TABLE 74: PATELLAR RESURFACING VERSUS NO PATELLAR RESURFACING: OTHER OUTCOMES

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell, D.G., 2006</td>
<td>Moderate Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100) ( )</td>
<td>8 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Campbell, D.G., 2006</td>
<td>Moderate Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100) ( )</td>
<td>10 years</td>
<td>Resurfacing( )</td>
<td>.</td>
<td>. %</td>
<td>No Resurfacing (Control) ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
BONE CEMENT

Overall recommendation language: A range of evidence (Strong, Moderate, and Limited Quality, based on component) examining component fixation supports the use of cemented or cementless fixation in knee arthroplasty due to similar functional outcomes and rates of complications and reoperations.

CEMENTED TIBIAL COMPONENTS VERSUS CEMENTLESS TIBIAL COMPONENTS

Strong evidence supports the use of tibial component fixation that is cemented or cementless in total knee arthroplasty due to similar functional outcomes and rates of complications and reoperations.

Strength of Recommendation: Strong Evidence ★★★★★
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

CEMENTED FEMORAL & TIBIAL COMPONENTS VERSUS CEMENTLESS FEMORAL & TIBIAL COMPONENTS

Moderate evidence supports the use of either cemented femoral and tibial components or cementless femoral and tibial components in knee arthroplasty due to similar rates of complications and reoperations.

Strength of Recommendation: Moderate Evidence ★★★★☆
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

ALL CEMENTED COMPONENTS VERSUS HYBRID FIXATION (CEMENTLESS FEMORAL COMPONENT)

Moderate evidence supports the use of either cementing all components or hybrid fixation (cementless femur) in total knee arthroplasty due to similar functional outcomes and rates of complications and reoperations.

Strength of Recommendation: Moderate Evidence ★★★★☆
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

ALL CEMENTLESS COMPONENTS VERSUS HYBRID FIXATION (CEMENTLESS FEMORAL COMPONENT)

Limited evidence supports the use of either all cementless components or hybrid fixation (cementless femur) in total knee arthroplasty due to similar rates of complications and reoperations.

Strength of Recommendation: Limited Evidence ★★★★☆
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

RATIONALE


The overall body of evidence was notable for heterogeneity in study design and comparative study groups (including cementless, hybrid, and cemented fixation). Nevertheless, across comparative groups, no major differences existed between cemented and cementless fixation with respect to rates of complications and re-operations, including studies with longer follow up (Khaw 2002, Baker 2007, Kim 2014).

Only small differences were seen with respect to outcome measures, depending on the particular study comparative groups, length of follow up, and scoring instruments. Lizaur-Utrilla found no significant differences in WOMAC scores at follow-up time points of two years or less when comparing cemented and cementless tibial fixation (with cementless femoral fixation and selective patellar resurfacing in both arms). WOMAC scores were significantly better in the uncemented (porous) tibial group (-5[-9.49,-0.51]) at final follow up (average 7 years), but this difference was not clinically significant. Knee Society function scores were significantly better in the uncemented tibial group only at the 2 year follow up (-4[-7.62,-0.38]). Knee Society pain scores were significantly better at 2 years (-3 [-5.58, -0.42]) and at final follow up (-3 [-5.68, -0.32]), but not at 6 months or one year. In a study comparing cemented and cementless tibial fixation (with cementless femoral fixation and selective patellar resurfacing in both arms), Beaupré reported that WOMAC pain and RAND SF-36 bodily pain scores were significantly worse in the group with cementless hydroxyapatite-coated tibial components (9.1[2.79,15.41] versus 18.1[9.66,26.54] for cemented fixation) at 6 months. The differences in pain did not remain statistically significant at 1 or 5 years post-operatively. Fernandez-Fairen found that WOMAC scores were worse in the cemented tibial fixation group compared to scores in the cementless tibial fixation group (cementless femoral fixation and no patellar resurfacing in both arms), with a difference of 4 points (CI 0.13, 7.87) that was not clinically significant. When comparing non-modular cemented tibial components with non-modular cementless porous tibial components, Pulido demonstrated more improvement in Knee Society pain scores (5 [0.08, 9.92]) in the cemented tibial group, but this difference was not clinically significant. When comparing non-unicompartmental knee arthroplasty patients implanted with either cemented or cementless femoral/tibial fixation, Pandit reported significantly worse Knee Society function scores at 5 years (-12.2[-20.26,-4.14]), but not at 1 or 2 years, for the cemented group. Tegner Activity Scores in the cemented group were significantly worse at 2 years (-0.6[-1.10,-0.10]), but not at 1 or 5 years.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION

There are no known harms associated with implementing this recommendation. The decision to use cementless versus cementless fixation may be influenced by particular patient situations. The practitioner should be aware of the advantages and disadvantages of particular treatments.
methods. For example, intra-operative fracture during component insertion or failure of ingrowth may be of concern with certain cementless designs in patients with poor bone quality.

**FUTURE RESEARCH**

Continued comparative studies between modern cemented and cementless component fixation options in knee arthroplasty will help to further define the utility of these component types, durability of fixation, and effect of evolving component designs (e.g. modular and monolithic) on patient-reported outcomes. Certainly, newer fixation materials (e.g. porous metals) should be evaluated in long-term follow-up. Identifying patient-specific factors that may inform the decision to utilize a particular fixation technique, or to avoid complications associated with particular fixation strategies, is important. Registry data and long-term studies (greater than ten years clinical follow up) should inform durability of particular components and may serve to analyze implant-specific complications and revision risk. Given some variability in the reported patient-reported outcome measures between treatment groups in particular high-quality studies, more clinical data may discern subtle differences in clinical outcomes based on the use of cemented or cementless component fixation. Issues of cost and cost-effectiveness should be incorporated into future clinical studies.
### RESULTS

**SUMMARY OF FINDINGS TABLE 11: PART 1 TIBIAL COMPONENT CEMENTING**

<table>
<thead>
<tr>
<th>Complications</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DVT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-op stiffness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-op patellar pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-op femoral loosening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-op tibial loosening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-op instability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wound drainage or delayed healing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthrofibrosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patellar crepitus and Clark syndrome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contained hematoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep periprosthetic joint infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Femoral aseptic loosening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Femoral periprosthetic fracture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patella periprosthetic fracture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation</td>
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<tr>
<td>GI bleed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progressive loosening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-op complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-op femoral fracture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Composites                                              |              |                  |
| WOMAC-overall                                          | ●            | ●                |
| RAND short form 36(all other subscales besides pain and function) | ● | ○ |

| Function                                                |              |                  |
| Knee Society Score-Function                             |              |                  |
| WOMAC-Function                                          |              |                  |
| RAND short form 36-physical function                    |              |                  |

| Length of stay                                          |              |                  |
| Length of stay                                          |              |                  |

| Pain                                                    |              |                  |
| Knee Society Score-Pain                                 |              |                  |
| WOMAC-Pain                                              |              |                  |
| RAND short form 36-bodily pain                          |              |                  |

| Reoperation                                             |              |                  |
| Reoperation                                             |              |                  |
### SUMMARY OF FINDINGS TABLE 12: PART 2 CEMENTED FEMORAL AND TIBIAL COMPONENTS

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Favors Cemented Femoral and Tibial Components</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Favors Cementless Femoral and Tibial Components</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Not Significant</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Infection</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Composite | | |
| WOMAC-overall | ○ | ○ |

| Function | | |
| Knee Society Score-Function | ○ | ● |
| Tegner Activity Scale | ● | |

| Mortality | | |
| Mortality | ○ | |

| Reoperation | | |
| Reoperation | ○ | ○ | ○ | ○ |
**SUMMARY OF FINDINGS TABLE 13: PART 3 ALL COMPONENT CEMENTED VERSUS HYBRID (CEMENTLESS FEMORAL)**

<table>
<thead>
<tr>
<th>Complications</th>
<th>High Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>aseptic loosening</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>ligamentous laxity</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>pain due to intra-articular cement fragment</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>vascular ischemia secondary to popliteal thrombosis</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Deep infection</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Composite</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>KOOS-Total Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>KOOS-Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Knee Society-Function</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>KOOS Pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>quality of life</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>KOOS-Quality Of Life</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>Recomeration</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>reoperation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
<td>☐</td>
</tr>
<tr>
<td>symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate Quality</td>
<td>Parker, D.A., 2001</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Favors Hybrid Fixation (Cementless Femoral Component)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Favors All Cementless Components</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Not Significant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Complications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infection causing revision</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td><strong>Reoperation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reoperation</strong></td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>
**QUALITY EVALUATION TABLE 7: BONE CEMENT**

**Quality Chart Key**

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- ◯ = Half flaw in domain of interest

**QE - Intervention - Observational**

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khatod,M., 2013</td>
<td>○</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

**QE - Intervention - Randomized**

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baker,P.N., 2007</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Beaupré,L.A., 2007</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Carlsson,A., 2005</td>
<td>◯</td>
<td>◯</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Demey,G., 2011</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Fernandez-Fairen,M., 2013</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Iosifidis,M., 2014</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
<tr>
<td>Khaw,F.M., 2002</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Kim,Y.H., 2014</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Lizaizur-Utrilla,A., 2014</td>
<td>●</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
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<tr>
<td>Pandit,H., 2013</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Park,J.W., 2011</td>
<td>●</td>
<td>◯</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Parker, D.A., 2001</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>
# DETAILED DATA TABLES

## TABLE 75 PART 1 TIBIAL COMPONENTS CEMENTED VERSUS TIBIAL COMPONENTS UNCEMENTED

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Effect Measure</th>
<th>Result (95%CI)</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlsson,A., 2005</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function ( )</td>
<td>2 years</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial component)</td>
<td>53 . %</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous or hydroxyapatite-coated tibial component)</td>
<td>57 . %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fernandez-Fairen,M., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>5 years</td>
<td>Hybrid(Partially) Cemented Arthroplasty (uncemented femoral and cemented tibial with no resurfacing)</td>
<td>63 63(19.1)</td>
<td>Uncemented Arthroplasty (porous. all components uncemented with no resurfacing)</td>
<td>69 69(15.1)</td>
<td>Mean Difference</td>
<td>4(0.13,7.87)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Fernandez-Fairen,M., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (cc)</td>
<td>post op</td>
<td>Hybrid(Partially) Cemented Arthroplasty (uncemented femoral and cemented tibial with no resurfacing)</td>
<td>63 71(889)</td>
<td>Uncemented Arthroplasty (porous. all components uncemented with no resurfacing)</td>
<td>73 73(908)</td>
<td>Mean Difference</td>
<td>-19(-63.76,25.76)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fernandez-Fairen,M., 2013</td>
<td>High Quality</td>
<td>Blood transfusion %()</td>
<td>post op</td>
<td>Hybrid(Partially) Cemented Arthroplasty (uncemented femoral</td>
<td>71 85%</td>
<td>Uncemented Arthroplasty (porous. all components</td>
<td>73 78%</td>
<td>RR</td>
<td>1.08(0.92,1.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Outcome</td>
<td>Time</td>
<td>Description</td>
<td>Mean</td>
<td>SD</td>
<td>Mean Difference</td>
<td>RR</td>
<td>Significance</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>---------</td>
<td>------</td>
<td>-------------</td>
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<td>----------------</td>
<td>----</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>Fernandez-Fairen, M., 2013</td>
<td>High Quality</td>
<td>Length Of Recovery</td>
<td>Length Of Stay (days)</td>
<td>during hospital stay</td>
<td>Hybrid (Partially) Cemented Arthroplasty (uncemented femoral and cemented tibial with no resurfacing)</td>
<td>71</td>
<td>71 (3.2)</td>
<td>Uncemented Arthroplasty (porous. all components uncemented with no resurfacing)</td>
<td>73</td>
<td>73 (3.2)</td>
</tr>
<tr>
<td>Fernandez-Fairen, M., 2013</td>
<td>High Quality</td>
<td>complications other (total complications)</td>
<td>5 years</td>
<td>Hybrid (Partially) Cemented Arthroplasty (uncemented femoral and cemented tibial with no resurfacing)</td>
<td>64</td>
<td>17%</td>
<td>Uncemented Arthroplasty (porous. all components uncemented with no resurfacing)</td>
<td>71</td>
<td>13%</td>
<td>RR</td>
</tr>
<tr>
<td>Fernandez-Fairen, M., 2013</td>
<td>High Quality</td>
<td>Deep venous thrombosis()</td>
<td>5 years</td>
<td>Hybrid (Partially) Cemented Arthroplasty (uncemented femoral and cemented tibial with no resurfacing)</td>
<td>64</td>
<td>3%</td>
<td>Uncemented Arthroplasty (porous. all components uncemented with no resurfacing)</td>
<td>71</td>
<td>3%</td>
<td>RR</td>
</tr>
<tr>
<td>Fernandez-Fairen, M., 2013</td>
<td>High Quality</td>
<td>complications other (post op stiffness)</td>
<td>5 years</td>
<td>Hybrid (Partially) Cemented Arthroplasty</td>
<td>64</td>
<td>11%</td>
<td>Uncemented Arthroplasty (porous. all components uncemented with no resurfacing)</td>
<td>71</td>
<td>8%</td>
<td>RR</td>
</tr>
<tr>
<td>Fernandez-Fairen, M., 2013</td>
<td>High Quality</td>
<td>Infection-Complications(s)</td>
<td>5 years</td>
<td>Hybrid(Partially) Cemented Arthroplasty(uncemented femoral and cemented tibial with no resurfacing)</td>
<td>64</td>
<td>2%</td>
<td>Uncemented Arthroplasty(porous, all components uncemented with no resurfacing)</td>
<td>71</td>
<td>0%</td>
<td>RD</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------</td>
<td>----------------------------</td>
<td>---------</td>
<td>-------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Fernandez-Fairen, M., 2013</td>
<td>High Quality</td>
<td>complications other(patellar pain)</td>
<td>5 years</td>
<td>Hybrid(Partially) Cemented Arthroplasty(uncemented femoral and cemented tibial with no resurfacing)</td>
<td>64</td>
<td>2%</td>
<td>Uncemented Arthroplasty(porous, all components uncemented with no resurfacing)</td>
<td>71</td>
<td>1%</td>
<td>RR</td>
</tr>
<tr>
<td>Fernandez-Fairen, M., 2013</td>
<td>High Quality</td>
<td>Reoperation(for patellar pain, infection, or postop stiffness)</td>
<td>5 years</td>
<td>Hybrid(Partially) Cemented Arthroplasty(uncemented femoral and cemented tibial with no resurfacing)</td>
<td>64</td>
<td>14%</td>
<td>Uncemented Arthroplasty(porous, all components uncemented with no resurfacing)</td>
<td>71</td>
<td>10%</td>
<td>RR</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Change in Knee Society Pain</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>41(19)</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>36(18)</td>
<td>Mean Difference</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Change in Knee Society Function</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>19(23)</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>18(23)</td>
<td>Mean Difference</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complications (femoral fracture)</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>0%</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>0%</td>
<td>rd</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complications (femoral loosening)</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>0%</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>0%</td>
<td>rd</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complications (tibial loosening)</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all)</td>
<td>115</td>
<td>0%</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but</td>
<td>106</td>
<td>0%</td>
<td>rd</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complication(s) (instability)</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>3.48%</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>0.94%</td>
<td>rr</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complication(s) (infection)</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>1.74%</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>1.89%</td>
<td>rr</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complication(s) (total complications)</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>3.48%</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>2.83%</td>
<td>rr</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complication(s) (Wound drainage or delayed healing)</td>
<td>Minimum of 2 year follow up</td>
<td>Conventional Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>6.96%</td>
<td>Conventional Bone Cement (Without Antibiotics) (all but tibial components cemented)</td>
<td>106</td>
<td>4.72%</td>
<td>rr</td>
</tr>
<tr>
<td>Pulido, L., 2014</td>
<td>Moderate Quality</td>
<td>Complication s</td>
<td>Minimum of 2 year follow up</td>
<td>Convention al Bone Cement (Without Antibiotics) (all components cemented)</td>
<td>115</td>
<td>4.35%</td>
<td>Convention al Bone Cement (Without Antibiotics) (all tibial components cemented)</td>
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<td>4.72%</td>
<td>rr</td>
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<td>Complication s</td>
<td>Minimum of 2 year follow up</td>
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<td>0%</td>
<td>Convention al Bone Cement (Without Antibiotics) (all tibial components cemented)</td>
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<td>2.61%</td>
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<td>Complication s</td>
<td>Minimum of 2 year follow up</td>
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<td>0%</td>
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<td>Complication</td>
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<td>Uncemented Arthroplasty (TKA with hydroxyapatite-coated tibial component and cemented patellar component when resurfacing was deemed necessary.)</td>
<td>41</td>
<td>39</td>
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<td>complications other (postoperative or after discharge)</td>
<td>Post-Op</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial fixation and cemented patellar component when resurfacing was deemed necessary.)</td>
<td>Uncemented Arthroplasty (TKA with hydroxyapatite-coated tibial component and cemented patellar component when resurfacing was deemed necessary.)</td>
<td>41</td>
<td>39</td>
<td>0.00%</td>
<td>0.00 (0.00, 0.00)</td>
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<td>RAND short form 36 (all other subscales)</td>
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<td>Uncemented Arthroplasty (TKA with hydroxyapatite-coated tibial component and cemented patellar component when resurfacing was deemed necessary.)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>&gt;.05</td>
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besides pain and function) 
cemented tibial fixation and cemented patellar component when resurfacing was deemed necessary.)
tite-coated tibial component and cemented patellar component when resurfacing was deemed necessary)

<table>
<thead>
<tr>
<th>Lizaur-Utrilla,A., 2014</th>
<th>Womac-overall-Composite averaged VAS version (0-100)</th>
<th>6 months</th>
<th>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar compents when resurfacing was deemed necessary)</th>
<th>48</th>
<th>78(16.40)</th>
<th>Uncemente d Arthroplast y (TKA with uncemented porous tibial components and cemented patellar compents when resurfacing was deemed necessary)</th>
<th>45</th>
<th>80(17.10)</th>
<th>Mean Difference</th>
<th>-2(-8.82, 4.82)</th>
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<td>1 years</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar compents when resurfacing was deemed necessary)</td>
<td>48</td>
<td>76(23.80)</td>
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<td>Comparator 2</td>
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<td>Womac-overall-Composite averaged VAS version (0-100)</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar compoents when resurfacing was deemed necessary)</td>
<td>Uncemente d Arthroplast y (TKA with uncemented porous tibial components and cemented patellar compoents when resurfacing was deemed necessary)</td>
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<td>Womac-function averaged VAS Version (0-100) (raw scores)</td>
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<td>Uncemente d Arthroplast y (TKA with hydroxyapatite-coated)</td>
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<td>41</td>
<td>71.7(19.60)</td>
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<td>39</td>
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<td>Womac-function averaged VAS Version (0-100) (raw scores)</td>
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<td>41</td>
<td>76(18.00)</td>
<td>Uncemented Arthroplasty (TKA with hydroxyapatite-coated tibial component and cemented patellar component when resurfacing was deemed necessary)</td>
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<td>74.6(22.80)</td>
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<td>Mean Difference</td>
<td>P-value</td>
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<td>RAND short form 36-physical function (raw score)</td>
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<td>RAND short form 36-physical function (raw score)</td>
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<td>6 months</td>
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<td>48</td>
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<td>Uncemented Arthroplasty (TKA with hydroxyapatite-coated tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
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<td>RAND short form 36-bodily pain (raw scores)</td>
<td>6 months</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial fixation and cemented patellar component when resurfacing was deemed necessary.)</td>
<td>41</td>
<td>63(19.40)</td>
<td>39</td>
<td>44.9(19.10)</td>
<td>Mean Difference</td>
<td>18.1(9.66,26.54)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>2007</td>
<td>High</td>
<td>RAND short form 36-bodily pain (raw scores)</td>
<td>1 year</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial fixation and cemented patellar component when resurfacing was deemed necessary.)</td>
<td>41</td>
<td>64.1(26.50)</td>
<td>39</td>
<td>58.7(22.40)</td>
<td>Mean Difference</td>
<td>5.4(-16.02,9.22)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>2007</td>
<td>High</td>
<td>RAND short form 36-bodily pain (raw scores)</td>
<td>5 years</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial fixation and cemented patellar component when resurfacing was deemed necessary.)</td>
<td>41</td>
<td>56.1(29.70)</td>
<td>39</td>
<td>59.5(27.90)</td>
<td>Mean Difference</td>
<td>-3.4(-16.02,9.22)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lizaur-Utrilla, A., 2014</td>
<td>High Quality Knee Society Score- Pain ( )</td>
<td>6 months</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>48</td>
<td>45(5.80)</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>45</td>
<td>45(5.3)</td>
<td>Mean Difference</td>
<td>0 (-2.29, 2.29)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Lizaur-Utrilla, A., 2014</td>
<td>High Quality Knee Society Score- Pain ( )</td>
<td>1 year</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>48</td>
<td>45(6.10)</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>45</td>
<td>47(5.6)</td>
<td>Mean Difference</td>
<td>-2 (-4.42, 0.42)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Study: Lizaur-Utrilla, A., 2014</td>
<td>Quality: High</td>
<td>Score: Knee Society Score - Pain</td>
<td>Time: 2 years</td>
<td>Treatment 1: Cemented Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>Treatment 2: Uncemented Arthroplasty (TKA with uncemented porous tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>Mean Difference: -3 (95% CI: -5.58, -0.42)</td>
<td>Treatment 2 Significant (P-value &lt; 0.05)</td>
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<tr>
<td>Study: Lizaur-Utrilla, A., 2014</td>
<td>Quality: High</td>
<td>Score: Knee Society Score - Pain</td>
<td>Time: 7 years</td>
<td>Treatment 1: Cemented Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>Treatment 2: Uncemented Arthroplasty (TKA with uncemented porous tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>Mean Difference: -3 (95% CI: -5.68, -0.32)</td>
<td>Treatment 2 Significant (P-value &lt; 0.05)</td>
<td></td>
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</tr>
<tr>
<td>Study: Lizaur-Utrilla, A., 2014</td>
<td>Quality: High</td>
<td>Reoperation: Reoperation (revision)</td>
<td>Time: 9 years</td>
<td>Treatment 1: Cemented Bone Cement (Without Antibiotics) (TKA with cemented)</td>
<td>Treatment 2: Uncemented Arthroplasty (TKA with uncemented porous)</td>
<td>RR: 4.69 (95% CI: 0.57, 38.59)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<tr>
<td>Lizaur-Utrilla, A., 2014</td>
<td>High Quality</td>
<td>Reoperation-Reoperation (reoperation for any reason)</td>
<td>9 years</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>48</td>
<td>12.50%</td>
<td>Uncemente d Arthroplast y (TKA with uncemented porous tibial components and cemented patellar components when resurfacing was deemed necessary)</td>
<td>45</td>
<td>4.44%</td>
<td>RR</td>
<td>2.81(0.60,13.22)</td>
</tr>
</tbody>
</table>
### TABLE 76 PART 2 FEMORAL AND TIBIAL COMPONENTS CEMENTED VERSUS FEMORAL AND TIBIAL COMPONENTS UNCEMENTED

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pandit,H., 2013</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function( )</td>
<td>1 years</td>
<td>Convention al Bone Cement (Without Antibiotics) (uninocompart mental arthroplasty with cemented tibial and femoral components )</td>
<td>31</td>
<td>87.5(16.00)</td>
<td>Uncemented Arthroplasty (uninocompart mental unncemented femoral and tibial components (both filled with porous titanium and coated with hydroxyapatite))</td>
<td>27</td>
<td>90.5(11.70)</td>
<td>Mean Difference</td>
<td>-3(-10.16,4.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pandit,H., 2013</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function( )</td>
<td>2 years</td>
<td>Convention al Bone Cement (Without Antibiotics) (uninocompart mental arthroplasty with cemented tibial and femoral components )</td>
<td>31</td>
<td>86.6(14.50)</td>
<td>Uncemented Arthroplasty (uninocompart mental unncemented femoral and tibial components (both filled with porous titanium and coated with hydroxyapatite))</td>
<td>27</td>
<td>91.5(12.90)</td>
<td>Mean Difference</td>
<td>-4.9(-11.95,2.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pandit,H., 2013</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function( )</td>
<td>5 years</td>
<td>Convention al Bone Cement (Without Antibiotics)</td>
<td>31</td>
<td>79.8(18.40)</td>
<td>Uncemented Arthroplasty (uninocompart</td>
<td>27</td>
<td>92(12.70)</td>
<td>Mean Difference</td>
<td>-12.2(-20.26,-4.14)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Pandit, H., 2013</td>
<td>Moderate Quality</td>
<td>Tenger Activity Scale( )</td>
<td>1 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (unicompartmental arthroplasty with cemented tibial and femoral components)</td>
<td>31</td>
<td>2.9(0.90)</td>
<td>Uncemented Arthroplasty (unicompartmental uncemented femoral and tibial components (both filled with porous titanium and coated with hydroxyapatite))</td>
<td>27</td>
<td>3.1(1.10)</td>
<td>Mean Difference</td>
<td>-0.2(-0.72,0.32)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Pandit, H., 2013</td>
<td>Moderate Quality</td>
<td>Tenger Activity Scale( )</td>
<td>2 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (unicompartmental arthroplasty with cemented tibial and femoral components)</td>
<td>31</td>
<td>2.5(0.80)</td>
<td>Uncemented Arthroplasty (unicompartmental uncemented femoral and tibial components (both filled with porous titanium and coated with hydroxyapatite))</td>
<td>27</td>
<td>3.1(1.10)</td>
<td>Mean Difference</td>
<td>-0.6(-1.10,-0.10)</td>
<td>Treatment 2 Significant (P-value &lt;.05)</td>
</tr>
<tr>
<td>Pandit, H., 2013</td>
<td>Moderate Quality</td>
<td>Tenger Activity Scale</td>
<td>5 years</td>
<td>Convention Bone Cement (Without Antibiotics) (unicompart mental arthroplasty with cemented tibial and femoral components)</td>
<td>31</td>
<td>2.60 (0.80)</td>
<td>Uncemented Arthroplasty (unicompart mental uncemented femoral and tibial components) (both filled with porous titanium and coated with hydroxyapatite)</td>
<td>27</td>
<td>2.90 (0.60)</td>
<td>Mean Difference</td>
<td>-0.30 (-0.66, 0.06)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Pandit, H., 2013</td>
<td>Moderate Quality</td>
<td>Mortality</td>
<td>6 months</td>
<td>Convention Bone Cement (Without Antibiotics) (unicompart mental arthroplasty with cemented tibial and femoral components)</td>
<td>33</td>
<td>3.03%</td>
<td>Uncemented Arthroplasty (unicompart mental uncemented femoral and tibial components) (both filled with porous titanium and coated with hydroxyapatite)</td>
<td>30</td>
<td>0.00%</td>
<td>RD</td>
<td>0.03 (-0.03, 0.09)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Pandit, H., 2013</td>
<td>Moderate Quality</td>
<td>Mortality</td>
<td>5 years</td>
<td>Convention Bone Cement (Without Antibiotics) (unicompart mental arthroplasty with cemented tibial and femoral components)</td>
<td>33</td>
<td>6.06%</td>
<td>Uncemented Arthroplasty (unicompart mental)</td>
<td>33</td>
<td>6.06%</td>
<td>RR</td>
<td>1.00 (0.15, 6.68)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Study</td>
<td>Quality</td>
<td>Reoperation Type</td>
<td>Follow-up</td>
<td>Cemented Arthroplasty (Without Antibiotics)</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous coated)</td>
<td>Hazard Ratio</td>
<td>P-value</td>
<td>Significance</td>
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<tr>
<td>Baker, P.N., 2007</td>
<td>Moderate</td>
<td>Reoperation - Reoperation (revision)</td>
<td>15 years</td>
<td>Conventional Bone Cement (TKA with cemented femoral and tibial components)</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous coated)</td>
<td>0.81 (0.49, 1.34)</td>
<td>&gt;0.05</td>
<td>Not Significant</td>
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<td>Khaw, F.M., 2002</td>
<td>Moderate</td>
<td>Reoperation - Reoperation (revision)</td>
<td>10 years</td>
<td>Conventional Bone Cement (TKA with cemented femoral and tibial components)</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous coated)</td>
<td>.97 (0.36, 2.6)</td>
<td>&gt;0.05</td>
<td>Not Significant</td>
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<tr>
<td>Year</td>
<td>Quality</td>
<td>Procedure</td>
<td>Follow-up</td>
<td>Measurement</td>
<td>n</td>
<td>%</td>
<td>Measurement</td>
<td>n</td>
<td>%</td>
<td>Author</td>
<td>Reported</td>
<td>Value</td>
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<tr>
<td>2011</td>
<td>Moderate</td>
<td>Knee Society Score-Function ()</td>
<td>13.6 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral tibial and patellar components)</td>
<td>50</td>
<td>.%</td>
<td>Uncemented Arthroplasty (TKA with cemented patellar components only uncemented tibial and patellar components)</td>
<td>.</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>2011</td>
<td>Moderate</td>
<td>Womac - overall-Composite averaged VAS version (0-100) ()</td>
<td>13.6 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral tibial and patellar components)</td>
<td>50</td>
<td>.%</td>
<td>Uncemented Arthroplasty (TKA with cemented patellar components only uncemented tibial and patellar components)</td>
<td>.</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>2011</td>
<td>Moderate</td>
<td>Reoperation - Reoperation (revision)</td>
<td>1 year</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral tibial and patellar components)</td>
<td>50</td>
<td>0.00%</td>
<td>Uncemented Arthroplasty (TKA with cemented patellar components only uncemented tibial and patellar components)</td>
<td>50</td>
<td>2.00%</td>
<td>RR/RD</td>
<td>-0.02(-0.06,0.02)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>High Quality</td>
<td>Component Description</td>
<td>Time</td>
<td>Component</td>
<td>Percentage</td>
<td>Author Reported</td>
<td>P-value</td>
<td>Significance</td>
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<tr>
<td>Kim,Y.H., 2014</td>
<td>High Quality</td>
<td>Womac-Overall-Composite Likert (0-96) ( )</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial, femoral and patellar component)</td>
<td>16 years</td>
<td>Uncemented Arthroplasty (TKA with cemented patellar component only and un cemented tibial and femoral)</td>
<td>80</td>
<td>. %</td>
<td></td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Kim,Y.H., 2014</td>
<td>High Quality</td>
<td>Infection-Complications (deep)</td>
<td>Post-Op</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial, femoral and patellar component)</td>
<td>80</td>
<td>1.25%</td>
<td>Uncemented Arthroplasty (TKA with cemented patellar component only and un cemented tibial and femoral)</td>
<td>80</td>
<td>1.25%</td>
<td>RR/RD</td>
<td>1.00(0.06, 15.71)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Kim,Y.H., 2014</td>
<td>High Quality</td>
<td>Reoperation - Reoperation (revision)</td>
<td>17 years</td>
<td>Convention al Bone Cement (Without Antibiotics) (TKA with cemented tibial, femoral and patellar component)</td>
<td>80</td>
<td>0.00%</td>
<td>Uncemented Arthroplasty (TKA with cemented patellar component only and un cemented tibial and femoral)</td>
<td>80</td>
<td>1.25%</td>
<td>RR/RD</td>
<td>-0.01(-0.04, 0.01)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Statistical Significance</td>
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<tr>
<td>Demey,G., 2011</td>
<td>High</td>
<td>Loosening-Complications (aseptic loosening)</td>
<td>2 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral, tibial and patellar components)</td>
<td>61</td>
<td>1.64%</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with Hydroxyapatite (HA)-coated femoral and patellar component and cemented tibial component)</td>
<td>60</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Demey,G., 2011</td>
<td>High</td>
<td>Complications other (ligamentous laxity)</td>
<td>2 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral, tibial and patellar components)</td>
<td>61</td>
<td>1.64%</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with Hydroxyapatite (HA)-coated femoral and patellar component)</td>
<td>60</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Demey, G., 2011</td>
<td>High Quality</td>
<td>Complications other (pain due to intra-articular cement fragment)</td>
<td>2 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral, tibial and patellar components)</td>
<td>61</td>
<td>1.64%</td>
<td>Hybrid (Partially) Cemented Arthroplasty (TKA with Hydroxyapatite (HA)-coated femoral and patellar component and cemented tibial component)</td>
<td>60</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Demey, G., 2011</td>
<td>High Quality</td>
<td>Complications other (vascular ischemia secondary to popliteal thrombosis)</td>
<td>Post-Op</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral, tibial and patellar)</td>
<td>61</td>
<td>0.00%</td>
<td>Hybrid (Partially) Cemented Arthroplasty (TKA with Hydroxyapatite (HA)-coated femoral)</td>
<td>60</td>
<td>1.67%</td>
<td>RD</td>
<td>-0.02(-0.05,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Demey, G., 2011</td>
<td>High Quality</td>
<td>Infection-Complications (deep infection)</td>
<td>2 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral, tibial and patellar components)</td>
<td>61</td>
<td>0.00%</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with Hydroxyapatite (HA)-coated femoral and patellar component and cemented tibial component)</td>
<td>60</td>
<td>1.67%</td>
<td>RD</td>
<td>-0.02(-0.05,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tr>
<tr>
<td>Iosifidis, M., 2014</td>
<td>Low Quality</td>
<td>KOOS-Total Score-Composite( )</td>
<td>10 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial and</td>
<td>45</td>
<td>77.8(17.50)</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with cemented tibial component)</td>
<td>37</td>
<td>77.2(20.40)</td>
<td>Mean Difference</td>
<td>0.6(-7.73,8.93)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Treatment Description</td>
<td>follow-up</td>
<td>High Quality Knee Society Score- Function- Function (international knee society)</td>
<td>2 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral, tibial and patellar components)</td>
<td>61</td>
<td>93(16.00)</td>
<td>Hybrid (Partially) Cemented Arthroplasty (TKA with Hydroxyapatite (HA) coated femoral and patellar component and cemented tibial component)</td>
<td>60</td>
<td>92(16.00)</td>
<td>Mean Difference</td>
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</tr>
<tr>
<td>Iosifidis, M., 2014</td>
<td>Low Quality</td>
<td>Mortality- Mortality( )</td>
<td>10 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial and femoral)</td>
<td>51</td>
<td>9.80%</td>
<td>41</td>
<td>4.88%</td>
<td>RR 2.01(0.41,9.83)</td>
<td>3</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Iosifidis, M., 2014</td>
<td>Low Quality</td>
<td>KOOS Pain-Pain ( )</td>
<td>10 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial and femoral components)</td>
<td>45</td>
<td>81.5(2 1.10)</td>
<td>Hybrid (Partially) Cemented Arthroplasty (TKA with cemented tibial component and uncemented femoral components)</td>
<td>37</td>
<td>82.3(2 0.40)</td>
<td>Mean Difference</td>
<td>-0.8(-9.81,8.21)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>--------------------------------</td>
</tr>
<tr>
<td>Iosifidis, M., 2014</td>
<td>Low Quality</td>
<td>KOOS-Quality Of Life-Quality Of Life( )</td>
<td>10 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial and femoral components)</td>
<td>45</td>
<td>70(28.90)</td>
<td>Hybrid (Partially) Cemented Arthroplasty (TKA with cemented tibial component and uncemented femoral components)</td>
<td>37</td>
<td>68.3(2 9.30)</td>
<td>Mean Difference</td>
<td>1.7(-10.97,14.37)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Iosifidis, M., 2014</td>
<td>Low Quality</td>
<td>Reoperation- Reoperation (revision)</td>
<td>10 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial and femoral components)</td>
<td>51</td>
<td>1.96%</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with cemented tibial component and uncemented femoral components)</td>
<td>41</td>
<td>4.88%</td>
<td>RR</td>
<td>0.40(0.04,4.28)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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</tr>
<tr>
<td>Khatod, M., 2013</td>
<td>Low Quality</td>
<td>Reoperation- Reoperation (revision)</td>
<td>2 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented femoral and tibial components)</td>
<td>32387</td>
<td>. %</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with cemented tibial component and uncemented femoral components)</td>
<td>2213</td>
<td>. %</td>
<td>Author Reported Hazard Ratio</td>
<td>1.02(.68,1.53)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Iosifidis, M., 2014</td>
<td>Low Quality</td>
<td>KOOS- Symptoms- Other ( )</td>
<td>10 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA)</td>
<td>45</td>
<td>88.1(15.10)</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with</td>
<td>37</td>
<td>86.1(16.40)</td>
<td>Mean Difference</td>
<td>2(-4.88,8.88)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Iosifidis, M., 2014</td>
<td>Low Quality</td>
<td>KOOS-Function in daily living ( )</td>
<td>10 years</td>
<td>Conventional Bone Cement (Without Antibiotics) (TKA with cemented tibial and femoral components)</td>
<td>45</td>
<td>71.6(17.5)</td>
<td>Hybrid (Partially) Cemented Arthroplasty (TKA with cemented tibial component and uncemented femoral components)</td>
<td>37</td>
<td>72(22.2)</td>
<td>Mean Difference</td>
<td>-.4(-9.12,8.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
### TABLE 78 PART 4 ALL BUT FEMORAL COMPONENTS CEMENTED (HYBRID) VERSUS ALL COMPONENTS UNCEMENTED

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parker, D.A., 2001</td>
<td>Moderate Quality</td>
<td>Reoperation - Reoperation (revision)</td>
<td>14 years</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with cemented tibial and patellar fixation)</td>
<td>48</td>
<td>33.33%</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous fixation)</td>
<td>52</td>
<td>44.23%</td>
<td>RR</td>
<td>0.75(0.46,1.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Parker, D.A., 2001</td>
<td>Moderate Quality</td>
<td>Infection-Complications (revision due to infection)</td>
<td>14 years</td>
<td>Hybrid(Partially) Cemented Arthroplasty (TKA with cemented tibial and patellar fixation)</td>
<td>48</td>
<td>4.17%</td>
<td>Uncemented Arthroplasty (TKA with uncemented porous fixation)</td>
<td>52</td>
<td>3.85%</td>
<td>RR</td>
<td>1.08(0.16,7.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
**BILATERAL TKA**

Limited evidence supports simultaneous bilateral total knee arthroplasty for patients aged 70 or younger or ASA status 1-2, because there are no increased complications.

**Strength of Recommendation: Limited Evidence ★★★★ ★
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.**

**RATIONALE**

There is one low quality retrospective comparative study (Yoon 2010) evaluating systemic complications in consecutive patients who had bilateral simultaneous total knee arthroplasty that met criteria for inclusion. They found equivalent complications among patients who were not elderly (defined as less than 71 years old) or not high risk (defined as ASA 1 and 2). Analysis showed patients aged 71 and older or ASA 3-4 were at higher risk of having systemic complications.

More data was not available for inclusion because many of the relevant studies included a mixture of patients with osteoarthritis and rheumatoid arthritis and the outcomes data was not split out.

**RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION**

Given the potential for serious perioperative mortality, further discussion is included here. Retrospective reviews of the Swedish Knee Arthroplasty Register (Stefansdottir 2008) revealed higher 30-day mortality if bilateral knee arthroplasties were done at the same time versus staged within a year. Multiple retrospective reviews (Meehan 2011, Memtsoudis 2011, and Health Quality Ontario 2013) showed adverse cardiovascular outcomes in patients with simultaneous bilateral knee arthroplasties. Memtsoudis 2011 helped define the higher risk patient by showing that patients who suffered a major complication had a higher prevalence of comorbidities including, specifically, chronic lung diseases, congestive heart failure and pulmonary hypertension.

**FUTURE RESEARCH**

Continued comparative multicenter prospective studies between simultaneous bilateral or staged bilateral total knee arthroplasty may further clarify the cohort of patients for whom simultaneous bilateral total knee arthroplasty is high-risk. It is also recommended that future research focus on osteoarthritis versus inflammatory arthropathies, and if mixed patient populations are utilized, the results are segregated in the literature.

The ASA physical status classification system was devised by the American Society of Anesthesiologists (ASA) to assess a patient’s physical status prior to surgical intervention. In addition to ASA status, future research may include a more robust risk stratification to identify high-risk patients.
RESULTS

SUMMARY OF FINDINGS TABLE 15: SIMULTANEOUS BI-LATERAL KNEE ARTHROPLASTY VERSUS STAGED KNEE ARTHROPLASTY

<table>
<thead>
<tr>
<th>Summary of Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Quality</td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
</tr>
</tbody>
</table>

TABLE 15: SIMULTANEOUS BI-LATERAL KNEE ARTHROPLASTY VERSUS STAGED KNEE ARTHROPLASTY

<table>
<thead>
<tr>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTE- Complications</td>
</tr>
<tr>
<td>Complications - overall</td>
</tr>
<tr>
<td>Systemic complications (ASA grade 3 or 4)</td>
</tr>
<tr>
<td>Systemic complications (ASA grade 1 or 2)</td>
</tr>
<tr>
<td>Systemic complications - overall</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality- Mortality</td>
</tr>
</tbody>
</table>

QUALITY EVALUATION TABLE 8: SIMULTANEOUS BI-LATERAL KNEE ARTHROPLASTY

Quality Chart Key

● = No Flaw in Domain of Interest
○ = Flaw in Domain of Interest
□ = Half flaw in domain of interest

QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoon,H.S., 2010</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>
### TABLE 79: SIMULTANEOUS BI-LATERAL KNEE ARTHROPLASTY VERSUS STAGED KNEE ARTHROPLASTY: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (hypovolemic shock)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ( )</td>
<td>119</td>
<td>0.00%</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months( )</td>
<td>119</td>
<td>0.84%</td>
<td>RD</td>
<td>-0.01(-0.02,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (pneumonia)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ( )</td>
<td>119</td>
<td>0.84%</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months( )</td>
<td>119</td>
<td>0.00%</td>
<td>RD</td>
<td>0.01(-0.01,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (confusion)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ( )</td>
<td>119</td>
<td>1.68%</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months( )</td>
<td>119</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.01,0.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (acute renal failure)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ( )</td>
<td>119</td>
<td>.84%</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months( )</td>
<td>119</td>
<td>0.00%</td>
<td>RD</td>
<td>0.008(-.015,.031)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (uremic encephalitis)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ( )</td>
<td>50</td>
<td>2.00%</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months( )</td>
<td>119</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (ICU care)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ()</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months ()</td>
<td>RD</td>
<td>0.01(-0.01,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (systemic complications among patients with ASA grade of 3 or 4)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ()</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months ()</td>
<td>RD</td>
<td>0.20(0.06,0.34)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (systemic complications among patients with ASA grade of 1 or 2)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ()</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months ()</td>
<td>RD</td>
<td>-0.01(-0.04,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>complications other (systemic complications overall)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ()</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months ()</td>
<td>RR</td>
<td>6(.73, 49.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>VTE- Complications (Thromboembolic disease)</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ()</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months ()</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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</table>
### TABLE 80: SIMULTANEOUS BI-LATERAL KNEE ARTHROPLASTY VERSUS STAGED KNEE ARTHROPLASTY: MORTALITY

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoon,H.S., 2010</td>
<td>Low Quality</td>
<td>Mortality - Mortality ()</td>
<td>Peri-Op</td>
<td>Simultaneous Bilateral Total Knee Arthroplasty (Tka) ()</td>
<td>119</td>
<td>0.00%</td>
<td>Staged (Not Simultaneous) Total Knee Arthroplasties (Tka) On Each Knee Within 6 Months( )</td>
<td>199</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
UNICOMPARTMENTAL KNEE ARTHROPLASTY (UKA)

A. UKA: REVISIONS

Moderate evidence supports that total knee arthroplasty (TKA) could be used to decrease revision surgery risk compared to unicompartmental knee arthroplasty (UKA) for medial compartment osteoarthritis.

**Strength of Recommendation: Moderate Evidence ⭐⭐⭐⭐
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.**

B. UKA: DVT & MANIPULATION UNDER ANESTHESIA

Limited evidence supports that unicompartmental knee arthroplasty might be used to decrease the risk of deep vein thrombosis (DVT) and manipulation under anesthesia compared to total knee arthroplasty (TKA) for medial compartment osteoarthritis.

**Strength of Recommendation: Limited Evidence ⭐⭐⭐⭐
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.**

C. UKA VERSUS OSTEOTOMY

Moderate evidence supports no difference between unicompartmental knee arthroplasty (UKA) or valgus-producing proximal tibial osteotomy in outcomes and complications in patients with medial compartment knee osteoarthritis.

**Strength of Recommendation: Moderate Evidence ⭐⭐⭐⭐
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.**

RATIONALE

One moderate quality study (Sun 2012) and our meta-analysis of two moderate quality (Sun 2012, Newman 1998) and one low quality (Cameron 1988) studies demonstrated that the rate of revision surgery was significantly higher for those patients with medial compartment OA of the knee treated with unicompartmental arthroplasty, when compared to total knee arthroplasty.

Comparing the data of two moderate quality studies (Newman 1998, Murray 2014) and one low quality study (Cameron 1988) for early complications there were fewer thromboembolic events and manipulations in the unicompartmental when compared to total knee arthroplasty.

One high quality (Stukenborg-Colsman 2001) and two moderate studies (Weidenhielm 1993 and Borjesson 2005) compared the outcomes of UKA and HTO in patients with predominantly medial compartment osteoarthritis. There were no statistically significant differences in complications or outcomes.

There was no data comparing tibial tubercle osteotomy to patellofemoral arthroplasty or total knee arthroplasty. Likewise, there was no data comparing distal femoral osteotomy to lateral compartment unicompartmental arthroplasty or total knee arthroplasty.
RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION
There are no known harms associated with implementing these recommendations.

FUTURE RESEARCH
A larger prospective randomized trial comparing a modern unicompartmental knee arthroplasty to total knee arthroplasty stressing functional outcomes, early complications and morbidity, and survivorship are warranted. Randomized controlled trials of unicompartmental knee arthroplasty versus high tibial osteotomy in a younger population (ages 40 to 60) would be of value to assess the functional outcomes and survivorship of either of these procedures in that younger population. Careful analysis of registry data comparing unicompartmental knee arthroplasty to total knee arthroplasty is warranted.
### RESULTS

**SUMMARY OF FINDINGS TABLE 3: PART 1 UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS TOTAL KNEE ARTHROPLASTY (EARLY FOLLOW-UP < 90 DAYS)**

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors UKA</td>
<td>Sun, P.F., 2012</td>
<td></td>
</tr>
<tr>
<td>Not Significant</td>
<td>Murray, D.W., 2014</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cameron, H.U., 1988</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hunt, L.P., 2014</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complications</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep venous thrombosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manipulation Under Anesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wound Complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Composite</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxford Knee Score</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of Stay</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Of Recovery- Length Of Stay</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mortality</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quality of Life</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EQ-5d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-12 Physical Component Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SF-12 Mental Component Score</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reoperation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reoperation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY OF FINDINGS TABLE 4: PART 1 UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS TOTAL KNEE ARTHROPLASTY (LATE FOLLOW-UP > 90 DAYS)**

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Favors UKA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Favors TKA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Not Significant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>composite</th>
<th>Oxford Knee Score</th>
<th>Pain</th>
<th>Bristol knee score pain</th>
<th>Quality of Life</th>
<th>Reoperation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Black dot indicates a positive finding
- White circle indicates a negative finding
## SUMMARY OF FINDINGS TABLE 5: PART 2 UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS OSTEOTOMY (EARLY FOLLOW-UP < 90 DAYS)

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors UKA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Favors Osteotomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications other</td>
<td></td>
<td>○</td>
</tr>
<tr>
<td>Deep venous thrombosis</td>
<td></td>
<td>○</td>
</tr>
<tr>
<td>Infection- Complications</td>
<td></td>
<td>○</td>
</tr>
<tr>
<td>Fractures- Complications</td>
<td></td>
<td>○</td>
</tr>
</tbody>
</table>

### Function

<table>
<thead>
<tr>
<th>Function</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee Society Score-Function</td>
<td></td>
<td>○</td>
</tr>
<tr>
<td>Timed Functional Test (higher scores better, distance, distance/time)- Function</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

### Pain

<table>
<thead>
<tr>
<th>Pain</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borg scale-Pain on walking</td>
<td></td>
<td>○</td>
</tr>
</tbody>
</table>
### SUMMARY OF FINDINGS TABLE 6: PART 2 UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS OSTEOTOMY (LATE FOLLOW-UP > 90 DAYS)

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors UKA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Favors Osteotomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Complications
- Infection- Complications

#### Function
- Knee Society Score-Function- Function
- Timed Functional Test (higher scores better, distance, distance/time)- Function
- Physical activity scale (1-6)

#### Pain
- Berg scale-Pain on walking
- Borg scale-Pain on walking

#### Reoperation
- Implant Survival- Reoperation
FIGURE 5  UKA VERSUS TKA: REOPERATION RISK RATIO FAVORS TKA GROUP

<table>
<thead>
<tr>
<th>Reference</th>
<th>RR (95% CI)</th>
<th>Treatment Events</th>
<th>Control Events</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newman, J. H., 1998</td>
<td>2.04 (0.19, 21.76)</td>
<td>2/45</td>
<td>1/46</td>
<td>100.00</td>
</tr>
<tr>
<td>Cameron, H. U., 1988</td>
<td>undefined</td>
<td>2/20</td>
<td>0/20</td>
<td>0.00</td>
</tr>
<tr>
<td>Sun, P. F., 2012</td>
<td>undefined</td>
<td>7/28</td>
<td>0/28</td>
<td>0.00</td>
</tr>
<tr>
<td>Overall (I-squared = 0.0%, p = 0.372)</td>
<td>11.14 (1.44, 86.47)</td>
<td>11/93</td>
<td>1/94</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Undefined means the trial effects were unable to be calculated due to zero events in one trial arm. The Mantel Haenszel RR still allows these trials to contribute to the pooled risk ratio.
### QUALITY EVALUATION TABLE 3: UNICOMPARTMENTAL KNEE ARTHROPLASTY

**Quality Chart Key**

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- ○ = Half Flaw in domain of interest

#### QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameron, H.U., 1988</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
<tr>
<td>Hunt, L.P., 2014</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

#### QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barjesson, M., 2005</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>●</td>
<td>●</td>
<td>□</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Newman, J.H., 1998</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>□</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Stukenborg-Colson, C., 2001</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Sun, P.F., 2012</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Weidenhielm, L., 1993</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>
## DETAILED DATA TABLES

### PART 1 UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS TOTAL KNEE REPLACEMENT

#### TABLE 81: PART 1- UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS TOTAL KNEE REPLACEMENT: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newman,J.H., 1998</td>
<td>Moderate Quality</td>
<td>Deep venous thrombosis (clinical signs)</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty (st george sled)</td>
<td>45 2.22%</td>
<td>Total Knee Arthroplasty (Tka) (posterior cruciate retaining)</td>
<td>46 10.87%</td>
<td>RR</td>
<td>0.20(0.02,1.68)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Newman,J.H., 1998</td>
<td>Moderate Quality</td>
<td>Manipulation Under Anesthesia- Other ( )</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty (st george sled)</td>
<td>45 0.00%</td>
<td>Total Knee Arthroplasty (Tka) (posterior cruciate retaining)</td>
<td>46 8.70%</td>
<td>RD</td>
<td>-0.09(-0.17,-0.01)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Newman,J.H., 1998</td>
<td>Moderate Quality</td>
<td>Wound Complications (delayed healing)</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty (st george sled)</td>
<td>45 0.00%</td>
<td>Total Knee Arthroplasty (Tka) (posterior cruciate retaining)</td>
<td>46 2.17%</td>
<td>RD</td>
<td>-0.02(-0.06,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Sun,P.F., 2012</td>
<td>Moderate Quality</td>
<td>Deep venous thrombosis ( )</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>28 %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>28 %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Cameron, H.U., 1988</td>
<td>Low Quality</td>
<td>Deep venous thrombosis( )</td>
<td>Intra-Op</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20 5.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20 5.00%</td>
<td>RR</td>
<td>1.00(0.07,14.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Cameron, H.U., 1988</td>
<td>Low Quality</td>
<td>pulmonary embolism( )</td>
<td>Intra-Op</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20 0.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20 5.00%</td>
<td>RD</td>
<td>-0.05(-0.15,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------</td>
<td>---------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>----------</td>
<td>----------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Cameron, H.U., 1988</td>
<td>Low</td>
<td>complications other (one tibial eminence avulsion)</td>
<td>Intra-Op</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>5.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>0.00%</td>
<td>RD</td>
</tr>
<tr>
<td>Cameron, H.U., 1988</td>
<td>Low</td>
<td>complications other (drop foot)</td>
<td>Intra-Op</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>0.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>5.00%</td>
<td>RD</td>
</tr>
<tr>
<td>Cameron, H.U., 1988</td>
<td>Low</td>
<td>complications other (neuroma of the infrapatellar branch of the saphenous nerve with significant dysesthesia.)</td>
<td>Intra-Op</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>10.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>0.00%</td>
<td>RD</td>
</tr>
<tr>
<td>Cameron, H.U., 1988</td>
<td>Low</td>
<td>Manipulation Under Anesthesia- Other ( )</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>28</td>
<td>0.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>28</td>
<td>25.00%</td>
<td>RD</td>
</tr>
</tbody>
</table>

**TABLE 82: PART 1- UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS TOTAL KNEE REPLACEMENT: COMPOSITE**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murray,D.W., 2014</td>
<td>Moderate</td>
<td>Oxford Knee Score( )</td>
<td>3 months</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>13</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>12(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>----------------</td>
<td>----------</td>
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<td>-----------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score( )</td>
<td>1 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>13</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>13(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score( )</td>
<td>2 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>12</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>13(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score( )</td>
<td>3 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>17</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>14(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Murray, D.W., 2014</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score( )</td>
<td>4 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>14</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>14(,)</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Murray, D.W., 2014</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score( )</td>
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<td>Unicompartmental Arthroplasty ( )</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
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<td>15(,)</td>
<td>Author Reported</td>
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<td>7 years</td>
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# TABLE 83: PART 1 - UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS TOTAL KNEE REPLACEMENT: LENGTH OF STAY

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<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Effect Measure Result (95% CI)</th>
<th>Favored Treatment</th>
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<tbody>
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<td>Newman, J.H., 1998</td>
<td>Moderate Quality</td>
<td>Length Of Recovery-Length Of Stay (&gt;= 20 days)</td>
<td>NA</td>
<td>Unicompartmental Arthroplasty (st george sled)</td>
<td>45</td>
<td>6.67%</td>
<td>Total Knee Arthroplasty (Tka) (posterior cruciate retaining)</td>
<td>46</td>
<td>23.91%</td>
<td>RR</td>
<td>0.28(0.08,0.93)</td>
<td>Significant (P-value &lt; 0.05)</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Mortality- Mortality</td>
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<td>Author Reported Hazard Ratio</td>
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**TABLE 85: PART 1- UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS TOTAL KNEE REPLACEMENT: PAIN**

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<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<td>Newman, J.H., 1998</td>
<td>Moderate Quality</td>
<td>bristol knee score pain (Excellent: score 35 to 40)</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty (st george sled)</td>
<td>45</td>
<td>88.89%</td>
<td>Total Knee Arthroplasty (Tka) (posterior cruciate retaining)</td>
<td>46</td>
<td>82.61%</td>
<td>RR</td>
<td>1.08(0.91,1.27)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Duration</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Murray,D.W., 2014</td>
<td>Moderate Quality</td>
<td>EQ-5d( )</td>
<td>3 months</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>16</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>14(.)</td>
<td>Author Reported</td>
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<td>EQ-5d( )</td>
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<td>16</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
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<td>15(.)</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Murray,D.W., 2014</td>
<td>Moderate Quality</td>
<td>EQ-5d( )</td>
<td>2 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>15</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>16(.)</td>
<td>Author Reported</td>
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<td>EQ-5d( )</td>
<td>3 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>17</td>
<td>. %</td>
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<td>.</td>
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<td>Author Reported</td>
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<td>EQ-5d( )</td>
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<td>Unicompartmental Arthroplasty ( )</td>
<td>16</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>14(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>EQ-5d( )</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>14</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>15(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>.</td>
<td>15(.)</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Murray,D.W., 2014</td>
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<td>EQ-5d( )</td>
<td>7 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>15</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
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<td>. %</td>
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<td>Quality</td>
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<td>3 months</td>
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<td>15</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>14( .)</td>
<td>Author Reported</td>
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<td>Quality</td>
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<td>Moderate</td>
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<td>Unicompartmental Arthroplasty ( )</td>
<td>15</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>15( .)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Unicompartmental Arthroplasty ( )</td>
<td>15</td>
<td>. %</td>
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<td>.</td>
<td>15( .)</td>
<td>Author Reported</td>
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<td>Moderate</td>
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<td>Unicompartmental Arthroplasty ( )</td>
<td>17</td>
<td>. %</td>
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<td>15( .)</td>
<td>Author Reported</td>
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<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
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<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<td>SF-12 Mental Component Score ( )</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
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<td>14( )</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Murray,D.W., 2014</td>
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<td>SF-12 Mental Component Score ( )</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
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<td>15( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Murray,D.W., 2014</td>
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<td>14( )</td>
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<td>Murray,D.W., 2014</td>
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<td>SF-12 Mental Component Score ( )</td>
<td>7 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
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<td>15( )</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Murray,D.W., 2014</td>
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<td>SF-12 Mental Component Score ( )</td>
<td>8 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
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<td>13( )</td>
<td>Author Reported</td>
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<td>Murray,D.W., 2014</td>
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<td>SF-12 Mental Component Score ( )</td>
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<td>Total Knee Arthroplasty (Tka) ( )</td>
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<td>11( )</td>
<td>Author Reported</td>
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<td>Murray,D.W., 2014</td>
<td>Moderate</td>
<td>SF-12 Mental Component Score ( )</td>
<td>10 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>12</td>
<td>. %</td>
<td>Total Knee Arthroplasty (Tka) ( )</td>
<td>.</td>
<td>10( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean 1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean 2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Newman, J.H., 1998</td>
<td>Moderate Quality</td>
<td>Reoperation- Reoperation ( )</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty (st george sled)</td>
<td>45</td>
<td>4.44%</td>
<td>Total Knee Arthroplasty (Tka) (posterior cruciate retaining)</td>
<td>46</td>
<td>2.17%</td>
<td>RR</td>
<td>2.04(0.19,21.76)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sun, P.F., 2012</td>
<td>Moderate Quality</td>
<td>Reoperation- Reoperation ( )</td>
<td>2 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>28</td>
<td>25.00%</td>
<td>( )</td>
<td>28</td>
<td>0.00%</td>
<td>RD</td>
<td>0.25(0.09,0.41)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
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<tr>
<td>Cameron, H.U., 1988</td>
<td>Low Quality</td>
<td>Reoperation- Reoperation (revision due to plastic wearing through)</td>
<td>3 years</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>5.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>.</td>
<td>. %</td>
<td>RR</td>
<td>0.05(-0.05,0.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cameron, H.U., 1988</td>
<td>Low Quality</td>
<td>Reoperation- Reoperation (reoperation due to inadequate pain relief)</td>
<td>Low Quality</td>
<td>Unicompartmental Arthroplasty (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>5.00%</td>
<td>Total Knee Arthroplasty (Tka) (patients with bilateral OA. one knee got uka, the other tka)</td>
<td>20</td>
<td>0.00%</td>
<td>RD</td>
<td>0.05(-0.05,0.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
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PART 2 UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS OSTEOTOMY

**TABLE 88: PART 2 - UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS OSTEOTOMY: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stukenborg-Colson, C., 2001</td>
<td>High Quality</td>
<td>complications other (pseudoarthritis)</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>28</td>
<td>0.00%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>3.13%</td>
<td>RD</td>
<td>-0.03(-0.09,0.03)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Stukenborg-Colson, C., 2001</td>
<td>High Quality</td>
<td>Fractures-Complications ()</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>28</td>
<td>0.00%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>6.25%</td>
<td>RD</td>
<td>-0.06(-0.15,0.02)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Stukenborg-Colson, C., 2001</td>
<td>High Quality</td>
<td>complications other (arthrolysis)</td>
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<td>Unicompartmental Arthroplasty ()</td>
<td>28</td>
<td>3.57%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>0.00%</td>
<td>RD</td>
<td>0.04(-0.03,0.10)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Stukenborg-Colson, C., 2001</td>
<td>High Quality</td>
<td>complications other (mobilisation)</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>.</td>
<td>. %</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>0.00%</td>
<td>RD</td>
<td>0.04(-0.03,0.10)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Stukenborg-Colson, C., 2001</td>
<td>High Quality</td>
<td>Deep venous thrombosis()</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>28</td>
<td>0.00%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>9.38%</td>
<td>RD</td>
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<td>High Quality</td>
<td>Infection-Complications ()</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>28</td>
<td>0.00%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>6.25%</td>
<td>RD</td>
<td>-0.06(-0.15,0.02)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Stukenborg-Colson, C., 2001</td>
<td>High Quality</td>
<td>complications other (pseudoarthritis)</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>28</td>
<td>0.00%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>3.13%</td>
<td>RD</td>
<td>-0.03(-0.09,0.03)</td>
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<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Infection-Complications ()</td>
<td>1 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>36</td>
<td>0.00%</td>
<td>High/Proximal Tibial Osteotomy(HTO)</td>
<td>23</td>
<td>4.35%</td>
<td>RD</td>
<td>-0.04(-0.12,0.04)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Weidenhielm, L., 1993</td>
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<td>1 years</td>
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<td>36</td>
<td>2.78%</td>
<td>High/Proximal Tibial Osteotomy(HTO)</td>
<td>23</td>
<td>0.00%</td>
<td>RD</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorited Treatment</td>
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<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Deep venous thrombosis( )</td>
<td>Post-Op</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>36</td>
<td>2.78%</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>23</td>
<td>0.00%</td>
<td>RD</td>
<td>0.03(-0.03,0.08)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Reference Title</td>
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<td>Mean2/P2 (SD2)</td>
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<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Stukenborg-Colsman, C., 2001</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function (follow up is 14 days, 2-5 years, 4-7 years, and 7-10 years)</td>
<td>2 weeks</td>
<td>Unicompartmental Arthroplasty ()</td>
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<td>. %</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>. %</td>
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<tr>
<td>Stukenborg-Colsman, C., 2001</td>
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<td>Knee Society Score-Function-Function (follow up is 14 days, 2-5 years, 4-7 years, and 7-10 years)</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ()</td>
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<td>. %</td>
<td>High/Proximal Tibial Osteotomy()</td>
<td>32</td>
<td>. %</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>High Quality</td>
<td>Knee Society Score-Function-Function (follow up is 14 days, 2-5 years, 4-7 years, and 7-10 years)</td>
<td>7 years</td>
<td>Unicompartmental Arthroplasty ()</td>
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<td>. %</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Stukenborg-Colsman, C., 2001</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function (follow up is 14 days, 2-5 years, 4-7 years, and 7-10 years)</td>
<td>10 years</td>
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<td>59(.)</td>
<td>High/Proximal Tibial Osteotomy()</td>
<td>32</td>
<td>71(.)</td>
<td>Author Reported</td>
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<td>Moderate Quality</td>
<td>physical activity scale (1-6) ( )</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>.</td>
<td>. %</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<td>Quality</td>
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<td>Duration</td>
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<td>Mean1/P1 (SD1)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Börjesson,M., 2005</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (free walk speed m/s)</td>
<td>3 months</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>22</td>
<td>1.16(0.16)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>0.94(0.18)</td>
<td>Mean Difference</td>
<td>0.22(0.11,0.33)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Börjesson,M., 2005</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (free walk speed m/s)</td>
<td>1 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>22</td>
<td>1.24(0.21)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>1.12(0.16)</td>
<td>Mean Difference</td>
<td>0.12(0.01,0.23)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Börjesson,M., 2005</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (free walk speed m/s)</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>22</td>
<td>1.19(0.15)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>1.13(0.14)</td>
<td>Mean Difference</td>
<td>0.06(-0.03,0.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Börjesson,M., 2005</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (step frequency (steps/s))</td>
<td>3 months</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>22</td>
<td>1.75(0.15)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>1.6(0.18)</td>
<td>Mean Difference</td>
<td>0.15(0.04,0.26)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Börjesson,M., 2005</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (step frequency (steps/s))</td>
<td>1 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>22</td>
<td>1.77(0.15)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>1.74(0.14)</td>
<td>Mean Difference</td>
<td>0.03(-0.06,0.12)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>-----------------</td>
<td>----------</td>
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<td>----------</td>
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<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Börjesson, M., 2005</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (step frequency (steps/s))</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>22</td>
<td>1.8(0.11)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>1.75(0.15)</td>
<td>Mean Difference</td>
<td>0.04(-0.04,0.12)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (walk speed m/s)</td>
<td>1 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>36</td>
<td>1.19(.19)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>23</td>
<td>1.09(.15)</td>
<td>Mean Difference</td>
<td>.1(.006,.19)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (step frequency (steps/s))</td>
<td>1 years</td>
<td>Unicompartmental Arthroplasty ()</td>
<td>36</td>
<td>1.78(.13)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>23</td>
<td>1.75(.14)</td>
<td>Mean Difference</td>
<td>.03(-.04,.10)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------</td>
<td>----------------------------------------</td>
<td>------------</td>
<td>----------------------------------------</td>
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<td>----------------</td>
<td>---------------------------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>-----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Börjesson,M., 2005</td>
<td>Moderate Quality</td>
<td>Borg scale-Pain on walking( )</td>
<td>3 months</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>22</td>
<td>. %</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Börjesson,M., 2005</td>
<td>Moderate Quality</td>
<td>Borg scale-Pain on walking</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>22</td>
<td>. %</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>18</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Weidenhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Berg scale-Pain on walking( )</td>
<td>1 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>36</td>
<td>0.5(0.90)</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>23</td>
<td>1(1.40)</td>
<td>Mean Difference</td>
<td>-0.5(-1.14,0.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
### TABLE 91: PART 2- UNICOMPARTMENTAL KNEE ARTHROPLASTY VERSUS OSTEOTOMY: REOPERATION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stukenborg-Colman,C., 2001</td>
<td>High Quality</td>
<td>Implant Survival-Reoperation (implant survival)</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>30</td>
<td>83.33%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>78.13%</td>
<td>RR</td>
<td>1.07(0.84,1.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stukenborg-Colman,C., 2001</td>
<td>High Quality</td>
<td>Implant Survival-Reoperation (implant survival)</td>
<td>10 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>30</td>
<td>76.67%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>59.38%</td>
<td>RR</td>
<td>1.29(0.91,1.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stukenborg-Colman,C., 2001</td>
<td>High Quality</td>
<td>Implant Survival-Reoperation (implant survival)</td>
<td>5 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>30</td>
<td>83.33%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>78.13%</td>
<td>RR</td>
<td>1.07(0.84,1.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Stukenborg-Colman,C., 2001</td>
<td>High Quality</td>
<td>Implant Survival-Reoperation (implant survival)</td>
<td>10 years</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>30</td>
<td>76.67%</td>
<td>High/Proximal Tibial Osteotomy( )</td>
<td>32</td>
<td>59.38%</td>
<td>RR</td>
<td>1.29(0.91,1.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Weidnhielm, L., 1993</td>
<td>Moderate Quality</td>
<td>Reoperation - Reoperation (aseptic loosening of tibial plateau leading to reoperation)</td>
<td>5.9 months</td>
<td>Unicompartmental Arthroplasty ( )</td>
<td>36</td>
<td>2.78%</td>
<td>High/Proximal Tibial Osteotomy (HTO)</td>
<td>23</td>
<td>0.00%</td>
<td>RD</td>
<td>0.03(-0.03,0.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
SURGICAL NAVIGATION
Strong evidence supports not using intraoperative navigation in total knee arthroplasty (TKA) because there is no difference in outcomes or complications.

**Strength of Recommendation: Strong Evidence ★★★★★**
*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*

**RATIONALE**
Three high quality studies (Thiengwittayaporn 2013, Seon 2009, Kiss 2012) and two moderate quality studies (Lutzner 2010, Dutton 2008) compared surgical navigation to conventional instrumentation for total knee arthroplasty. At follow-up greater than 90 days, there were no differences in patient reported quality of life outcomes (EQ-5D, SF-36 Mental Component Summary), patient reported knee function (Oxford Knee Score, Knee Society Score, and WOMAC), and pain (WOMAC).

Four high quality studies (Lutzner 2008, Church 2007, Chin 2005, Blakeney 2011) and one moderate quality study (Kalairajah 2005) were all consistent in their findings that length of surgery favored no surgical navigation. A meta-analysis on infection found no difference in infection risk comparing surgical navigation to conventional instrumentation for total knee arthroplasty.

The work group recognizes that there are scenarios where computer navigation theoretically could be considered, such as malunions, intramedullary implants, or in training scenarios, but the evidence is insufficient to make a recommendation.

**RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION**
There are no known harms associated with implementing this recommendation.

**FUTURE RESEARCH**
The theoretical benefit of surgical navigation is to improve knee function and long-term implant survival by improving the accuracy of alignment. No consensus on optimal knee alignment in total knee arthroplasty has been reached. However, coupling of surgical navigation data with registry implant longevity data has the potential to determine if surgical navigation improves implant longevity through alignment. The strong evidence indicates that no further research is needed on reviewed current surgical navigation methods. New surgical navigation methods will need randomized controlled trials to determine their effectiveness.
## RESULTS

### SUMMARY OF FINDINGS TABLE 16: SURGICAL NAVIGATION (EARLY FOLLOW-UP < 90 DAYS)

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Favors Surgical Navigation</strong></td>
<td>○</td>
<td></td>
</tr>
<tr>
<td><strong>Favors No Surgical Navigation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Not Significant</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Complications
- Complications other
- Fall in HB, g/dL
- Infection- Complications
- Manipulation Under Anesthesia- Other
- Blood Loss
- Drainage- Complications

### Composite
- Knee Society Score KSS

### Function
- Knee Society Score-Function- Function
- Timed Functional Test (higher scores better, distance, distance/time)- Function
- WOMAC-function averaged VAS Version (0-100)

### Length of Surgery
- Length Of Surgery- Length Of Surgery

### Pain
- WOMAC-Pain averaged VAS Version (0-100)

### Reoperation
- Reoperation- Reoperation
- Reoperation polyethylene exchange

### Stiffness
- WOMAC-stiffness averaged VAS Version (0-100)
### SUMMARY OF FINDINGS TABLE 17: SURGICAL NAVIGATION (LATE FOLLOW-UP > 90 DAYS)

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors Surgical Navigation</td>
<td></td>
<td>Thiengwittayaporn, S., 2013</td>
</tr>
</tbody>
</table>

#### Composite
- Euroqol-5d(Eq-5d Total- Composite
- Oxford Knee Score (Oks)- Composite
- SF-36 Mental Component summary
- Womac-overall- Composite Likert (0-96)

#### Function
- Knee Society Score-Function- Function
- Muscle Strength- Function
- Timed Functional Test (higher scores better, distance, distance/time)- Function
- Range Of Motion(overall) - Function

#### Pain
- Womac-Pain Likert Version (0-20)
- Hospital for Special Surgery Knee Rating
**FIGURE 6 SURGICAL NAVIGATION VERSUS NO SURGICAL NAVIGATION – INFECTION**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Outcome</th>
<th>RR (95% CI)</th>
<th>Events, Treatment</th>
<th>Events, Control</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>Superficial infection</td>
<td>1.00 (0.06, 15.61)</td>
<td>1/58</td>
<td>1/58</td>
<td>31.95</td>
</tr>
<tr>
<td>Decking, R., 2005</td>
<td>Superficial infection</td>
<td>0.93 (0.14, 6.09)</td>
<td>2/27</td>
<td>2/25</td>
<td>68.05</td>
</tr>
<tr>
<td>Blakeney, W.G., 2011</td>
<td>Deep infection</td>
<td>0.00 (., .)</td>
<td>0/36</td>
<td>1/70</td>
<td>0.00</td>
</tr>
<tr>
<td>Dutton, A.Q., 2008</td>
<td>Deep infection</td>
<td>0.00 (., .)</td>
<td>0/52</td>
<td>1/56</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Overall (I-squared = 0.0%, p = 0.962) 0.95 (0.20, 4.49) 3/173 5/209 100.00

NOTE: Weights are from random effects analysis

>0(., .) means study risk ratio is inestimable due to zero events in one arm, but it still can contribute to the overall pooled Mantel Haenszel risk ratio
### QUALITY EVALUATION TABLE 9: SURGICAL NAVIGATION

#### Quality Chart Key

- **●** = No Flaw in Domain of Interest
- **○** = Flaw in Domain of Interest
- **⊙** = Half Flaw in domain of interest

#### QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohanlal, P.K., 2013</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Not best available evidence</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

#### QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blakeney, W.G., 2011</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Chin, P.L., 2005</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Church, J.S., 2007</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Decking, R., 2005</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Dutton, A.Q., 2008</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Hoffart, H.E., 2012</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
<tr>
<td>Kalairajah, Y., 2005</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Kim, Y.-H., 2007</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Kim, Y.H., 2008</td>
<td>●</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
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<tr>
<td>Kiss, R.M., 2012</td>
<td>●</td>
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<td>●</td>
<td>Include</td>
<td>High Quality</td>
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<tr>
<td>Lutzner, J., 2008</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
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<tr>
<td>Lutzner, J., 2010</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>Moderate Quality</td>
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<tr>
<td>Seon, J.K., 2009</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Keene, G., 2006</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Weng, Y.J., 2009</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Not best available evidence</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>
### TABLE 92: **SURGICAL NAVIGATION VERSUS NO SURGICAL NAVIGATION: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalairajah,Y., 2005</td>
<td>High Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>30</td>
<td>1351(466.68 )</td>
<td>No Surgical Navigation ( )</td>
<td>30</td>
<td>1747(461.09 )</td>
<td>Mean Difference</td>
<td>-396(-630.76,-161.24)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Kalairajah,Y., 2005</td>
<td>High Quality</td>
<td>Fall in HB, g/dL (Calculated Hb loss in g/dl)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>30</td>
<td>36.5(9.22)</td>
<td>No Surgical Navigation ( )</td>
<td>30</td>
<td>52.6(17.05)</td>
<td>Mean Difference</td>
<td>-16.1(-23.04,-9.16)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Blakeney,W.G., 2011</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia - Other ( )</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>36</td>
<td>0.00%</td>
<td>No Surgical Navigation (Extramedullary Guide)</td>
<td>34</td>
<td>2.94%</td>
<td>RD</td>
<td>-0.03(-0.09,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Blakeney,W.G., 2011</td>
<td>High Quality</td>
<td>Infection-Complications ( )</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>36</td>
<td>0.00%</td>
<td>No Surgical Navigation (Extramedullary Guide)</td>
<td>34</td>
<td>2.94%</td>
<td>RD</td>
<td>-0.03(-0.09,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Blakeney,W.G., 2011</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia - Other ( )</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>36</td>
<td>0.00%</td>
<td>No Surgical Navigation (Intramedullary Guide)</td>
<td>36</td>
<td>2.78%</td>
<td>RD</td>
<td>-0.03(-0.08,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Blakeney,W.G., 2011</td>
<td>High Quality</td>
<td>Infection-Complications ( )</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>36</td>
<td>0.00%</td>
<td>No Surgical Navigation (Intramedullary Guide)</td>
<td>36</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chin,P.L., 2005</td>
<td>High Quality</td>
<td>Drainage-Complications (ml)</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>30</td>
<td>290.3( )</td>
<td>No Surgical Navigation (Intramedullary Guide)</td>
<td>30</td>
<td>396.3( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chin,P.L., 2005</td>
<td>High Quality</td>
<td>Fall in HB, g/dL ( )</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>30</td>
<td>2.56( )</td>
<td>No Surgical Navigation (Intramedullary Guide)</td>
<td>30</td>
<td>3.14( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chin,P.L., 2005</td>
<td>High Quality</td>
<td>Drainage-Complications (ml)</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>30</td>
<td>290.3( )</td>
<td>No Surgical Navigation (Extramedullary Guide)</td>
<td>30</td>
<td>400.5( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Chin, P.L., 2005</td>
<td>High Quality</td>
<td>Fall in HB, g/dL ( )</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>30</td>
<td>2.56( )</td>
<td>No Surgical Navigation (Extemedullary Guide)</td>
<td>30</td>
<td>2.94( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Decking, R., 2005</td>
<td>High Quality</td>
<td>Infection-Complications ( )</td>
<td>Post-Op</td>
<td>Surgical Navigation (Computer Assisted Navigation)</td>
<td>27</td>
<td>7.41%</td>
<td>No Surgical Navigation (Manually Implanted TKAs)</td>
<td>25</td>
<td>8.00%</td>
<td>RR</td>
<td>0.93(0.146.09)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim, Y.H., 2008</td>
<td>High Quality</td>
<td>complications other (fat embolism measured as at least 1 fat globule found)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>210</td>
<td>48.57%</td>
<td>No Surgical Navigation ( )</td>
<td>210</td>
<td>51.90%</td>
<td>RR</td>
<td>0.94(0.77.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim, Y.H., 2008</td>
<td>High Quality</td>
<td>complications other (at least 1 bone marrow cell embolization)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>210</td>
<td>17.14%</td>
<td>No Surgical Navigation ( )</td>
<td>210</td>
<td>14.76%</td>
<td>RR</td>
<td>1.16(0.75.1.80)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Peri-Op</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>423(227.95)</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>449(238.75)</td>
<td>Mean Difference</td>
<td>-26(-110.95,58.95)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Infection-Complications (Superficial infection)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>1.72%</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>1.72%</td>
<td>RR</td>
<td>1.00(0.06.15 .61)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia-Other (Need for Manipulation)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>1.72%</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Drainage-Complications (Prolonged wound drainage)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>1.72%</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>0.00%</td>
<td>RD</td>
<td>0.02(-0.02,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Dutton, A.Q., 2008</td>
<td>Moderate Quality</td>
<td>Infection-Complications (Infection requiring readmission)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>52</td>
<td>0.00%</td>
<td>No Surgical Navigation ( )</td>
<td>56</td>
<td>1.79%</td>
<td>RD</td>
<td>-0.02(-0.05,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim, Y.-H., 2007</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>100</td>
<td>277(.)</td>
<td>No Surgical Navigation ( )</td>
<td>100</td>
<td>264.7(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim, Y.-H., 2007</td>
<td>Moderate Quality</td>
<td>Overall Complications - Complications ( )</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>100</td>
<td>7.00%</td>
<td>No Surgical Navigation ( )</td>
<td>100</td>
<td>1.00%</td>
<td>RR</td>
<td>7.00(0.88,55.86)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kim, Y.-H., 2007</td>
<td>Moderate Quality</td>
<td>Drainage-Complications (ml)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>100</td>
<td>783.3(.)</td>
<td>No Surgical Navigation ( )</td>
<td>100</td>
<td>750(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Hoffart, H.E., 2012</td>
<td>Low Quality</td>
<td>Overall Complications - Complications ([ctrl: Short term complications: pulmonary embolus (1), deep venous thrombosis (3), cerebrovascular accident with hemiparesis (1), anaemia (1) and delayed wound healing (1).] [navig short term complications: Short term complications: deep infection])</td>
<td>5 years</td>
<td>Surgical Navigation ( )</td>
<td>98</td>
<td>6.12%</td>
<td>No Surgical Navigation ( )</td>
<td>97</td>
<td>7.22%</td>
<td>RR</td>
<td>0.85(0.30,2.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Hoffart, H.E., 2012</td>
<td>Low Quality</td>
<td>Overall Complications (Late complications: revision (1), femoral osteolysis(2), navig.: distal femoral calcification (1), synovial hypertrophy(1), adhesions(1))</td>
<td>5 years</td>
<td>Surgical Navigation ( )</td>
<td>98</td>
<td>3.06%</td>
<td>No Surgical Navigation ( )</td>
<td>97</td>
<td>3.09%</td>
<td>RR</td>
<td>0.99(0.20, 4.78)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
</tbody>
</table>
TABLE 93: SURGICAL NAVIGATION VERSUS NO SURGICAL NAVIGATION: COMPOSITE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seon, J.K., 2009</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) ()</td>
<td>2 years</td>
<td>Surgical Navigation ()</td>
<td>43</td>
<td>32.3(.)</td>
<td>No Surgical Navigation ()</td>
<td>42</td>
<td>32.2(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dutton, A.Q., 2008</td>
<td>Moderate Quality</td>
<td>SF-36 Mental Component summary ( )</td>
<td>5.9 months</td>
<td>Surgical Navigation ()</td>
<td>52</td>
<td>57(.)</td>
<td>No Surgical Navigation ()</td>
<td>56</td>
<td>58(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dutton, A.Q., 2008</td>
<td>Moderate Quality</td>
<td>Oxford Knee Score (OKS)-Composite ( )</td>
<td>5.9 months</td>
<td>Surgical Navigation ()</td>
<td>52</td>
<td>20(.)</td>
<td>No Surgical Navigation ()</td>
<td>56</td>
<td>22(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lutzner, J., 2010</td>
<td>Moderate Quality</td>
<td>Euroqol-5d (Eq-5d) Total-Composite ( )</td>
<td>1.6 years</td>
<td>Surgical Navigation ()</td>
<td>38</td>
<td>. %</td>
<td>No Surgical Navigation ()</td>
<td>35</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>

TABLE 94: SURGICAL NAVIGATION VERSUS NO SURGICAL NAVIGATION: FUNCTION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mizu-uchi, H., 2008</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Function-Version (0-100) (Scale unclear. Reported on 10cm scale. Extracted on 100mm scale.)</td>
<td>6 months</td>
<td>Surgical Navigation ( )</td>
<td>37</td>
<td>78.1(.)</td>
<td>No Surgical Navigation ( )</td>
<td>39</td>
<td>78.2(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Decking, R., 2005</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100) (Scale unclear. Reported on 10cm scale. Extracted on 100mm scale.)</td>
<td>3 months</td>
<td>Surgical Navigation (Computer Assisted Navigation)</td>
<td>27</td>
<td>20(16.00)</td>
<td>No Surgical Navigation (Manually Implanted TKAs)</td>
<td>25</td>
<td>23(15.00)</td>
<td>Mean Difference</td>
<td>-3(-11.43,5.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Kiss, R.M., 2012</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Walking speed (m/s))</td>
<td>5.9 months</td>
<td>Surgical Navigation ( )</td>
<td>15</td>
<td>0.8(0.20)</td>
<td>No Surgical Navigation ( )</td>
<td>15</td>
<td>0.8(0.30)</td>
<td>Mean Difference</td>
<td>0(-0.18,0.18)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kiss, R.M., 2012</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Walking speed (m/s))</td>
<td>11.8 months</td>
<td>Surgical Navigation ( )</td>
<td>15</td>
<td>1.0(0.20)</td>
<td>No Surgical Navigation ( )</td>
<td>15</td>
<td>1.0(0.20)</td>
<td>Mean Difference</td>
<td>0(-0.14,0.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Seon, J.K., 2009</td>
<td>High Quality</td>
<td>Range Of Motion (overall) -Function ( )</td>
<td>2 years</td>
<td>Surgical Navigation ( )</td>
<td>43</td>
<td>129( )</td>
<td>No Surgical Navigation ( )</td>
<td>42</td>
<td>129.2( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>1.4 months</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>65(2.31)</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>64(2.72)</td>
<td>Mean Difference</td>
<td>1(0.08,1.92)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>6 years</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>67.3(4.64)</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>66.7(2.77)</td>
<td>Mean Difference</td>
<td>0.6(-0.79,1.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dutton, A.Q., 2008</td>
<td>Moderate Quality</td>
<td>Muscle Strength-Function (Manual muscle testing (kg))</td>
<td>5.9 months</td>
<td>Surgical Navigation ( )</td>
<td>52</td>
<td>14( )</td>
<td>No Surgical Navigation ( )</td>
<td>56</td>
<td>15( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Dutton,A.Q., 2008</td>
<td>Moderate Quality</td>
<td><strong>Timed Functional Test</strong> (higher scores better, distance, distance/time)-Function (Walking ability: number of patients able to walk independently for more than 30 min)</td>
<td>1 months</td>
<td>Surgical Navigation ( )</td>
<td>52</td>
<td>. %</td>
<td>No Surgical Navigation ( )</td>
<td>56</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Decking,R., 2005</td>
<td>High Quality</td>
<td><strong>Knee Society Score</strong> KSS(Scale unclear. KSS generally on 0-100 scale?)</td>
<td>3 months</td>
<td>Surgical Navigation (Computer Assisted Navigation)</td>
<td>27</td>
<td>167.7(24.80)</td>
<td>No Surgical Navigation (Manually Implanted TKAs)</td>
<td>25</td>
<td>160.6(22.20)</td>
<td>Mean Difference</td>
<td>7.1(-5.68,19.88)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Latzner,J., 2010</td>
<td>High Quality</td>
<td><strong>Knee Society Score-Function-Function</strong> (Improvement in score)</td>
<td>1 months</td>
<td>Surgical Navigation ( )</td>
<td>38</td>
<td>. %</td>
<td>No Surgical Navigation ( )</td>
<td>35</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dutton,A.Q., 2008</td>
<td>Moderate Quality</td>
<td><strong>Timed Functional Test</strong> (higher scores better, distance, distance/time)-Function (Walking ability: number of patients able to walk independently for more than 30 min)</td>
<td>5.9 months</td>
<td>Surgical Navigation ( )</td>
<td>52</td>
<td>. %</td>
<td>No Surgical Navigation ( )</td>
<td>56</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
## TABLE 95: SURGICAL NAVIGATION VERSUS NO SURGICAL NAVIGATION: LENGTH OF SURGERY

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church, J.S., 2007</td>
<td>High Quality</td>
<td>Length Of Surgery-Length Of Surgery ( )</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>14</td>
<td>74.1( )</td>
<td>No Surgical Navigation ( )</td>
<td>12</td>
<td>56.8( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Lutzner, J., 2008</td>
<td>High Quality</td>
<td>Length Of Surgery-Length Of Surgery (Minutes)</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>40</td>
<td>. %</td>
<td>No Surgical Navigation ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Length Of Surgery-Length Of Surgery (min)</td>
<td>Intra-Op</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>159(28.2)</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>117(21.77)</td>
<td>Mean Difference</td>
<td>42 (32.73, 51.27)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
### TABLE 96: SURGICAL NAVIGATION VERSUS NO SURGICAL NAVIGATION: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decking,R., 2005</td>
<td>High</td>
<td>Womac-Pain averaged VAS Version (0-100) (Scale unclear. Reported on 10cm scale. Extracted on 100mm scale.)</td>
<td>3 months</td>
<td>Surgical Navigation (Computer Assisted Navigation)</td>
<td>27</td>
<td>19(20.00)</td>
<td>No Surgical Navigation (Manually Implanted TKAs)</td>
<td>25</td>
<td>19(17.00)</td>
<td>Mean Difference</td>
<td>0(-10.07,10.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Seon,J.K., 2009</td>
<td>High</td>
<td>Hospital for Special Surgery Knee Rating(Pain subscale)</td>
<td>2 years</td>
<td>Surgical Navigation ()</td>
<td>43</td>
<td>28.7(.)</td>
<td>No Surgical Navigation ()</td>
<td>42</td>
<td>29.2(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Seon,J.K., 2009</td>
<td>High</td>
<td>Womac-Pain Likert Version (0-20) ()</td>
<td>2 years</td>
<td>Surgical Navigation ()</td>
<td>43</td>
<td>6.1(.)</td>
<td>No Surgical Navigation ()</td>
<td>42</td>
<td>6.3(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Reoperation- Reoperation (Open reduction surgery for fracture (in non-navigation group: for patellar fracture; for navigation group: for supracondylar fracture))</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>1.72%</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>1.72%</td>
<td>RR</td>
<td>1.00(0.06,15.61)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Thiengwittayaporn, S., 2013</td>
<td>High Quality</td>
<td>Outcomes Of Conversions- Reoperation (Polyethylene exchange for postoperative recurvatum)</td>
<td>Post-Op</td>
<td>Surgical Navigation ( )</td>
<td>58</td>
<td>0.00%</td>
<td>No Surgical Navigation ( )</td>
<td>58</td>
<td>1.72%</td>
<td>RD</td>
<td>-0.02(-0.05,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Decking,R., 2005</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100) (Scale unclear. Reported on 10cm scale. Extracted on 100mm scale.)</td>
<td>3 months</td>
<td>Surgical Navigation (Computer Assisted Navigation)</td>
<td>27</td>
<td>23(18.00)</td>
<td>No Surgical Navigation (Manually Implanted TKAs)</td>
<td>25</td>
<td>28(19.00)</td>
<td>Mean Difference</td>
<td>-5(-15.08,5.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>

**TABLE 98: SURGICAL NAVIGATION VERSUS NO SURGICAL NAVIGATION: STIFFNESS**
PATIENT SPECIFIC TECHNOLOGY

A. PATIENT SPECIFIC INSTRUMENTATION: PAIN AND FUNCTION
Strong evidence supports not using patient specific instrumentation compared to conventional instrumentation for total knee arthroplasty (TKA) because there is no difference in pain or functional outcomes.

Strength of Recommendation: Strong Evidence

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

B. PATIENT SPECIFIC INSTRUMENTATION: TRANSFUSIONS AND COMPLICATIONS
Moderate evidence supports not using patient specific instrumentation compared to conventional instrumentation for total knee arthroplasty (TKA) because there is no difference in transfusions or complications.

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

RATIONALE
Two high quality studies (Pfitzner 2014 and Pietsch 2013) demonstrated no difference in knee society and visual analog pain scores between patient specific cutting guides and conventional instrumentation. Both studies also found no difference in knee society function score and one study (Pfitzner 2014) additionally found no difference in the overall WOMAC score. There was heterogeneity in outcomes regarding perioperative blood loss with Pietsch 2013 demonstrating a clinically significant difference in perioperative blood loss, however, no impact in the drop in hgb and need for transfusion. This indicates that while there is some improvement in blood loss in patients who receive patient specific instrumentation there was no significant clinical impact when compared to conventional instrumentation. Three moderate quality studies and one low quality study found similar results with no significant difference between both treatment groups.

There was no evidence to demonstrate a clinically relevant difference in surgical time or shorter length of stay when comparing both groups. One moderate quality study (Boonen 2013) found no difference in hospital length of stay between both groups.

The work group recognizes that there are scenarios where patient specific instrumentation theoretically could be considered but the evidence is insufficient to make a recommendation.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION
There are no risks or Harms with implementation.
FUTURE RESEARCH
Further study into the impact of patient specific cutting guides on blood loss and potential transfusion rates would be appropriate.
## RESULTS

**SUMMARY OF FINDINGS TABLE 30: PATIENT SPECIFIC TECHNOLOGY**

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors Patient Specific Technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Favors Traditional Instrumentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Complications

- Complications other
- Fall in HB, g/dL
- Blood transfusion %
- Need Transfusion- Complications
- Blood Loss

### Composite

- Womac-overall- Composite Likert (0-96)

### Function

- Knee Society Score-Function- Function

### Length of Stay

- Length Of Recovery- Length Of Stay

### Length of Surgery

- Length Of Surgery- Length Of Surgery

### Pain

- Knee Society Score- Pain
- Vas Pain (10cm)- Pain

### References

- Pietsch, M., 2013
- Pfitzner, T., 2014
- Roh, Y.W., 2013
- Chareancholvanich, K., 2013
- Boonen, B., 2013
- Chen, J.Y., 2014
**QUALITY EVALUATION TABLE 20: PATIENT SPECIFIC TECHNOLOGY**

**Quality Chart Key**

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- ☠ = Half flaw in domain of interest

### QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chen,J.Y., 2014</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

### QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boonen,B., 2013</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Chareancholvanich,K., 2013</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Hamilton,W.G., 2013</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Pfitzner,T., 2014</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Roh,Y.W., 2013</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>
### Table 99: Patient Specific Technology Versus Conventional Instrumentation: Complications

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Post-Op</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>391(186.0)</td>
<td>No Use Of Patient Specific Technology(minimally invasive conventional surgery)</td>
<td>40</td>
<td>603(239.0)</td>
<td>Mean Difference</td>
<td>-212(-305.85,-118.15)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Need Transfusion- Complications ( )</td>
<td>Post-Op</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>7.50%</td>
<td>No Use Of Patient Specific Technology(minimally invasive conventional surgery)</td>
<td>40</td>
<td>10.00%</td>
<td>RR</td>
<td>0.75(0.18,3.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Fall in HB, g/dL(HB loss)</td>
<td>Post-Op</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>3.6(1.00)</td>
<td>No Use Of Patient Specific Technology(minimally invasive conventional surgery)</td>
<td>40</td>
<td>4.1(1.20)</td>
<td>Mean Difference</td>
<td>-0.5(-0.98,-0.02)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Boonen,B., 2013</td>
<td>Moderate Quality</td>
<td>Fall in HB, g/dL(raw hb levels mmol/L)</td>
<td>1 Days</td>
<td>Use Of Patient Specific Technology(MRI patient specific guides)</td>
<td>45</td>
<td>7.5(0.70)</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>45</td>
<td>7.4(1.10)</td>
<td>Mean Difference</td>
<td>0.1(-0.28,0.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Boonen,B., 2013</td>
<td>Moderate Quality</td>
<td>Fall in HB, g/dL(raw hb levels mmol/L)</td>
<td>3 Days</td>
<td>Use Of Patient Specific Technology(MRI patient specific guides)</td>
<td>45</td>
<td>6.9(0.80)</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>45</td>
<td>6.7(1.30)</td>
<td>Mean Difference</td>
<td>0.2(-0.25,0.65)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Boonen,B., 2013</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Peri-Op</td>
<td>Use Of Patient Specific Technology(MRI patient specific guides)</td>
<td>.</td>
<td>. %</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chareancholvanchohnan, K., 2013</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Intra-Op</td>
<td>Use Of Patient Specific Technology(patien specific cutting guides)</td>
<td>40</td>
<td>614.8(.)</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>40</td>
<td>581.8(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Chareancholvanchik, K., 2013</td>
<td>Moderate Quality</td>
<td>Blood transfusion % ( )</td>
<td>Intra-Op</td>
<td>Use Of Patient Specific Technology(patient specific cutting guides)</td>
<td>40</td>
<td>20.00%</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>40</td>
<td>25.00%</td>
<td>RR</td>
<td>0.80 (0.35, 1.82)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Roh,Y.W., 2013</td>
<td>Moderate Quality</td>
<td>Blood Loss - Complications (ml)</td>
<td>Post-Op</td>
<td>Use Of Patient Specific Technology( )</td>
<td>42</td>
<td>783.7( )</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>48</td>
<td>843.8( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Chen,J.Y., 2014</td>
<td>Low Quality</td>
<td>complication other (Non-ST Elevation Myocardial Infarction (NSTEMI))</td>
<td>Post-Op</td>
<td>Use Of Patient Specific Technology(patient specific instrumentation with MRI scan)</td>
<td>29</td>
<td>3.45%</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>30</td>
<td>0.00%</td>
<td>RD</td>
<td>0.03 (-0.03, 0.10)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
</tbody>
</table>
## TABLE 100: PATIENT SPECIFIC TECHNOLOGY VERSUS CONVENTIONAL INSTRUMENTATION: COMPOSITE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfitzner,T., 2014</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96) ()</td>
<td>3 months</td>
<td>Use Of Patient Specific Technology(MRI patient specific cutting blocks)</td>
<td>.</td>
<td>. %</td>
<td>No Use Of Patient Specific Technology()</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
</tr>
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<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Pfitzner,T., 2014</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>3 months</td>
<td>Use Of Patient Specific Technology(MRI patient specific cutting blocks)</td>
<td>.</td>
<td>. %</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2 weeks</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>57(11.00)</td>
<td>No Use Of Patient Specific Technology(minimally invasive conventional surgery)</td>
<td>40</td>
<td>56(13.00)</td>
<td>Mean Difference</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>1.4 months</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>79(14.00)</td>
<td>No Use Of Patient Specific Technology(minimally invasive conventional surgery)</td>
<td>40</td>
<td>79(15.00)</td>
<td>Mean Difference</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Knee Society Score-Function-Function ( )</td>
<td>2.8 months</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>86(12.00)</td>
<td>No Use Of Patient Specific Technology(minimally invasive conventional surgery)</td>
<td>40</td>
<td>86(13.00)</td>
<td>Mean Difference</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>----------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Boonen,B., 2013</td>
<td>Moderate</td>
<td>Length Of Recovery-Length Of Stay (days)</td>
<td>Peri-Op</td>
<td>Use Of Patient Specific Technology(MRI patient specific guides)</td>
<td>No Use Of Patient Specific Technology(   )</td>
<td>Mean Difference</td>
<td>-0.1(-0.52,0.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chareancholvanich,K., 2013</td>
<td>Moderate</td>
<td>Length Of Recovery-Length Of Stay (days)</td>
<td>During Hospital Stay</td>
<td>Use Of Patient Specific Technology(patient specific cutting guides)</td>
<td>No Use Of Patient Specific Technology(   )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------</td>
<td>----------------------------------</td>
<td>----------</td>
<td>-------------------------------------------------------------------------------------</td>
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<td>----------------</td>
<td>-----------------------------------------------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Roh,Y.W., 2013</td>
<td>Moderate Quality</td>
<td>Length Of Surgery- Length Of Surgery (minutes)</td>
<td>Intra-Op</td>
<td>Use Of Patient Specific Technology( )</td>
<td>42</td>
<td>59.4(6.0)</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>48</td>
<td>46.6(6.0)</td>
<td>Author Reported</td>
</tr>
<tr>
<td>Pfitzner,T., 2014</td>
<td>High Quality</td>
<td>Length Of Surgery- Length Of Surgery ( )</td>
<td>Intra-Op</td>
<td>Use Of Patient Specific Technology(MRI patient specific cutting blocks)</td>
<td>30</td>
<td>. %</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
</tr>
<tr>
<td>Boonen,B., 2013</td>
<td>Moderate Quality</td>
<td>Length Of Surgery- Length Of Surgery (in minutes)</td>
<td>Intra-Op</td>
<td>Use Of Patient Specific Technology(MRI patient specific guides)</td>
<td>90</td>
<td>44.7(6.50)</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>90</td>
<td>50(10.60)</td>
<td>Mean Difference</td>
</tr>
<tr>
<td>Hamilton,W.G., 2013</td>
<td>Moderate Quality</td>
<td>Length Of Surgery- Length Of Surgery (in seconds)</td>
<td>Intra-Op</td>
<td>Use Of Patient Specific Technology(patient specific instrumentation with CT scan)</td>
<td>26</td>
<td>3447(298)</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>26</td>
<td>3707(348)</td>
<td>Mean Difference</td>
</tr>
</tbody>
</table>
TABLE 104: PATIENT SPECIFIC TECHNOLOGY VERSUS CONVENTIONAL INSTRUMENTATION: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfitzner,T., 2014</td>
<td>High Quality</td>
<td>Knee Society Score-Pain-Pain ( )</td>
<td>3 months</td>
<td>Use Of Patient Specific Technology(MRI patient specific cutting blocks)</td>
<td>30</td>
<td>. %</td>
<td>No Use Of Patient Specific Technology( )</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>1 Days</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>2.6(0.70)</td>
<td>No Use Of Patient Specific Technology(minimal ly invasive conventional surgery)</td>
<td>40</td>
<td>2.9(0.80)</td>
<td>Mean Difference</td>
<td>-0.3(-0.63,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>3 Days</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>2.6(0.60)</td>
<td>No Use Of Patient Specific Technology(minimal ly invasive conventional surgery)</td>
<td>40</td>
<td>2.6(0.70)</td>
<td>Mean Difference</td>
<td>0(-0.29,0.29)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>1.4 weeks</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>2(0.70)</td>
<td>No Use Of Patient Specific Technology(minimal ly invasive conventional surgery)</td>
<td>40</td>
<td>2.1(0.70)</td>
<td>Mean Difference</td>
<td>-0.1(-0.41,0.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pietsch,M., 2013</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>1.4 months</td>
<td>Use Of Patient Specific Technology(custom fit MRI=based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>1.1(9.00)</td>
<td>No Use Of Patient Specific Technology(minimal ly invasive conventional surgery)</td>
<td>40</td>
<td>1.3(1.00)</td>
<td>Mean Difference</td>
<td>-0.2(-3.01,2.61)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
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<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Pietsch, M., 2013</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ()</td>
<td>2.8 months</td>
<td>Use Of Patient Specific Technology (custom fit MRI-based pin guide with minimally invasive surgery)</td>
<td>40</td>
<td>0.8(0.80)</td>
<td>No Use Of Patient Specific Technology (minimally invasive conventional surgery)</td>
<td>40</td>
<td>0.9(0.70)</td>
<td>Mean Difference</td>
<td>-0.1(-0.43,0.23)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
DRAINS
Strong evidence supports not using a drain with total knee arthroplasty (TKA) because there is no difference in complications or outcomes.

Strength of Recommendation: Strong Evidence 🟢🟢🟢
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

RATIONALE
Four high-quality studies and three moderate-quality studies were reviewed. These studies showed no difference in multiple measures including VTE, infection, swelling, blood transfusions, hematoma formation, range of motion, length of stay, pain or reoperation between the treatment groups. One high quality study demonstrated a significantly greater need for manipulation (8% vs. 0%, P-value<0.05) in patients who did not receive a drain (Esler, 2003). Two high-quality studies reported significantly higher transfusion rates in patients who received a drain (Esler, 2003 and Li 2011). Two high-quality studies found no difference in transfusion rates in the presence or absence of a drain (Ritter 1994 and Jenny 2001). Meta-analysis of the included studies did not show significant differences in infection or flexion range of motion in the presence or absence of a drain. One study (Niskanen 2000) suggested that there may be more wound drainage in patients without a drain. All studies were relatively small ranging from 20–50 patients per treatment group with the exception of one high-quality study with 138 patients per treatment group (Ritter 1994).

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION
Potential harms include increased incidence of knee stiffness requiring manipulation with resultant poor range of motion, and increased wound drainage.

FUTURE RESEARCH
This is an ideal topic for a large, prospective, multi-centered randomized clinical trial. If appropriately risk adjusted, data from large registries could also be of value. Particular focus could be given to evaluation of patient-reported outcomes, infection, and long-term functional outcomes including range of motion.
## RESULTS

### SUMMARY OF FINDINGS TABLE 1: DRAINS VERSUS NO DRAINS

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Favors Drains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Favors No Drains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Complications

- Complications other
- Deep venous thrombosis
- Fall in HB, g/dL
- Infection- Complications
- Manipulation Under Anesthesia- Other
- Swelling - Other
- VTE- Complications
- Blood transfusion %
- Effusion
- Hematoma
- Need Transfusion- Complications
- Wound Complications
- Blood Loss
- Drainage- Complications

#### Function

- Range of Motion(flexion) - Function
- Range Of Motion(overall) - Function

#### Length of Stay

- Length Of Recovery- Length Of Stay

#### Pain

- Vas Pain (10cm)- Pain

#### Reoperation

|----------------|--------------------|----------------------|-------------|---------------------|------------------|---------------------|----------------|
### Figure 7 Drains versus No Drains: Infection Peto Odds Ratio

<table>
<thead>
<tr>
<th>Reference</th>
<th>Outcome</th>
<th>OR (95% CI)</th>
<th>Treatment</th>
<th>Control</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niskanen, R.O., 2000</td>
<td>Superficial</td>
<td>0.13 (0.00, 6.48)</td>
<td>0/20</td>
<td>1/19</td>
<td>25.03</td>
</tr>
<tr>
<td>Ritter, M.A., 1994</td>
<td>Superficial</td>
<td>1.00 (0.06, 16.07)</td>
<td>1/138</td>
<td>1/138</td>
<td>49.92</td>
</tr>
<tr>
<td>Li, C., 2011</td>
<td>Wound infections</td>
<td>0.14 (0.00, 6.82)</td>
<td>0/50</td>
<td>1/50</td>
<td>25.05</td>
</tr>
<tr>
<td>Overall (I-squared = 0.0%, p = 0.599)</td>
<td></td>
<td>0.36 (0.05, 2.58)</td>
<td>1/208</td>
<td>3/207</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note: The odds ratio favors drains. The p-value is 0.00254, indicating statistical significance.
FIGURE 8 DRAINS VERSUS NO DRAINS RANGE OF MOTION IN FLEXION

<table>
<thead>
<tr>
<th>reference</th>
<th>days</th>
<th>WMD (95% CI)</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ritter, M.A., 1994</td>
<td>7 days</td>
<td>0.00 (-1.64, 1.64)</td>
<td>85.61</td>
</tr>
<tr>
<td>Li, C., 2011</td>
<td>7 days</td>
<td>-2.00 (-6.70, 2.70)</td>
<td>10.41</td>
</tr>
<tr>
<td>Jenny, J.Y., 2001</td>
<td>7 days</td>
<td>3.00 (-4.61, 10.61)</td>
<td>3.98</td>
</tr>
<tr>
<td>Subtotal (I-squared = 0.0%, p = 0.528)</td>
<td></td>
<td>-0.09 (-1.61, 1.43)</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>2 to 3 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Li, C., 2011</td>
<td>2 to 3 days</td>
<td>-3.00 (-9.08, 3.08)</td>
<td>54.09</td>
</tr>
<tr>
<td>Jenny, J.Y., 2001</td>
<td>2 to 3 days</td>
<td>-1.00 (-7.60, 5.60)</td>
<td>45.91</td>
</tr>
<tr>
<td>Subtotal (I-squared = 0.0%, p = 0.662)</td>
<td></td>
<td>-2.08 (-6.55, 2.39)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

NOTE: Weights are from random effects analysis.
QUALITY EVALUATION TABLE 1: DRAINS

Quality Chart Key

- = No Flaw in Domain of Interest
○ = Flaw in Domain of Interest
☆ = Half flaw in domain of interest

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheng,S.C., 2005</td>
<td>☆</td>
<td>☆</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Esler,C.N.A., 2003</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Li,C., 2011</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Niskanen, R.O., 2000</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Omonbude, D., 2010</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Ritter,M.A., 1994</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
</tbody>
</table>
### DETAILED DATA TABLES

**PART 1: DRAINS VERSUS NO DRAINS**

**TABLE 105: PART 1- DRAINS VERSUS NO DRAINS: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esler, C.N. A., 2003</td>
<td>High Quality</td>
<td>complications other (fever above 30 degrees celsius)</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>8.00%</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>18.00%</td>
<td>RR</td>
<td>0.44(0.15,1.35)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Esler, C.N. A., 2003</td>
<td>High Quality</td>
<td>Deep venous thrombosis ( )</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Esler, C.N. A., 2003</td>
<td>High Quality</td>
<td>Hematoma (hematoma or bruising)</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Esler, C.N. A., 2003</td>
<td>High Quality</td>
<td>Blood transfusion %(transfusion)</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>62.00%</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>38.00%</td>
<td>RR</td>
<td>1.63(1.08,2.47)</td>
<td>Treatment 2 Significant (P-value&lt;0.05)</td>
</tr>
<tr>
<td>Jenny, J.Y., 2001</td>
<td>High Quality</td>
<td>Swelling - Other ( )</td>
<td>1 weeks</td>
<td>Drains ( )</td>
<td>30</td>
<td>49(5.00)</td>
<td>No Use Of Drains ( )</td>
<td>30</td>
<td>49(4.00)</td>
<td>Mean Difference</td>
<td>0(-2.29,2.29)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Jenny, J.Y., 2001</td>
<td>High Quality</td>
<td>Blood transfusion %( )</td>
<td>Post-Op</td>
<td>Drains ( )</td>
<td>30</td>
<td>36.67%</td>
<td>No Use Of Drains ( )</td>
<td>30</td>
<td>33.33%</td>
<td>RR</td>
<td>1.10(0.55,2.19)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Jenny, J.Y., 2001</td>
<td>High Quality</td>
<td>Swelling - Other ( )</td>
<td>2 hours</td>
<td>Drains ( )</td>
<td>30</td>
<td>49(5.00)</td>
<td>No Use Of Drains ( )</td>
<td>30</td>
<td>49(4.00)</td>
<td>Mean Difference</td>
<td>0(-2.29,2.29)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Li,C., 2011</td>
<td>High Quality</td>
<td>Infection-Complications (wound infections)</td>
<td>Post-Op</td>
<td>Drains ( )</td>
<td>50</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>2.00%</td>
<td>RD</td>
<td>-0.02(-0.06,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Li,C., 2011</td>
<td>High Quality</td>
<td>Deep venous thrombosis( )</td>
<td>Post-Op</td>
<td>Drains ( )</td>
<td>50</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Niskanen, R.O., 2000</td>
<td>High Quality</td>
<td>Need Transfusion-Complications (units transfused)</td>
<td>Post-Op</td>
<td>Drains (closed suction drainage)</td>
<td>20</td>
<td>2.3(,)</td>
<td>No Use Of Drains ( )</td>
<td>19</td>
<td>1.4(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Niskanen, R.O., 2000</td>
<td>High Quality</td>
<td>complications other (prolonged oozing)</td>
<td>Post-Op</td>
<td>Drains (closed suction drainage)</td>
<td>20</td>
<td>5.00%</td>
<td>No Use Of Drains ( )</td>
<td>19</td>
<td>0.00%</td>
<td>RD</td>
<td>0.05(-0.05,0.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Niskanen, R.O., 2000</td>
<td>High Quality</td>
<td>Infection-Complications (superficial infection)</td>
<td>Post-Op</td>
<td>Drains (closed suction drainage)</td>
<td>20</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>19</td>
<td>5.26%</td>
<td>RD</td>
<td>-0.05(-0.15,0.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ritter,M.A., 1994</td>
<td>High Quality</td>
<td>Fall in HB, g/dL(raw HB score)</td>
<td>1 Days</td>
<td>Drains (closed wound drainage)</td>
<td>.</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ritter,M.A., 1994</td>
<td>High Quality</td>
<td>Fall in HB, g/dL(raw HB score)</td>
<td>2 Days</td>
<td>Drains (closed wound drainage)</td>
<td>.</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Ritter,M.A., 1994</td>
<td>High Quality</td>
<td>Fall in HB, g/dL(raw HB score)</td>
<td>5 Days</td>
<td>Drains (closed wound drainage)</td>
<td>.</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
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<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ritter,M.A., 1994</td>
<td>High Quality</td>
<td>Blood transfusion % (raw transfusion in ml)</td>
<td>Post-Op</td>
<td>Drains (closed)</td>
<td>.</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatmen t 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatmen t 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Ritter, M. A., 1994</td>
<td>High Quality</td>
<td>Blood transfusion % (percent needi ng transfusion)</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>138</td>
<td>64.49%</td>
<td>No Use Of Drains ( )</td>
<td>138</td>
<td>67.39%</td>
<td>RR</td>
<td>0.96(0.81,1.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ritter, M. A., 1994</td>
<td>High Quality</td>
<td>complications other (need joint immobilization due to excessive bleeding)</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>138</td>
<td>21.74%</td>
<td>No Use Of Drains ( )</td>
<td>138</td>
<td>25.36%</td>
<td>RR</td>
<td>0.86(0.56,1.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ritter, M. A., 1994</td>
<td>High Quality</td>
<td>Infection-Complications (superficial)</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>138</td>
<td>0.72%</td>
<td>No Use Of Drains ( )</td>
<td>138</td>
<td>0.72%</td>
<td>RR</td>
<td>1.00(0.06,15.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ritter, M. A., 1994</td>
<td>High Quality</td>
<td>VTE-Complications ( )</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>138</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>138</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ritter, M. A., 1994</td>
<td>High Quality</td>
<td>Swelling - Other ( )</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>138</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>138</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ritter, M. A., 1994</td>
<td>High Quality</td>
<td>complications other (bleeding dyscrasias)</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>138</td>
<td>0.00%</td>
<td>No Use Of Drains ( )</td>
<td>138</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fan, Y., 2013</td>
<td>Moderate Quality</td>
<td>Wound Complications (wound redness)</td>
<td>2 Days</td>
<td>Drains ( )</td>
<td>40</td>
<td>2.50%</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>0.00%</td>
<td>RD</td>
<td>.025(-.02,.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Omonbude, D., 2010</td>
<td>Moderate Quality</td>
<td>Effusion (maximum depth of thickness in mm)</td>
<td>1 Days</td>
<td>Drains ( )</td>
<td>40</td>
<td>5.91(29.33)</td>
<td>No Use Of Drains ( )</td>
<td>38</td>
<td>6.08(28.05 )</td>
<td>Mean Difference</td>
<td>-0.17(-12.91,12.57)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Omonbude, D., 2010</td>
<td>Moderate Quality</td>
<td>hematoma (maximum depth of thickness in mm)</td>
<td>4 Days</td>
<td>Drains ( )</td>
<td>40</td>
<td>8.41(260.05)</td>
<td>No Use Of Drains ( )</td>
<td>38</td>
<td>11.08(251.36)</td>
<td>Mean Difference</td>
<td>-2.67(-116.17,110.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>
### TABLE 106: PART 1- DRAINS VERSUS NO DRAINS: FUNCTION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esler,C.N.A., 2003</td>
<td>High Quality</td>
<td>Range Of Motion (overall) - Function (percentage of preoperation flexion regained by day 10)</td>
<td>1.4 weeks</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>. %</td>
<td>No Use Of Drains ()</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jenny,J.Y., 2001</td>
<td>High Quality</td>
<td>Range Of Motion (flexion) - Function ()</td>
<td>1 weeks</td>
<td>Drains ()</td>
<td>30</td>
<td>79(16.00)</td>
<td>No Use Of Drains ()</td>
<td>30</td>
<td>76(14.00)</td>
<td>Mean Difference</td>
<td>3(-4.61,10.61)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jenny,J.Y., 2001</td>
<td>High Quality</td>
<td>Range Of Motion (flexion) - Function ()</td>
<td>2 Days</td>
<td>Drains ()</td>
<td>30</td>
<td>48(14.00)</td>
<td>No Use Of Drains ()</td>
<td>30</td>
<td>49(12.00)</td>
<td>Mean Difference</td>
<td>-1(-7.60,5.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Li,C., 2011</td>
<td>High Quality</td>
<td>Range Of Motion (overall) - Function (degrees of active flexion)</td>
<td>3 Days</td>
<td>Drains ()</td>
<td>50</td>
<td>45(15.00)</td>
<td>No Use Of Drains ()</td>
<td>50</td>
<td>48(16.00)</td>
<td>Mean Difference</td>
<td>-3(-9.08,3.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Li,C., 2011</td>
<td>High Quality</td>
<td>Range Of Motion (overall) - Function (degrees of active flexion)</td>
<td>1 weeks</td>
<td>Drains ()</td>
<td>50</td>
<td>68(12.00)</td>
<td>No Use Of Drains ()</td>
<td>50</td>
<td>70(12.00)</td>
<td>Mean Difference</td>
<td>-2(-6.70,2.70)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Li,C., 2011</td>
<td>High Quality</td>
<td>Range Of Motion</td>
<td>2 weeks</td>
<td>Drains ()</td>
<td>50</td>
<td>82(16.00)</td>
<td>No Use Of Drains ()</td>
<td>50</td>
<td>83(14.00)</td>
<td>Mean Difference</td>
<td>-1(-6.89,4.89)</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Li,C., 2011</td>
<td>High Quality</td>
<td>Range Of Motion (overall) - Function (degrees of active flexion)</td>
<td>1 years</td>
<td>Drains ( )</td>
<td>50</td>
<td>100(12.00)</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>100(10.00)</td>
<td>Mean Difference</td>
<td>0(-4.33,4.33)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ritter,M.A., 1994</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>1 weeks</td>
<td>Drains (closed wound drainage)</td>
<td>138</td>
<td>70(,)</td>
<td>No Use Of Drains ( )</td>
<td>138</td>
<td>72(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function (in flexion)</td>
<td>1 weeks</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function (in flexion)</td>
<td>2 weeks</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function (in flexion)</td>
<td>1 months</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function (during extension)</td>
<td>1 weeks</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function (during extension)</td>
<td>2 weeks</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function (during extension)</td>
<td>1 months</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Range Of Motion (overall) - Function ( )</td>
<td>1 years</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>

**TABLE 107: PART 1- DRAINS VERSUS NO DRAINS: LENGTH OF STAY**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esler,C.N.A., 2003</td>
<td>High Quality</td>
<td>Length Of Recovery- Length Of Stay ( )</td>
<td>Post-Op</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tbody>
</table>

**TABLE 108: PART 1- DRAINS VERSUS NO DRAINS: PAIN**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esler,C.N.A., 2003</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>2 Days</td>
<td>Drains (closed)</td>
<td>50</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Esler,C.N.A., 2003</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>6 Days</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Esler,C.N.A., 2003</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>1.4 weeks</td>
<td>Drains (closed wound drainage)</td>
<td>50</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>50</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jenny,J.Y., 2001</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>2 Days</td>
<td>Drains ( )</td>
<td>30</td>
<td>5.3(2.80)</td>
<td>No Use Of Drains ( )</td>
<td>30</td>
<td>5.1(1.80)</td>
<td>Mean Difference</td>
<td>0.2(-0.99,1.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jenny,J.Y., 2001</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>1 weeks</td>
<td>Drains ( )</td>
<td>30</td>
<td>4.9(2.20)</td>
<td>No Use Of Drains ( )</td>
<td>30</td>
<td>5(2.20)</td>
<td>Mean Difference</td>
<td>-0.1(-1.21,1.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>3 Days</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>1 Days</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>5 Days</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>1 weeks</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Fan,Y., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)-Pain ( )</td>
<td>2 weeks</td>
<td>Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>No Use Of Drains ( )</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>
CRYOTHERAPY DEVICES
Moderate evidence supports that cryotherapy devices after knee arthroplasty (KA) do not improve outcomes.

Strength of Recommendation: Moderate Evidence
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

RATIONALE
The literature extraction and review revealed one high quality study, two moderate quality studies, and one low quality study.

The high quality study (Ivey 1994) used a cryotherapy sleeve on all of the patients and randomized the target temperatures up to including 70°F. There was no evidence for dose dependent differences in need for pain medication including the control of 70°F. There is some issue with this control, in that it does have a cooling effect. As the only high level study it falls to a moderate level of evidence for this guideline.

Of the two moderate quality studies that used cryotherapy, one (Holmstram 2005) consisted of postoperative unicompartmental knees that were randomized between epidural anesthesia, cryotherapy, and a third arm that does not document the use of simple cold packs/ice. It reported less pain medication consumption in the two treatment arms.

The second of the moderate quality studies (Su 2012) compared cryotherapy/compression to cryotherapy alone, including the early post-discharge period, and showed no significant outcome differences other than less overall narcotics used over the broad period of the first two weeks and higher levels of patient satisfaction. The study involved 11 sites and the patients could not be blinded to treatment.

One low quality study (Theinpoint, 2014) demonstrated less flexion in the cryotherapy group at an intermediate time period; this was attributed to the patient having less freedom to bend their knee while in the device.

The lack of dose effect in reducing narcotic consumption in the high level study contradicts the findings in the two relevant moderate level studies, both of which were not internally supported by significant differences in visual analogue pain scales. There were no other significant differences in other outcomes in the two relevant moderate studies.

RISKS AND HARMs OF IMPLEMENTING THIS RECOMMENDATION
Frostbite (cold burn) is a potential harm for the use of cryotherapy. It is possible that a unique patient population at risk for complications from pain medication might benefit from less narcotic consumption in the early post-operative period using cryotherapy.
FUTURE RESEARCH
The varied temperature study (Ivey 1994) could be replicated with larger numbers to confirm the lack of dose effect from the cooling mechanisms.

A larger multi-center study that compared simple cold packs or ice with cryotherapy devices and also followed the patients for a longer period of time will be very valuable. Using patient reported outcomes in addition to satisfaction scores to measure differences between the groups will be appropriate.

Further randomized controlled trials of the use of compression in cryotherapy compared to standard treatments (cryotherapy alone or compression alone) would be appropriate.

RESULTS

SUMMARY OF FINDINGS TABLE 26: CRYOTHERAPY

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Favors No Cryotherapy</td>
<td>Thiepport, E., 2014</td>
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○ Not Significant

<table>
<thead>
<tr>
<th>Complications</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
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</thead>
<tbody>
<tr>
<td>Fall in HB, g/dL</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Overall Complications- Complications</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Manipulation Under Anesthesia</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Swelling</td>
<td>○</td>
<td>○</td>
<td>○</td>
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Function

<table>
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<tr>
<th>Range of Motion</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
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</thead>
<tbody>
<tr>
<td>Timed Functional Tests</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tbody>
</table>

Pain

<table>
<thead>
<tr>
<th>Vas Pain</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>○</td>
<td>○</td>
<td>○</td>
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</tbody>
</table>

Postoperative Pain Control

<table>
<thead>
<tr>
<th>Additional Medication- Postoperative Pain Control</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine consumption (mg)</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</table>

<table>
<thead>
<tr>
<th>Narcotic Use</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perioperative Use Of Narcotics- Pain</td>
<td>●</td>
<td>○</td>
<td>○</td>
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</table>

Other

<table>
<thead>
<tr>
<th>Patient satisfaction</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
### QUALITY EVALUATION TABLE 17: CRYOTHERAPY

#### Quality Chart Key

- **●** = No Flaw in Domain of Interest
- **○** = Flaw in Domain of Interest
- **◊** = Half flaw in domain of interest

#### QE - Intervention - Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
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<tbody>
<tr>
<td>Holmström.A., 2005</td>
<td>◊</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Ivey.M., 1994</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Su.E.P., 2012</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Thienpont.E., 2014</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>
### DETAILED DATA TABLES

**TABLE 109: CRYOTHERAPY VERSUS NO CRYOTHERAPY: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thienpont,E., 2014</td>
<td>Low Quality</td>
<td>Fall in HB, g/dL (Recorded as actual HB levels - not loss)</td>
<td>2 days</td>
<td>Cryotherapy (4 hrs of continuous cooling at 11C after surgery, 2 hrs before and after PT first postoperative day)</td>
<td>50</td>
<td>12(1.00)</td>
<td>No Cryotherapy (Cold packs applied 15 min at a time at 2 and 4 hours after surgery, after PT, and at night as needed.)</td>
<td>50</td>
<td>12(1.00)</td>
<td>Mean Difference</td>
<td>0(-0.39,0.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Thienpont,E., 2014</td>
<td>Low Quality</td>
<td>Fall in HB, g/dL (Recorded as actual HB levels - not loss)</td>
<td>4 days</td>
<td>Cryotherapy (4 hrs of continuous cooling at 11C after surgery, 2 hrs before and after PT first postoperative day)</td>
<td>50</td>
<td>11.5(1.00)</td>
<td>No Cryotherapy (Cold packs applied 15 min at a time at 2 and 4 hours after surgery, after PT, and at night as needed.)</td>
<td>50</td>
<td>11.5(0.50)</td>
<td>Mean Difference</td>
<td>0(-0.31,0.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>HolmstrÃm,A., 2005</td>
<td>Moderate Quality</td>
<td>Overall Complications - Complications ()</td>
<td>NR</td>
<td>Cryotherapy (Cryo/Cuff applied circulating ice water at 10-15 degrees C for 48 hours.)</td>
<td>23</td>
<td>4.35%</td>
<td>No Cryotherapy (Traditional pain management with no cryotherapy.)</td>
<td>17</td>
<td>5.88%</td>
<td>RR</td>
<td>0.74(0.05,11.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>HolmstrÃm,A., 2005</td>
<td>Moderate Quality</td>
<td>Swelling - Other((mm))</td>
<td>1 week</td>
<td>Cryotherapy (Cryo/Cuff applied circulating ice water at 10-15 degrees C for 48 hours.)</td>
<td>23</td>
<td>. %</td>
<td>No Cryotherapy (Traditional pain management with no cryotherapy.)</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>HolmstrÃm,A., 2005</td>
<td>Moderate Quality</td>
<td>Swelling - Other((mm))</td>
<td>6 weeks</td>
<td>Cryotherapy (Cryo/Cuff applied circulating ice water at 10-15 degrees C for 48 hours.)</td>
<td>23</td>
<td>. %</td>
<td>No Cryotherapy (Traditional pain management with no cryotherapy.)</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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</tr>
<tr>
<td>Su,E.P., 2012</td>
<td>Moderate Quality</td>
<td>Swelling - Other(knee girth)</td>
<td>2 weeks</td>
<td>Cryotherapy(Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>. %</td>
<td>No Cryotherapy(ice packs with static compression)</td>
<td>84</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Su,E.P., 2012</td>
<td>Moderate Quality</td>
<td>Manipulation Under Anesthesia-Other( )</td>
<td>6 weeks</td>
<td>Cryotherapy(Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>5.83%</td>
<td>No Cryotherapy(ice packs with static compression)</td>
<td>84</td>
<td>8.33%</td>
<td>RR 0.70(0.24,2.00)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>HolmstrÃm, A., 2005</td>
<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function (Active and passive)</td>
<td>6 weeks</td>
<td>Cryotherapy (Cryo/Cuff applied circulating ice water at 10-15 degrees C for 48 hours)</td>
<td>23</td>
<td>. %</td>
<td>No Cryotherapy (Traditional pain management with no cryotherapy.)</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Su, E.P., 2012</td>
<td>Moderate Quality</td>
<td>Range of Motion (extension) - Function ( )</td>
<td>6 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>-1.7(.)</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>-1.5(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Su, E.P., 2012</td>
<td>Moderate Quality</td>
<td>Range of Motion (extension) - Function ( )</td>
<td>2 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>1.5(.)</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>1.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>6 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>-9.5(.)</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>-8.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>2 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
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<td>-33(.)</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>-28.7(.)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Su, E.P., 2012</td>
<td>Moderate</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)- Function (six minute walk test (meters))</td>
<td>6 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>7.9(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Su, E.P., 2012</td>
<td>Moderate</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)- Function (six minute walk test (meters))</td>
<td>2 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>-107.7(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Su, E.P., 2012</td>
<td>Moderate</td>
<td>Timed Functional Test (lower scores better, units of time)- Function (time up and go (sec))</td>
<td>6 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>-2.4(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Su, E.P., 2012</td>
<td>Moderate</td>
<td>Timed Functional Test (lower scores better, units of time)- Function (time up and go (sec))</td>
<td>2 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>5(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt; .05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Su,E.P., 2012</td>
<td>Moderate Quality</td>
<td>Patient satisfaction ( )</td>
<td>6 weeks</td>
<td>Cryotherapy(Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103 . %</td>
<td>No Cryotherapy(ice packs with static compression)</td>
<td>84 . %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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</table>
### TABLE 112: CRYOTHERAPY VERSUS NO CRYOTHERAPY: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1</th>
<th>Treatment 2 (Details)</th>
<th>Group 2</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holmström, A., 2005</td>
<td>Moderate Quality</td>
<td>Vas Pain (10 cm)- Pain (Percent of patients free of pain at rest (VAS=0))</td>
<td>6 weeks</td>
<td>Cryotherapy (Cryo/ Cuff applied circulating ice water at 10-15 degrees C for 48 hours.)</td>
<td>23</td>
<td>73.91% No Cryotherapy (Traditional pain management with no cryotherapy.)</td>
<td>17</td>
<td>RR</td>
<td>1.14 (0.75, 1.75)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Su, E.P., 2012</td>
<td>Moderate Quality</td>
<td>Vas Pain (100 mm)- Pain ( )</td>
<td>6 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>-23.4( ) No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Su, E.P., 2012</td>
<td>Moderate Quality</td>
<td>Vas Pain (100 mm)- Pain ( )</td>
<td>2 weeks</td>
<td>Cryotherapy (Game Ready cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>-9( ) No Cryotherapy (ice packs with static compression)</td>
<td>84</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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## TABLE 113: CRYOTHERAPY VERSUS NO CRYOTHERAPY: POST-OP PAIN CONTROL

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Groupe1 N</th>
<th>Mean1/ P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Groupe2 N</th>
<th>Mean2/ P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivey,M., 1994</td>
<td>High Quality</td>
<td>Additional Medication-Postoperative Pain Control (PCA attempts per hour)</td>
<td>Post-Op</td>
<td>Cryotherapy (Cooling set to 50 degrees)</td>
<td>28</td>
<td>3.6(2.40)</td>
<td>No Cryotherapy (Cooling set to 70 degrees (room temperature))</td>
<td>30</td>
<td>3.9(3.00)</td>
<td>Mean Difference</td>
<td>-0.3(-1.69,1.09)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ivey,M., 1994</td>
<td>High Quality</td>
<td>Additional Medication-Postoperative Pain Control (PCA attempts per hour)</td>
<td>Post-Op</td>
<td>Cryotherapy (Cooling set to 60 degrees)</td>
<td>30</td>
<td>3.4(2.80)</td>
<td>No Cryotherapy (Cooling set to 70 degrees (room temperature))</td>
<td>30</td>
<td>3.9(3.00)</td>
<td>Mean Difference</td>
<td>-0.5(-1.97,0.97)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ivey,M., 1994</td>
<td>High Quality</td>
<td>Additional Medication-Postoperative Pain Control (PCA attempts per hour)</td>
<td>Post-Op</td>
<td>Cryotherapy (Cooling set to 50 degrees)</td>
<td>28</td>
<td>3.6(2.40)</td>
<td>Cryotherapy (Cooling set to 60 degrees)</td>
<td>30</td>
<td>3.4(2.80)</td>
<td>Mean Difference</td>
<td>0.2(-1.14,1.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ivey,M., 1994</td>
<td>High Quality</td>
<td>Morphine consumption (mg)/(mg/h)</td>
<td>Post-Op</td>
<td>Cryotherapy (Cooling set to 50 degrees)</td>
<td>28</td>
<td>1.6(0.80)</td>
<td>No Cryotherapy (Cooling set to 70 degrees (room temperature))</td>
<td>30</td>
<td>1.3(0.60)</td>
<td>Mean Difference</td>
<td>0.3(-0.07,0.67)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ivey,M., 1994</td>
<td>High Quality</td>
<td>Morphine consumption (mg)/(mg/h)</td>
<td>Post-Op</td>
<td>Cryotherapy (Cooling set to 60 degrees)</td>
<td>30</td>
<td>1.4(0.70)</td>
<td>No Cryotherapy (Cooling set to 70 degrees (room temperature))</td>
<td>30</td>
<td>1.3(0.60)</td>
<td>Mean Difference</td>
<td>0.1(-0.23,0.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Groupe p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Groupe p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<tr>
<td>Ivey,M., 1994</td>
<td>High Quality</td>
<td>Morphine consumption (mg)(mg/h)</td>
<td>Post-Op</td>
<td>Cryotherapy(Cooling set to 50 degrees)</td>
<td>28</td>
<td>1.6(0.80)</td>
<td>Cryotherapy(Cooling set to 60 degrees)</td>
<td>30</td>
<td>1.4(0.70)</td>
<td>Mean Difference</td>
<td>0.2(-0.19,0.59)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Holmström, A., 2005</td>
<td>Moderate Quality</td>
<td>Perioperative Use Of Narcotics-Pain(Morphine use)</td>
<td>1 day</td>
<td>Cryotherapy(Cryo/Cuff applied circulating ice water at 10-15 degrees C for 48 hours.)</td>
<td>23</td>
<td>. %</td>
<td>No Cryotherapy(Traditional pain management with no cryotherapy.)</td>
<td>23</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatme nt 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Holmström, A., 2005</td>
<td>Moderate Quality</td>
<td>Perioperative Use Of Narcotics-Pain(Morphine use)</td>
<td>2 days</td>
<td>Cryotherapy(Cryo/Cuff applied circulating ice water at 10-15 degrees C for 48 hours.)</td>
<td>23</td>
<td>. %</td>
<td>No Cryotherapy(Traditional pain management with no cryotherapy.)</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Holmström, A., 2005</td>
<td>Moderate Quality</td>
<td>Perioperative Use Of Narcotics-Pain(Morphine use)</td>
<td>3 days</td>
<td>Cryotherapy(Cryo/Cuff applied circulating ice water at 10-15 degrees C for 48 hours.)</td>
<td>23</td>
<td>. %</td>
<td>No Cryotherapy(Traditional pain management with no cryotherapy.)</td>
<td>17</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Su,E.P., 2012</td>
<td>Moderate Quality</td>
<td>Narcotic Use( )</td>
<td>2 weeks</td>
<td>Cryotherapy(GameReady cryopneumatic device with cooling and compression set by patient as tolerated)</td>
<td>103</td>
<td>. %</td>
<td>No Cryotherapy(ice packs with static compression)</td>
<td>84</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Treatme nt 1 Significant (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
CONTINUOUS PASSIVE MOTION (CPM)
Strong evidence supports that CPM after knee arthroplasty (KA) does not improve outcomes.

Strength of Recommendation: Strong Evidence

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

RATIONALE
Two high quality studies (Beaupre 2001, Denis 2006) and five moderate quality studies (Can 2003, Chan 2013, Herbold 2014, MacDonald 2000, Montgomery 1996) compared the utilization of continuous passive motion during hospital stay to no utilization of continuous passive motion. The combined results provide strong evidence that the surgical outcomes for those who used continuous passive motion are not better than for those who did not use continuous passive motion.

Five of the seven studies measured outcomes of physical function and quality of life. Beaupre et al, Denis et al, Herbold et al, and MacDonald et al found no significant differences in a gamut of outcomes (WOMAC, SF-36, Timed “up + go” [TUG], functional independence measure [FIM], and Knee Society Score). Chen et al reported better quality of life in the group that did not use continuous passive motion. Knee range of motion was investigated by Beaupre et al, Denis et al, and Chen et al. Meta-analysis showed no differences in knee range of motion. Complications were evaluated by Beaupre et al and Denis et al and were not statistically different between groups. Beaupre et al, Can et al, Chen et al, MacDonald et al, and Montgomery et al demonstrated that pain and stiffness were not decreased by CPM, whereas Denis et al reported significantly less pain in the continuous passive motion group (12 points difference in VAS ranging from 0-100). Meta-analysis from Denis et al, Herbold et al, and Montgomery et al showed no differences in length of hospital stay.

One high quality study (Lenssen 2008) demonstrated no statistically significant benefits in functional outcome scores or range of motion with the use of continuous passive motion in conjunction with physical therapy compared to physical therapy alone. The continuous passive motion was used for 17 consecutive days after surgery (about 2 weeks after discharge).

RISKS AND HARMs OF IMPLEMENTING THIS RECOMMENDATION
There are no known harms associated with implementing this recommendation.

FUTURE RESEARCH
The strong evidence indicated that no further research is needed on the routine use of continuous passive motion after total knee arthroplasty, but there are patients who are at significant risk of postoperative stiffness, for whom additional studies are appropriate. Continued comparative multicenter prospective studies may further define optimal postoperative rehabilitation after total knee arthroplasty.
## RESULTS

### SUMMARY OF FINDINGS TABLE 25: CONTINUOUS PASSIVE MOTION

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Anlysis</th>
</tr>
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<tbody>
<tr>
<td><strong>● Favors CPM</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>● Favors No CPM</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>○ Not Significant</strong></td>
<td></td>
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</tbody>
</table>

### Complications
- Manipulation Under Anesthesia
- Swelling

### Composite
- SF-36 Physical component summary
- Womac-overall
- SF-36 Overall

### Function
- Functional independence measure (FIM)
- Knee Society Score KSS
- Range of Motion
- SF-36 Mental Health- Function
- SF-36 Physical Functioning- Function
- SF-36 Physical Role Functioning- Function
- SF-36 Social Role Functioning- Function
- Timed Functional Test
- Womac-function

### Length of Stay
- Days- Length Of Stay
- Length Of Recovery- Length Of Stay

### Other
- SF-36 Emotional Role Functioning
- SF-36 General Health Perceptions- Other
- SF-36 Mental Component summary
- SF-36 Vitality- Other

### Pain
- Knee Society Score-Pain
- SF-36 Bodily Pain
- Vas Pain (10cm)
- Womac-Pain

### Stiffness
- Womac-Stiffness Likert (0-8)

### Meta-Anlysis
- Denis M., 2006
- Lenssen T.A., 2008
- Can F., 2003
- Chen L.H., 2013
- Herbold J.A., 2014
- Mac Donald S.L., 2000
- Montgomery F., 1996

**Not Significant**
### QUALITY EVALUATION TABLE 15: CONTINUOUS PASSIVE MOTION

#### Quality Chart Key

- ● = No Flaw in Domain of Interest
- ○ = Flaw in Domain of Interest
- 굴 = Half flaw in domain of interest

#### QE - Intervention - Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ververeli, P.A., 1995</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td></td>
<td>Include</td>
<td>Low Quality</td>
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<tr>
<td>Jordan, L.R., 1995</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
<td>Not best available evidence</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

#### QE - Intervention - Randomized

<table>
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<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
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<tbody>
<tr>
<td>Beaupré, L.A., 2001</td>
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<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>High Quality</td>
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<tr>
<td>Can, F., 2003</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
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<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Chen, L.H., 2013</td>
<td>○</td>
<td>●</td>
<td>○</td>
<td>●</td>
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<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Denis, M., 2006</td>
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<td>●</td>
<td>Include</td>
<td>High Quality</td>
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<tr>
<td>Herbold, J.A., 2014</td>
<td>○</td>
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<td>●</td>
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<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<td>MacDonald, S.J., 2000</td>
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<td>Include</td>
<td>Moderate Quality</td>
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<td>Montgomery, F., 1996</td>
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<td>Johnson, D.P., 1992</td>
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<td>Not best available evidence</td>
<td>Moderate Quality</td>
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<td>Kumar, P.J., 1996</td>
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<td>●</td>
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<td>●</td>
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<td>●</td>
<td>Not best available evidence</td>
<td>Low Quality</td>
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</table>
### DETAILED DATA TABLES

**TABLE 114: CONTINUOUS PASSIVE MOTION VERSUS NO CONTINUOUS PASSIVE MOTION: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure (95% CI)</th>
<th>Result (P-value)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia-Other( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>40</td>
<td>2.50%</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>40</td>
<td>0.00%</td>
<td>RD</td>
<td>0.03(-0.02,0.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia-Other( )</td>
<td>Discharge</td>
<td>Cpm used post-op (In Hospital)(CPM used 2 hours daily.)</td>
<td>28</td>
<td>0.00%</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00 )</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Manipulation Under Anesthesia-Other( )</td>
<td>Discharge</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>0.00%</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00 )</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ververeli, P.A., 1995</td>
<td>Low Quality</td>
<td>Manipulation Under Anesthesia-Other(Manipulations done if patient failed to maintain 50 degrees flexion beyond 10th post operative day.)</td>
<td>1.3 months</td>
<td>Cpm used post-op (In Hospital)(CPM initiated in recovery room. Patients used device approx 20 hours per day for 7 days.)</td>
<td>51</td>
<td>0.00%</td>
<td>No Post-op Cpm (In-Hospital)(No intervention.)</td>
<td>52</td>
<td>3.85%</td>
<td>RD</td>
<td>-0.04(-0.09,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Ververeli,P.A., 1995</td>
<td>Low Quality</td>
<td>Manipulation Under Anesthesia-Other (Manipulations done if patient failed to maintain 50 degrees flexion beyond 10th post operative day.)</td>
<td>10 days</td>
<td>Cpm used post-op (In Hospital)(CPM initiated in recovery room. Patients used device approx 20 hours per day for 7 days.)</td>
<td>51</td>
<td>0.00%</td>
<td>No Post-op Cpm (In-Hospital)(No intervention.)</td>
<td>52</td>
<td>5.77%</td>
<td>RD</td>
<td>-0.05(-0.11,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ververeli,P.A., 1995</td>
<td>Low Quality</td>
<td>Swelling - Other (Knee circumference measured at mid-patella. (mm))</td>
<td>1 week</td>
<td>Cpm used post-op (In Hospital)(CPM initiated in recovery room. Patients used device approx 20 hours per day for 7 days.)</td>
<td>51</td>
<td>23.5(17.90)</td>
<td>No Post-op Cpm (In-Hospital)(No intervention.)</td>
<td>52</td>
<td>22.2(13.10)</td>
<td>Mean Difference</td>
<td>1.3(-4.77,7.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Herbold,J.A., 2014</td>
<td>Moderate Quality</td>
<td>Swelling - Other (Knee girth in cm)</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(2 hrs/day of CPM in addition to conventional PT)</td>
<td>70</td>
<td>46.1(5.30)</td>
<td>No Post-op Cpm (In-Hospital)(3 hrs/day of conventional PT)</td>
<td>71</td>
<td>46.2(5.00)</td>
<td>Mean Difference</td>
<td>-0.1(-1.80,1.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Montgomery,F., 1996</td>
<td>Moderate Quality</td>
<td>Swelling - Other (Measured as difference in mid-patellar circumference pre/post-op.)</td>
<td>Discharge</td>
<td>Cpm used post-op (In Hospital)(CPM for 3 hours 3 times daily, 7 days a week.)</td>
<td>28</td>
<td>1.3(2.00)</td>
<td>No Post-op Cpm (In-Hospital)(Active and passive motion exercises with a physical therapist 30 minutes twice daily, 5 days a week.)</td>
<td>32</td>
<td>4.6(8.00)</td>
<td>Mean Difference</td>
<td>-3.3(-6.17,-0.43)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Qualit y</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Physical component summary</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>Mean Differe nce</td>
<td>0(-3.33,3.33)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Physical component summary</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>Mean Differe nce</td>
<td>-2(-6.69,2.69)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 2 hours daily.)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>Mean Differe nce</td>
<td>-4.9(-16.34,6.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>Mean Differe nce</td>
<td>4.1(-6.78,14.98)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96)( )</td>
<td>17 days</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>Mean Differe nce</td>
<td>4.5(-3.67,12.67)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96)( )</td>
<td>6 weeks</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>Mean Differe nce</td>
<td>0.5(-7.04,8.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-overall-Composite Likert (0-96)( )</td>
<td>3 months</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>Mean Differe nce</td>
<td>-2.3(-4.99,0.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Sf-36 Overall - Composite( )</td>
<td>6 weeks</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>2.53(0.14)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>2.56(0.16)</td>
<td>Mean Difference</td>
<td>-0.03(-0.09,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Sf-36 Overall - Composite( )</td>
<td>2 weeks</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>3.38(0.16)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>3.47(0.14)</td>
<td>Mean Difference</td>
<td>-0.09(-0.15,-0.03)</td>
<td>Treatment 2 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Sf-36 Overall - Composite( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>2.08(0.14)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>2.01(0.18)</td>
<td>Mean Difference</td>
<td>0.07(0.00,0.14)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Sf-36 Overall - Composite( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>1.77(0.15)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>1.83(0.16)</td>
<td>Mean Difference</td>
<td>-0.06(-0.12,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (Active extension. Hypoextension reported as negative values.)</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>33</td>
<td>4(4.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>32</td>
<td>3(6.00)</td>
<td>Mean Difference</td>
<td>1(-.49,3.49)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (Active extension. Hypoextension reported as negative values.)</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>33</td>
<td>4(4.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>32</td>
<td>2(5.00)</td>
<td>Mean Difference</td>
<td>2(-.21,4.21)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active flexion)</td>
<td>Discharge</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>40</td>
<td>8(4.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>40</td>
<td>8(4.00)</td>
<td>Mean Difference</td>
<td>0(-.75,1.75)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active flexion)</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>33</td>
<td>94(11.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>32</td>
<td>91(11.00)</td>
<td>Mean Difference</td>
<td>3(-2.35,8.35)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active flexion)</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>33</td>
<td>98(13.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>32</td>
<td>94(21.00)</td>
<td>Mean Difference</td>
<td>4(-4.52,12.52)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<tr>
<td>Beaupré, L. A., 2001</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active flexion)</td>
<td>Discharge</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>40</td>
<td>61(14.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>40</td>
<td>65(13.00)</td>
<td>Mean Difference</td>
<td>-4(-9.92,1.92)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L. A., 2001</td>
<td>High Quality</td>
<td>Sf-36 Mental Health-Function( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>79(17.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>34</td>
<td>74(19.00)</td>
<td>Mean Difference</td>
<td>5(-3.46,13.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L. A., 2001</td>
<td>High Quality</td>
<td>Sf-36 Physical Functioning-Function( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>46(18.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>34</td>
<td>45(20.00)</td>
<td>Mean Difference</td>
<td>1(-7.93,9.93)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L. A., 2001</td>
<td>High Quality</td>
<td>Sf-36 Physical Role Functioning-Function( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>19(26.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>34</td>
<td>28(41.00)</td>
<td>Mean Difference</td>
<td>-9(-20.18,2.18)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L. A., 2001</td>
<td>High Quality</td>
<td>Sf-36 Physical Role Functioning-Function( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital) (Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>40(40.00)</td>
<td>No Post-op Cpm (In-Hospital) (Standard exercise)</td>
<td>34</td>
<td>43(40.00)</td>
<td>Mean Difference</td>
<td>-3(-21.75,15.75)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Sf-36 Social Role Functioning( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>75(23.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>69(24.00)</td>
<td>Mean Difference</td>
<td>6(-5.02,17.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Sf-36 Social Role Functioning( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>81(22.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>79(25.00)</td>
<td>Mean Difference</td>
<td>2(-9.06,13.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>34</td>
<td>73(13.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>72(17.00)</td>
<td>Mean Difference</td>
<td>1(-6.19,8.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Range of Motion(extension) - Function(Active extension. Reviewer judgement that author reported negative values for hypo-extension.)</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>7(3.70)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>8(3.50)</td>
<td>Mean Difference</td>
<td>-1(-2.94,0.94)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Range of Motion(flexion) - Function(Active flexion. Outcome measured at discharge (8 dayapprox.))</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>78.7(10.60)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>80.4(11.80)</td>
<td>Mean Difference</td>
<td>-1.7(-7.73,4.33)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
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<td>Treatment 1 (Details)</td>
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<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
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<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 2 hours daily.)</td>
<td>28</td>
<td>52.3(34.90)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>41.9(21.40)</td>
<td>Mean Difference</td>
<td>10.4(-4.84,25 .64)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>50.7(22.60)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>41.9(21.40)</td>
<td>Mean Difference</td>
<td>8.8(-3.06,20 .66)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 2 hours daily.)</td>
<td>28</td>
<td>31(23.90)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>33(22.70)</td>
<td>Mean Difference</td>
<td>-2(-14.32,1 0.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>40(20.20)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>33(22.70)</td>
<td>Mean Difference</td>
<td>7(-4.56,18 .56)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Knee Society Score KSS( )</td>
<td>17 days</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>67.6(19.60)</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>67.3(14.90)</td>
<td>Mean Difference</td>
<td>0.3(-8.51,9.11)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Knee Society Score KSS( )</td>
<td>6 weeks</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>77.3(14.90)</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>73.6(13.80)</td>
<td>Mean Difference</td>
<td>3.7(-3.57,10 .97)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Knee Society Score KSS( )</td>
<td>3 months</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>80.4(5.30)</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>78.8(5.30)</td>
<td>Mean Difference</td>
<td>1.6(-1.08,4.28)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (Active extension)</td>
<td>17 days</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>6.3 (3.90)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>8.1 (4.80)</td>
<td>Mean Difference</td>
<td>-1.8 (-4.01, 0.41)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (Active extension)</td>
<td>6 weeks</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>6.3 (4.00)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>6.9 (5.40)</td>
<td>Mean Difference</td>
<td>-0.6 (-3.00, 1.80)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (Active extension)</td>
<td>3 months</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>4.8 (3.90)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>4.3 (4.70)</td>
<td>Mean Difference</td>
<td>0.5 (-1.69, 2.69)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active flexion)</td>
<td>17 days</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>89.9 (9.10)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>86.7 (8.50)</td>
<td>Mean Difference</td>
<td>3.2 (-1.26, 7.66)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active flexion)</td>
<td>6 weeks</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>98.2 (11.70)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>98.7 (11.20)</td>
<td>Mean Difference</td>
<td>-0.5 (-6.30, 5.30)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (Active flexion)</td>
<td>3 months</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>105.7 (2.50)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>106.2 (0.60)</td>
<td>Mean Difference</td>
<td>-0.5 (-1.42, 0.42)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Function Likert version (0-68) ( )</td>
<td>17 days</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>49.1 (11.90)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>45.3 (12.30)</td>
<td>Mean Difference</td>
<td>3.8 (-2.32, 9.92)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<td>Effect Measure</td>
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<tr>
<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Function likert version (0-68) ( )</td>
<td>6 weeks</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>53 (9.50)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>52.7 (12.00)</td>
<td>Mean Difference</td>
<td>0.3 (-5.18, 5.78)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Function likert version (0-68) ( )</td>
<td>3 months</td>
<td>Cpm used post-discharge (In Home) ( )</td>
<td>30</td>
<td>57.6 (4.20)</td>
<td>No Post-Discharge Cpm (In-Home) ( )</td>
<td>30</td>
<td>58.6 (8.40)</td>
<td>Mean Difference</td>
<td>-1 (-4.36, 2.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen, L.H., 2013</td>
<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>6 weeks</td>
<td>Cpm used post-op (In Hospital) (CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>110.51 (9.74)</td>
<td>No Post-op Cpm (In-Hospital) ( )</td>
<td>39</td>
<td>113.21 (10.03)</td>
<td>Mean Difference</td>
<td>-2.7 (-6.61, 1.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen, L.H., 2013</td>
<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>2 weeks</td>
<td>Cpm used post-op (In Hospital) (CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>102.33 (9.17)</td>
<td>No Post-op Cpm (In-Hospital) ( )</td>
<td>39</td>
<td>105 (10.76)</td>
<td>Mean Difference</td>
<td>-2.67 (-6.69, 1.35)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen, L.H., 2013</td>
<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital) (CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>119.26 (8.86)</td>
<td>No Post-op Cpm (In-Hospital) ( )</td>
<td>39</td>
<td>119.1 (9.31)</td>
<td>Mean Difference</td>
<td>0.16 (-3.44, 3.76)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen, L.H., 2013</td>
<td>Moderate Quality</td>
<td>Range of Motion (flexion) - Function ( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital) (CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>125.51 (5.99)</td>
<td>No Post-op Cpm (In-Hospital) ( )</td>
<td>39</td>
<td>125.13 (6.44)</td>
<td>Mean Difference</td>
<td>0.38 (-2.09, 2.85)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Herbold, J.A., 2014</td>
<td>Moderate Quality</td>
<td>Functional independence measure (FIM) (Higher scores indicate higher level of independence)</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital) (2 hrs/day of CPM in addition to conventional PT)</td>
<td>70</td>
<td>107 (4.10)</td>
<td>No Post-op Cpm (In-Hospital) (3 hrs/day of conventional PT)</td>
<td>71</td>
<td>107.8 (3.20)</td>
<td>Mean Difference</td>
<td>-0.8 (-2.02, 0.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
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<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Herbold, J.A., 2014</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(TUG (s))</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(2 hrs/day of CPM in addition to conventional PT)</td>
<td>70</td>
<td>19.9(7.50)</td>
<td>No Post-op Cpm (In-Hospital)(3 hrs/day of conventional PT)</td>
<td>71</td>
<td>19.8(6.10)</td>
<td>Mean Difference</td>
<td>0.1(-2.16,2.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>MacDonal, S.J., 2000</td>
<td>Moderate Quality</td>
<td>Knee Society Score KSS( )</td>
<td>1 year</td>
<td>Cpm used post-op (In Hospital)(CPM set to 0-50 degrees ROM starting in recovery room and ending the next postoperative day.)</td>
<td>40</td>
<td>166(23.00)</td>
<td>No Post-op Cpm (In-Hospital)(Control Group recieving standard care.)</td>
<td>40</td>
<td>166(25.00)</td>
<td>Mean Difference</td>
<td>0(-10.53,10.53)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>MacDonal, S.J., 2000</td>
<td>Moderate Quality</td>
<td>Knee Society Score KSS( )</td>
<td>1 year</td>
<td>Cpm used post-op (In Hospital)(CPM set to 70-110 degrees ROM starting in recovery room until next postoperative day.)</td>
<td>40</td>
<td>165(18.00)</td>
<td>No Post-op Cpm (In-Hospital)(Control Group recieving standard care.)</td>
<td>40</td>
<td>166(25.00)</td>
<td>Mean Difference</td>
<td>-1(-10.55,8.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Days- Length Of Stay(Real Length of Stay)</td>
<td>NA</td>
<td>Cpm used post-op (In Hospital)(CPM used 2 hours daily.)</td>
<td>28</td>
<td>8(2.10)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>7.8(2.00)</td>
<td>Mean Difference</td>
<td>0.2(-0.88,1.28)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Days- Length Of Stay(Real Length of Stay)</td>
<td>NA</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>8.1(2.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>7.8(2.00)</td>
<td>Mean Difference</td>
<td>0.3(-0.78,1.38)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Length Of Recovery-Length Of Stay(Theoretical Length of Stay. Time to achieve discharge criteria for knee. ROM of approx. 75)</td>
<td>NA</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>7.9(1.60)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>7.5(1.40)</td>
<td>Mean Difference</td>
<td>0.4(-0.41,1.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Herbold,J.A., 2014</td>
<td>Moderate Quality</td>
<td>Days- Length Of Stay( )</td>
<td>NR</td>
<td>Cpm used post-op (In Hospital)/2 hrs/day of CPM in addition to conventional PT</td>
<td>70</td>
<td>8.3(1.70)</td>
<td>No Post-op Cpm (In-Hospital)(3 hrs/day of conventional PT)</td>
<td>71</td>
<td>8.7(2.70)</td>
<td>Mean Difference</td>
<td>-0.4(-1.14,0.34)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Montgomery,F., 1996</td>
<td>Moderate Quality</td>
<td>Length Of Recovery-Length Of Stay(Days to reach ROM 70 degrees flexion.)</td>
<td>NA</td>
<td>Cpm used post-op (In Hospital)(CPM for 3 hours 3 times daily, 7 days a week.)</td>
<td>28</td>
<td>5(2.00)</td>
<td>No Post-op Cpm (In-Hospital)(Active and passive motion exercises with a physical therapist 30 minutes twice daily, 5 days a week.)</td>
<td>32</td>
<td>7(3.00)</td>
<td>Mean Difference</td>
<td>-2(-3.28,0.72)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Montgomery,F., 1996</td>
<td>Moderate Quality</td>
<td>Days- Length Of Stay(Criteria for discharge was when patients reach 70 degrees active knee flexion, no wound problems, ability to walk including stairs.)</td>
<td>NA</td>
<td>Cpm used post-op (In Hospital)(CPM for 3 hours 3 times daily, 7 days a week.)</td>
<td>28</td>
<td>9(3.00)</td>
<td>No Post-op Cpm (In-Hospital)(Active and passive motion exercises with a physical therapist 30 minutes twice daily, 5 days a week.)</td>
<td>32</td>
<td>10(4.00)</td>
<td>Mean Difference</td>
<td>-1(-2.78,0.78)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Beauprâ,L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Emotional Role Functioning( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>68(41.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>84(32.00)</td>
<td>Mean Difference</td>
<td>-16(-33.18,1.18)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beauprâ,L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Emotional Role Functioning( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>73(39.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>81(34.00)</td>
<td>Mean Difference</td>
<td>-8(-25.11,9.11)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beauprâ,L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Mental Component summary( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>54(10.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>55(9.00)</td>
<td>Mean Difference</td>
<td>-1(-5.45,3.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beauprâ,L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Mental Component summary( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>57(8.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>56(9.00)</td>
<td>Mean Difference</td>
<td>1(-3.00,5.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beauprâ,L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 General Health Perceptions-Other( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>69(21.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>69(19.00)</td>
<td>Mean Difference</td>
<td>0(-9.37,9.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beauprâ,L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 General Health Perceptions-Other( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>73(21.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>70(22.00)</td>
<td>Mean Difference</td>
<td>3(-7.09,13.09)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Beauprâ,L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Vitality-Other( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>53(20.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>56(17.00)</td>
<td>Mean Difference</td>
<td>-3(-11.68,5.68)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<td>-----------------</td>
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</tr>
<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Sf-36 Vitality-Other( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>60(18.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>59(21.00)</td>
<td>Mean Difference</td>
<td>1(-8.31,10.31)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Bodily Pain- Pain( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>Mean Difference</td>
<td>1(-8.45,10.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>SF-36 Bodily Pain- Pain( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>36</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>Mean Difference</td>
<td>-7(-16.65,2.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>34</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>Mean Difference</td>
<td>0(-8.32,8.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Beaupré, L.A., 2001</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>34</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>Mean Difference</td>
<td>-3(-10.37,4.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 2 hours daily.)</td>
<td>28</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>Mean Difference</td>
<td>-12.1(-23.40,-0.80)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Denis, M., 2006</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>Mean Difference</td>
<td>-3(-14.11,8.11)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20)( )</td>
<td>17 days</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>Mean Difference</td>
<td>0.5(-1.73,2.73)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20)( )</td>
<td>6 weeks</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>Mean Difference</td>
<td>-0.6(-2.55,1.35)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Lenssen, T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Pain Likert Version (0-20)</td>
<td>3 months</td>
<td>Cpm used post-discharge (In Home)</td>
<td>30</td>
<td>17.3 (3.80)</td>
<td>No Post-Discharge Cpm (In-Home)</td>
<td>30</td>
<td>17.5 (0.90)</td>
<td>Mean Difference</td>
<td>-0.2 (-1.60, 1.20)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Can, F., 2003</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain-Pain</td>
<td>1 day</td>
<td>Cpm used post-op (In Hospital)(CPM 4 to 6 hours daily starting immediately after surgery.)</td>
<td>16</td>
<td>10.32 (6.45)</td>
<td>No Post-op Cpm (In-Hospital)</td>
<td>16</td>
<td>8 (6.02)</td>
<td>Mean Difference</td>
<td>2.32 (-2.00, 6.64)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Can, F., 2003</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain-Pain</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(CPM 4 to 6 hours daily starting immediately after surgery.)</td>
<td>16</td>
<td>45.1 (8.63)</td>
<td>No Post-op Cpm (In-Hospital)</td>
<td>16</td>
<td>45.17 (7.12)</td>
<td>Mean Difference</td>
<td>-0.07 (-5.55, 5.41)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Can, F., 2003</td>
<td>Moderate Quality</td>
<td>Knee Society Score-Pain-Pain</td>
<td>3 weeks</td>
<td>Cpm used post-op (In Hospital)(CPM 4 to 6 hours daily starting immediately after surgery.)</td>
<td>16</td>
<td>35.65 (9.32)</td>
<td>No Post-op Cpm (In-Hospital)</td>
<td>16</td>
<td>35.15 (9.11)</td>
<td>Mean Difference</td>
<td>0.5 (-5.89, 6.89)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Can, F., 2003</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)</td>
<td>1 day</td>
<td>Cpm used post-op (In Hospital)(CPM 4 to 6 hours daily starting immediately after surgery.)</td>
<td>16</td>
<td>. %</td>
<td>No Post-op Cpm (In-Hospital)</td>
<td>16</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Can, F., 2003</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(CPM 4 to 6 hours daily starting immediately after surgery.)</td>
<td>16</td>
<td>. %</td>
<td>No Post-op Cpm (In-Hospital)</td>
<td>16</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference</td>
<td>Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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</tr>
<tr>
<td>Can,F., 2003</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain( )</td>
<td>3 weeks</td>
<td>Cpm used post-op (In Hospital)(CPM 4 to 6 hours daily starting immediately after surgery.)</td>
<td>16</td>
<td>. %</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>16</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain(1-10 scale (cm))</td>
<td>6 weeks</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>3.22(1.28)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>3.05(1.54)</td>
<td>Mean Difference</td>
<td>0.17(-0.40,0.74)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain(1-10 scale (cm))</td>
<td>2 weeks</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>5.12(1.39)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>4.77(1.56)</td>
<td>Mean Difference</td>
<td>0.35(-0.24,0.94)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain(1-10 scale (cm))</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>1.43(1.00)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>1.03(1.11)</td>
<td>Mean Difference</td>
<td>0.4(-0.02,0.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chen,L.H., 2013</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain(1-10 scale (cm))</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(CPM used for 2 hours 3 times daily starting day after surgery.)</td>
<td>68</td>
<td>0.37(0.60)</td>
<td>No Post-op Cpm (In-Hospital)( )</td>
<td>39</td>
<td>0.21(0.47)</td>
<td>Mean Difference</td>
<td>0.16(-0.05,0.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Montgomery,F., 1996</td>
<td>Moderate Quality</td>
<td>Vas Pain (10cm)- Pain(Recorded at day 1, day 3, and day 5 post operatively.)</td>
<td>5 days</td>
<td>Cpm used post-op (In Hospital)(CPM for 3 hours 3 times daily, 7 days a week.)</td>
<td>28</td>
<td>. %</td>
<td>No Post-op Cpm (In-Hospital)(Active and passive motion exercises with a physical therapist 30 minutes twice daily, 5 days a week.)</td>
<td>32</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>
**TABLE 120: CONTINUOUS PASSIVE MOTION VERSUS NO CONTINUOUS PASSIVE MOTION: STIFFNESS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>BeauprÃ,L.A., 2001</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>3 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>34</td>
<td>63(18.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>62(18.00)</td>
<td>Mean Difference</td>
<td>1(-7.56,9.56)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>BeauprÃ,L.A., 2001</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>6 months</td>
<td>Cpm used post-op (In Hospital)(Three 2 hour sessions each day with increasing range.)</td>
<td>34</td>
<td>65(21.00)</td>
<td>No Post-op Cpm (In-Hospital)(Standard exercise)</td>
<td>34</td>
<td>69(19.00)</td>
<td>Mean Difference</td>
<td>-4(-13.52,5.52)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 2 hours daily.)</td>
<td>28</td>
<td>50.1(24.10)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>53.8(26.10)</td>
<td>Mean Difference</td>
<td>-3.7(-16.99,9.59)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Denis,M., 2006</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>8 days</td>
<td>Cpm used post-op (In Hospital)(CPM used 35 min daily.)</td>
<td>26</td>
<td>59.3(19.30)</td>
<td>No Post-op Cpm (In-Hospital)(Standard physical therapy)</td>
<td>27</td>
<td>53.8(26.10)</td>
<td>Mean Difference</td>
<td>5.5(-6.83,17.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Stiffness Likert (0-8)( )</td>
<td>17 days</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>5(1.80)</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>4.8(1.60)</td>
<td>Mean Difference</td>
<td>0.2(-0.66,1.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Stiffness Likert (0-8)( )</td>
<td>6 weeks</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>5.4(1.50)</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>4.8(1.50)</td>
<td>Mean Difference</td>
<td>0.6(-0.16,1.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lenssen,T.A., 2008</td>
<td>High Quality</td>
<td>Womac-Stiffness Likert (0-8)( )</td>
<td>3 months</td>
<td>Cpm used post-discharge (In Home)( )</td>
<td>30</td>
<td>5.5(1.40)</td>
<td>No Post-Discharge Cpm (In-Home)( )</td>
<td>30</td>
<td>5.3(1.60)</td>
<td>Mean Difference</td>
<td>0.2(-0.56,0.96)</td>
<td>Not Significant (P-value&gt;.05)</td>
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POSTOPERATIVE MOBILIZATION

A. POSTOPERATIVE MOBILIZATION: LENGTH OF STAY
Strong evidence supports that rehabilitation started on the day of the total knee arthroplasty (TKA) reduces length of hospital stay.

**Strength of Recommendation: Strong Evidence ★★★★★**
*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*

B. POSTOPERATIVE MOBILIZATION: PAIN AND FUNCTION
Moderate evidence supports that rehabilitation started on day of total knee arthroplasty (TKA) compared to rehabilitation started on postop day 1 reduces pain and improves function.

**Strength of Recommendation: Moderate Evidence ★★★★**
*Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.*

RATIONALE
Two high quality studies (Labraca et al 2011; Larsen et al 2008) investigated the effects of starting rehabilitation on the day of surgery compared to delayed rehabilitation (start on the day after surgery or later). Labraca et al compared a group who initiated rehabilitation within the first 24 hours post-surgery to a control group who remained at rest during the first 24 hours and started rehabilitation after that. They found that the group who started rehabilitation within 24 hours had fewer days of hospital stay, reduced pain, and improved physical function (balance, muscle strength and range of knee motion). Larsen et al compared an intervention group who received a new accelerated peri-operative protocol compared to a control group who received conventional perioperative procedure. The accelerated protocol aimed to mobilize the patient in bed and out of bed in the day of surgery and progressed to four hours out of bed (combination of physical and occupational therapy) on the first postoperative day, and eight hours of mobilization for the rest of the hospital stay. The control group started mobilization in and out of bed on the day after surgery and increased mobilization according to patient’s state. The accelerated protocol also included education, pain relief, nausea control, nutrition, and elimination. The study found that the accelerated group had less length of stay as compared to the control group. Quality of life was not different between the groups.

RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION
Although there are no known harms associated with implementing this recommendation, the promotion of early and accelerated rehabilitation depends on hospital support to accessible rehabilitation services; and cohesive coordination between surgeons, anesthesiologists, nurses, and physical therapists to manage pain, nausea, orthostatic intolerance, and other hindrances to early mobilization.
FUTURE RESEARCH
Prospective randomized trials to evaluate the dose-response of rehabilitation protocols during hospital stay to decrease variability of care. There is no consistency in the amount of rehabilitation during acute care - protocols have varied from as low as 20 minutes to as high as eight hours per day of rehabilitative care.

RESULTS
SUMMARY OF FINDINGS TABLE 24: ACCELERATED MOBILIZATION

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors Accelerated</td>
<td>Labraca, N. S., 2011</td>
</tr>
<tr>
<td>● Favors Non-accelerated Mobilization</td>
<td>Larsen, K., 2008</td>
</tr>
<tr>
<td>○ Not Significant</td>
<td></td>
</tr>
</tbody>
</table>

- Complications
  - Readmission
  - Function
    - Balance - Function
    - Barthel Index - Function
    - Muscle Strength - Function
    - Range of Motion - Function

- Length of Stay
  - Days - Length of Stay

- Pain
  - Vas Pain (10cm) - Pain

- Quality of Life
  - Euroqol-5d (Eq-5d) Total
**QUALITY EVALUATION TABLE 14: ACCELERATED MOBILIZATION**

**Quality Chart Key**

- ○ = No Flaw in Domain of Interest
- O = Flaw in Domain of Interest
- ⚫ = Half flaw in domain of interest

### QE - Intervention – Observational

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jordan, L.R., 1995</td>
<td>O</td>
<td>⚫</td>
<td></td>
<td>⚫</td>
<td>⚫</td>
<td></td>
<td>Not best available evidence</td>
<td>Low Quality</td>
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### QE - Intervention – Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
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<tbody>
<tr>
<td>Labraca, N.S., 2011</td>
<td>⚫</td>
<td>⚫</td>
<td>O</td>
<td>⚫</td>
<td>⚫</td>
<td>⚫</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Larsen, K., 2008</td>
<td>⚫</td>
<td>⚫</td>
<td>O</td>
<td>⚫</td>
<td>⚫</td>
<td>⚫</td>
<td>Include</td>
<td>High Quality</td>
</tr>
</tbody>
</table>
DETAILED DATA TABLES

**TABLE 121: ACCELERATED MOBILIZATION VERSUS NON-ACCELERATED MOBILIZATION: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/ P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/ P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larsen,K., 2008</td>
<td>High Quality</td>
<td>Readmission- Length Of Stay(Number of patients re-admitted due to pain/complications within the specified follow up.)</td>
<td>3 months</td>
<td>Accelerated Post-Op Mobilization(4h of mobilization day of surgery. 8h of mobilization per day goal for each day after.)</td>
<td>15</td>
<td>6.67%</td>
<td>Non-Accelerated Post-Op Mobilization(Control group receiving standard care for post-op mobilization. Post-op therapy does not begin until)</td>
<td>12</td>
<td>8.33%</td>
<td>RR</td>
<td>0.80(0.06,11.50)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Labraca, N. S., 2011</td>
<td>High Quality</td>
<td>Balance-Function (Tinetti test. Static balance subscale. (0=abnormal, 1=adaptive, 2=normal). Reported as dichotomous data where N events=N of normal patients.)</td>
<td>Discharge</td>
<td>Accelerated Post-Op Mobilization (Begins mobilization with first 24 hours of surgery.)</td>
<td>Non-Accelerated Post-Op Mobilization (Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>RR</td>
<td>1.06(1.01,1.12)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Labraca, N. S., 2011</td>
<td>High Quality</td>
<td>Balance-Function (Tinetti test. Gait subscale. (0=abnormal, 1=adaptive, 2=normal). Reported as dichotomous data where N events=N of normal patients.)</td>
<td>Discharge</td>
<td>Accelerated Post-Op Mobilization (Begins mobilization with first 24 hours of surgery.)</td>
<td>Non-Accelerated Post-Op Mobilization (Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>RR</td>
<td>1.08(1.02,1.16)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Labraca, N. S., 2011</td>
<td>High Quality</td>
<td>Barthel Index - Function (Number of patients completely independent on Barthel Index)</td>
<td>Discharge</td>
<td>Accelerated Post-Op Mobilization (Begins mobilization with first 24 hours of surgery.)</td>
<td>Non-Accelerated Post-Op Mobilization (Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>RR</td>
<td>1.07(0.98,1.18)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Labraca, N. S., 2011</td>
<td>High Quality</td>
<td>Muscle Strength-Function(Quadriceps strength (0=no activity to 5=normal muscle response))</td>
<td>Post-Op</td>
<td>Accelerated Post-Op Mobilization( Begins mobilization with first 24 hours of surgery.)</td>
<td>138</td>
<td>3.91(0.56)</td>
<td>Non-Accelerated Post-Op Mobilization( Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>135</td>
<td>3.01(0.52)</td>
<td>Mean Difference</td>
<td>0.9(0.77,1.03)</td>
<td>Treat 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Labraca, N. S., 2011</td>
<td>High Quality</td>
<td>Muscle Strength-Function(Hamstring muscles (0=no activity to 5=normal muscle response))</td>
<td>Post-Op</td>
<td>Accelerated Post-Op Mobilization( Begins mobilization with first 24 hours of surgery.)</td>
<td>138</td>
<td>4.02(0.82)</td>
<td>Non-Accelerated Post-Op Mobilization( Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>135</td>
<td>2.97(0.59)</td>
<td>Mean Difference</td>
<td>1.05(0.88,1.22)</td>
<td>Treat 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Labraca, N. S., 2011</td>
<td>High Quality</td>
<td>Range of Motion(Extension) - Function( )</td>
<td>Post-Op</td>
<td>Accelerated Post-Op Mobilization( Begins mobilization with first 24 hours of surgery.)</td>
<td>138</td>
<td>88.11(2.35)</td>
<td>Non-Accelerated Post-Op Mobilization( Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>135</td>
<td>71.82(16.81)</td>
<td>Mean Difference</td>
<td>16.29(13.43,19.15)</td>
<td>Treat 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure 95% CI</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Labraca, N.S., 2011</td>
<td>High Quality</td>
<td>Days- Length Of Stay( )</td>
<td>NA</td>
<td>Accelerated Post-Op Mobilization( Begins mobilization with first 24 hours of surgery.)</td>
<td>Non-Accelerated Post-Op Mobilization(Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>138</td>
<td>6.37(1.16)</td>
<td>135</td>
<td>8.46(2.63)</td>
<td>Mean Difference -2.09(-2.57,-1.61)</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
<td></td>
</tr>
<tr>
<td>Larsen, K., 2008</td>
<td>High Quality</td>
<td>Days- Length Of Stay( )</td>
<td>NA</td>
<td>Accelerated Post-Op Mobilization(4h of mobilization day of surgery. 8h of mobilization per day goal for each day after.)</td>
<td>Non-Accelerated Post-Op Mobilization(Contr ol group receiving standard care for post-op mobilization. Post-op therapy does not begin until)</td>
<td>15</td>
<td>6.1(3.50)</td>
<td>12</td>
<td>9.3(2.50)</td>
<td>Mean Difference -3.2(-5.47,-0.93)</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
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</tbody>
</table>
### TABLE 124: ACCELERATED MOBILIZATION VERSUS NON-ACCELERATED MOBILIZATION: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labraca, N.S., 2011</td>
<td>High Quality</td>
<td>Vas Pain (10cm)-Pain( )</td>
<td>Post-Op</td>
<td>Accelerated Post-Op Mobilization(Begins mobilization with first 24 hours of surgery.)</td>
<td>138</td>
<td>3.01(2.35)</td>
<td>Non-Accelerated Post-Op Mobilization(Does not begin mobilization until day after surgery. (Standard care control group).)</td>
<td>135</td>
<td>5.36(2.54)</td>
<td>Mean Difference</td>
<td>-2.35(-2.93,-1.77)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
TABLE 125: ACCELERATED MOBILIZATION VERSUS NON-ACCELERATED MOBILIZATION: QUALITY OF LIFE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality Details</th>
<th>Outcomes Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favoured Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larsen, K., 2008</td>
<td>High Quality</td>
<td>Euroqol-5d(Eq-5d) Total-Composite (Eq-5D for TKA patients only)</td>
<td>3 months</td>
<td>Accelerated Post-Op Mobilization (4h of mobilization day of surgery. 8h of mobilization per day goal for each day after.)</td>
<td>Non-Accelerated Post-Op Mobilization (Control group receiving standard care for post-op mobilization. Post-op therapy does not begin until)</td>
<td>Mean Difference</td>
<td>Result (95% CI)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
STRUCTURED EXERCISE PROGRAM

A. EARLY STAGE SUPERVISED EXERCISE PROGRAM: FUNCTION
Moderate evidence supports that a supervised exercise program during the first two months after total knee arthroplasty (TKA) improves physical function.

Strength of Recommendation: Moderate Evidence
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

B. EARLY STAGE SUPERVISED EXERCISE PROGRAM: PAIN
Limited evidence supports that a supervised exercise program during the first two months after total knee arthroplasty (TKA) decreases pain.

Strength of Recommendation: Limited Evidence
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

C. LATE STAGE POSTOPERATIVE SUPERVISED EXERCISE PROGRAM: FUNCTION
Limited evidence supports that selected patients might be referred to an intensive supervised exercise program during late stage post total knee arthroplasty (TKA) to improve physical function.

Strength of Recommendation: Limited Evidence
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

RATIONALE
One high quality study (Evgeniadis 2008) and one moderate quality study (Akbaba 2014) investigated supervised exercise programs started after hospital discharge compared to no exercise or minimal exercise during the first two months after surgery. Evgeniadis et al compared a group of patients post total knee arthroplasty who received a home exercise program of eight weeks (three times a week) that consisted of lower extremity strength training, to a group who did not receive supervised exercises. The exercise group had significantly better physical function and knee flexion and extension range of motion. Akbaba et al compared a group of patients with bilateral total knee arthroplasty who received a month of intensive supervised rehabilitation (two times a week for one hour) to a control group who received supervised rehabilitation once every 15 days. The intense supervised group had less pain and stiffness, and better balance and physical function than the control group.
Two high quality studies (Liao 2013, Moffet 2004) and one moderate quality study (Valtonen 2010) investigated supervised intensive exercise programs started two or more months after surgery (late stage post total knee arthroplasty) compared to no or less exercise. Liao et al compared a group who performed functional exercise supplemented with balance training to a group who performed functional training only. The exercise programs lasted eight weeks and started two months post-surgery. The group who received a combination of functional and balance exercises had better patient reported and performance-based outcomes of physical function. Moffet et al compared a group who received intensive functional training during eight weeks to a standard care group who received minimal rehabilitative care. Pain and emotional health was significantly better in the intensive functional training group at 4 and 6 months, but the effects were no longer significant at the 12 months’ time point. Valtonen et al compared a group who performed a high-intensity progressive aquatic resistance training of six week duration that started at least four months after surgery to a control group who did not exercise. The outcomes of both groups were similar.

**RISKS AND HARMS OF IMPLEMENTING THIS RECOMMENDATION**

There are no risks or Harms with implementation.

**FUTURE RESEARCH**

Continued comparative studies of supervised exercise programs that are aligned with recommendations from national guidelines. Future research from multi-site studies utilizing a standardized training program with large populations of patients with co-existing chronic conditions. In addition, there is a need to investigate protocols (i.e., exercise type, intensity), delivery of interventions (i.e., more emphasis during early stage versus late stage), and strategies to improve adherence to optimize outcome. Future research should also address the influence of physical activity on prevention of weight gain and on survival of prosthesis. Issues of cost and cost-effectiveness should be incorporated into future clinical studies.
### RESULTS

#### SUMMARY OF FINDINGS TABLE 31: POST-OP STRUCTURED EXERCISE EARLY POST-OP OUTCOMES

<table>
<thead>
<tr>
<th>Summary of Findings</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Favors Post-op Structured Exercise</td>
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<tr>
<td>● Favors No/less Post-op Structured Exercise</td>
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<tr>
<td>○ Not Significant</td>
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<tr>
<td><strong>Function</strong></td>
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<tr>
<td>Balance</td>
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<tr>
<td>Iowa Level of Assistance Scale (ILAS)</td>
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<tr>
<td>Range of Motion</td>
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<tr>
<td>Timed Functional Tests</td>
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<tr>
<td>Womac-Function</td>
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<tr>
<td><strong>Pain</strong></td>
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<tr>
<td>Womac-Pain</td>
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<td><strong>Stiffness</strong></td>
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<td>Womac-Stiffness</td>
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</table>
### SUMMARY OF FINDINGS TABLE 32: POST-OP STRUCTURED EXERCISE LATE POST-OP OUTCOMES

#### Summary of Findings

- **High Quality**
- **Moderate Quality**
- **Not Significant**

<table>
<thead>
<tr>
<th>Composite</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Other</th>
<th>Pain</th>
<th>Quality of Life</th>
<th>Stiffness</th>
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<td>Womac-overall</td>
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<td>Function</td>
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<td>Balance</td>
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<td>Muscle Power (w)</td>
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<td>Range of Motion</td>
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<td>SF-36 Physical Functioning- Function</td>
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<td>SF-36 Physical Role Functioning- Function</td>
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<td>SF-36 Social Role Functioning- Function</td>
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<td>Timed Functional Tests</td>
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<td>Womac-function averaged VAS Version (0-100)</td>
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<td>Other</td>
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<td>SF-36 Mental Health- Function</td>
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<td>Pain</td>
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- **Favors Exercise during late stage post surgery**
- **Favors No/less exercise during late stage post surgery**
- **Not Significant**

**References:**
- Kauppila, A. M., 2010
- Liao, C. D., 2013
- Vuorenmaa, M., 2014
- Moffet, H., 2004
- Valtonen, A., 2010
### QUALITY EVALUATION TABLE 21: POST-OPERATIVE STRUCTURED EXERCISE

#### Quality Chart Key

- **●**: No Flaw in Domain of Interest
- **○**: Flaw in Domain of Interest
- **_half_flaw**: Half flaw in domain of interest

#### QE - Intervention – Randomized

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Inclusion</th>
<th>Strength</th>
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<td>Akbaba, Y.A., 2014</td>
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<td>Codine, Ph, 2004</td>
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<td>Moderate Quality</td>
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<tr>
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<td>●</td>
<td>●</td>
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<td>High Quality</td>
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<td>Han, A.S., 2014</td>
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<td>●</td>
<td>●</td>
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<td>Moderate Quality</td>
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<td>●</td>
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<td>Vuorenmaa, M., 2014</td>
<td>●</td>
<td>●</td>
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<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
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**DETAILED DATA TABLES**

**TABLE 126: PART 1- STRUCTURED EXERCISE VERSUS NO/LESS STRUCTURED EXERCISE DURING EARLY STAGE POST SURGERY: FUNCTION**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function(ILAS Total (0-50))</td>
<td>6 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>9.16(0.93)</td>
<td>Pre-Op: No Structured Exercise program (control)(Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>10.08(1.16)</td>
<td>Mean Difference</td>
<td>-0.92(-1.61,-0.23)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function(ILAS Total (0-50))</td>
<td>2 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>20.5(1.20)</td>
<td>Pre-Op: No Structured Exercise program (control)(Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>20.3(1.97)</td>
<td>Mean Difference</td>
<td>0.2(-0.86,1.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function(ILAS Total (0-50))</td>
<td>10 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>2.79(0.64)</td>
<td>Pre-Op: No Structured Exercise program (control)(Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>4.87(0.73)</td>
<td>Mean Difference</td>
<td>-2.08(-2.54,-1.62)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Evgeniadis,G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function(ILAS Total (0-50))</td>
<td>3 days</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>28.2(2.40)</td>
<td>Pre-Op: No Structured Exercise program (control)(Did not receive additional exercise program either pre-op or post-op.)</td>
<td>20</td>
<td>28.9(3.30)</td>
<td>Mean Difference</td>
<td>-0.7(-2.59,1.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Evgeniadis, G., 2008</td>
<td>High Quality</td>
<td>Iowa Level of Assistance Scale (ILAS) - Function(ILAS Total (0-50))</td>
<td>14 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>0.14(0.39)</td>
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<td>0.38(0.56)</td>
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<td>-0.24(-0.55,0.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Evgeniadis, G., 2008</td>
<td>High Quality</td>
<td>Range of Motion(extension) - Function(Active extension. Hypoextension reported as negative values)</td>
<td>2 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>5.67(3.12)</td>
<td>Pre-Op: No Structured Exercise program (control)(Did not receive additional exercise program either pre-op or post-op.)</td>
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<td>6.5(3.83)</td>
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<tr>
<td>Evgeniadis, G., 2008</td>
<td>High Quality</td>
<td>Range of Motion(extension) - Function(Active extension. Hypoextension reported as negative values)</td>
<td>10 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
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<td>2.6(1.80)</td>
<td>Pre-Op: No Structured Exercise program (control)(Did not receive additional exercise program either pre-op or post-op.)</td>
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<td>7(3.95)</td>
<td>Mean Differece</td>
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<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
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<td>Range of Motion(extension) - Function(Active extension. Hypoextension reported as negative values)</td>
<td>14 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>1.8(1.27)</td>
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<td>6.42(3.60)</td>
<td>Mean Differece</td>
<td>-4.62(-6.32,-2.92)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Evgeniadis,G., 2008</td>
<td>High</td>
<td>Range of Motion(flexion) - Function(Activ e flexion)</td>
<td>2 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
<td>15</td>
<td>66(8.32)</td>
<td>Pre-Op: No Structured Exercise program (control)(Did not receive additional exercise program either pre-op or post-op.)</td>
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<td>70.25(11.30)</td>
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<td>10 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
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<td>84.7(9.26)</td>
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<td>76.08(10.30)</td>
<td>Mean Differe</td>
<td>8.62(2.11,15.13)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<tr>
<td>Evgeniadis,G., 2008</td>
<td>High</td>
<td>Range of Motion(flexion) - Function(Activ e flexion)</td>
<td>14 weeks</td>
<td>Post-Op: Structured Exercise Program or PT(8 week post-op strengthening exercise program)</td>
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<td>18(10.74,25.26)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Akbaba,Y.A., 2014</td>
<td>Moder ate</td>
<td>Balance-Function(Left single leg stance, sec)</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>15.8(17.40)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>3.2(2.20)</td>
<td>Mean Differe</td>
<td>12.6(4.91,20.29)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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<td>Akbaba,Y.A., 2014</td>
<td>Moder ate</td>
<td>Balance-Function(Left single leg stance, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>42.6(32.50)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
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<td>8.1(6.20)</td>
<td>Mean Differe</td>
<td>34.5(20.00,49.00)</td>
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<td>Duration</td>
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<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2/P2 (SD2)</td>
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<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Moderate Quality</td>
<td>Balance-Function(Right single leg stance, sec)</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>15.3(16.80)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
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<td>3.2(1.80)</td>
<td>Mean Difference</td>
<td>12.1(4.69,19.51)</td>
<td>Treatment 1 Significant (P-values&lt;.05)</td>
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<tr>
<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Balance-Function(Right single leg stance, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>44.2(32.20)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>13.8(9.70)</td>
<td>Mean Difference</td>
<td>30.4(15.66,45.14)</td>
<td>Treatment 1 Significant (P-values&lt;.05)</td>
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<tr>
<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(20-m walk test, sec)</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>95.5(16.70)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>89(21.00)</td>
<td>Mean Difference</td>
<td>6.5(-5.26,18.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(20-m walk test, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>106.7(17.70)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>102(14.30)</td>
<td>Mean Difference</td>
<td>4.7(-5.27,14.67)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(Time up and go, sec)</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>19(10.30)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>26.7(17.60)</td>
<td>Mean Difference</td>
<td>-7.7(-16.64,1.24)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Akbaba, Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(Time up and go, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>12.9(2.90)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>18.2(11.40)</td>
<td>Mean Difference</td>
<td>-5.3(-10.46, 0.14)</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
</tr>
<tr>
<td>Akbaba, Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(stair test, sec)</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>34.9(20.50)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>46.5(23.90)</td>
<td>Mean Difference</td>
<td>-11.6(-25.40, 2.20)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Akbaba, Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(stair test, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>17.5(7.20)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>30.1(12.30)</td>
<td>Mean Difference</td>
<td>-12.6(-18.85, 6.35)</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
</tr>
<tr>
<td>Akbaba, Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Womac-Function likert version (0-68)(Turkish version (0-30))</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>4.7(2.50)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>6.2(1.70)</td>
<td>Mean Difference</td>
<td>-1.5(-2.82, 0.18)</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
</tr>
<tr>
<td>Akbaba, Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Womac-Function likert version (0-68)(Turkish version (0-30))</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>1.9(0.90)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>4(1.70)</td>
<td>Mean Difference</td>
<td>-2.1(-2.94, 1.26)</td>
<td>Treatment 1 Significant (P-value &lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Womac-Pain Likert Version (0-20)(Turkish version (0-30))</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>3.3(2.10)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>3.3(1.20)</td>
<td>Mean Difference</td>
<td>0(-1.06,1.06)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Womac-Pain Likert Version (0-20)(Turkish version (0-30))</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>1.4(1.00)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>2.6(1.30)</td>
<td>Mean Difference</td>
<td>-1.2(-1.92,-0.48)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
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### TABLE 128: PART 1- STRUCTURED EXERCISE VERSUS NO/LESS STRUCTURED EXERCISE DURING EARLY STAGE POST SURGERY: STIFFNESS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Womac-Stiffness Likert (0-8)(Turkish version (0-30))</td>
<td>1 month</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>5.8(2.20)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>5.2(2.80)</td>
<td>Mean Difference</td>
<td>0.6(-0.96, 2.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Akbaba,Y.A., 2014</td>
<td>Moderate Quality</td>
<td>Womac-Stiffness Likert (0-8)(Turkish version (0-30))</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(1-hr exercise program with physical therapist 2 times/week for a month)</td>
<td>20</td>
<td>2.5(1.60)</td>
<td>Post-Op: Structured Exercise Program or PT(exercise program with physical therapist once every 2 weeks)</td>
<td>20</td>
<td>4(2.10)</td>
<td>Mean Difference</td>
<td>-1.5(-2.66, -0.34)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
</tbody>
</table>

### TABLE 129: PART 2- STRUCTURED EXERCISE VERSUS NO/LESS STRUCTURED EXERCISE DURING LATE STAGE POST SURGERY (AFTER 2 MONTHS): COMPOSITE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
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<tbody>
<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Womac-overall Composite averaged VAS version (0-100)( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>. %</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>36%</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>39%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Liao,C.D., 2013</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>-38.98(9.47)</td>
<td>Post-Op: No Structured Exercise Program (control)(60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>55</td>
<td>-34.31(8.70)</td>
<td>Mean Difference</td>
<td>-4.67(-8.02,-1.32)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>13.5(14.10)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>19.4(17.60)</td>
<td>Mean Difference</td>
<td>-5.9(-13.07,1.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>12(12.80)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>18.6(18.50)</td>
<td>Mean Difference</td>
<td>-6.6(-13.82,0.62)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Moffet, H., 2004</td>
<td>High Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>11.6(13.80)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>15.3(16.30)</td>
<td>Mean Difference</td>
<td>-3.7(-10.92,3.52)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>SF-36 Mental Component summary( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>4(11.35)</td>
<td>Post-Op: No Structured Exercise Program (control)(No additional guidance; standard care)</td>
<td>53</td>
<td>3(11.14)</td>
<td>Mean Difference</td>
<td>1(-3.29,5.29)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>SF-36 Physical component summary( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>8(11.35)</td>
<td>Post-Op: No Structured Exercise Program (control)(No additional guidance; standard care)</td>
<td>53</td>
<td>6(11.14)</td>
<td>Mean Difference</td>
<td>2(-2.24,6.24)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen, A., 2010</td>
<td>Moderate Quality</td>
<td>Womac-overall-Composite averaged VAS version (0-100)( )</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 week group course with aquatic based exercises,)</td>
<td>25</td>
<td>17.9(8.50)</td>
<td>Post-Op: No Structured Exercise Program (control)(No intervention.)</td>
<td>21</td>
<td>18.3(16.00)</td>
<td>Mean Difference</td>
<td>-0.4(-8.01,7.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
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### TABLE 130: PART 2- STRUCTURED EXERCISE VERSUS NO/LESS STRUCTURED EXERCISE DURING LATE STAGE POST SURGERY (AFTER 2 MONTHS): FUNCTION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High</td>
<td>Range of Motion(extension) - Function(active extension. Hypo-extension reported as positive values.)</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>36</td>
<td>6(3.00)</td>
<td>38</td>
<td>6(3.00)</td>
<td>Mean Differe</td>
<td>0(-1.37,1.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High</td>
<td>Range of Motion(extension) - Function(active extension. Hypo-extension reported as positive values.)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>36</td>
<td>5(4.00)</td>
<td>38</td>
<td>4(4.00)</td>
<td>Mean Differe</td>
<td>1(-0.82,2.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High</td>
<td>Range of Motion(flexion) - Function(active flexion)</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>36</td>
<td>105(12.00)</td>
<td>38</td>
<td>103(11.00)</td>
<td>Mean Differe</td>
<td>2(-2.59,7.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High</td>
<td>Range of Motion(flexion) - Function(active flexion)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>36</td>
<td>107(11.00)</td>
<td>38</td>
<td>105(9.00)</td>
<td>Mean Differe</td>
<td>2(-2.59,6.59)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(Stair test - down (in seconds))</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>10.7(5.00)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>36</td>
<td>10.5(4.10)</td>
<td>Mean Difference</td>
<td>0.2(-1.91,2.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(Stair test - down (in seconds))</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>10.7(5.30)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>34</td>
<td>10.7(5.00)</td>
<td>Mean Difference</td>
<td>0(-2.41,2.41)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(Stair test - up (in seconds))</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>11(5.60)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>36</td>
<td>9.6(3.40)</td>
<td>Mean Difference</td>
<td>1.4(-0.74,3.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(Stair test - up (in seconds))</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>10.3(3.70)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>34</td>
<td>10(4.10)</td>
<td>Mean Difference</td>
<td>0.3(-1.53,2.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kauppila, A.M., 2010</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function(time to complete 15-m walk (in seconds))</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>13.4(2.40)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>13.3(2.50)</td>
<td>Mean Difference</td>
<td>0.1(-1.01,1.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function(time to complete 15-m walk (in seconds))</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>13.8(3.60)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>37</td>
<td>13.7(2.90)</td>
<td>Mean Difference</td>
<td>0.1(-1.40,1.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>. %</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kauppila, A.M., 2010</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>-32.4(26.40)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>-32.8(20.10)</td>
<td>Mean Difference</td>
<td>0.4(-10.29,11.09)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Liao,C.D., 2013</td>
<td>High Quality</td>
<td>Balance-Function(Single leg stance (s) with eyes closed)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT (90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>4.07 (1.20)</td>
<td>Post-Op: No Structured Exercise Program (control) (60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>55</td>
<td>2.69 (1.30)</td>
<td>Mean Difference</td>
<td>1.38 (0.92, 1.84)</td>
<td>Treatment 1 Significant (P-value &lt; .05)</td>
</tr>
<tr>
<td>Liao,C.D., 2013</td>
<td>High Quality</td>
<td>Balance-Function(Single leg stance (s) with eyes open)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT (90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>4.69 (0.74)</td>
<td>Post-Op: No Structured Exercise Program (control) (60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>55</td>
<td>2.23 (1.34)</td>
<td>Mean Difference</td>
<td>2.46 (2.06, 2.86)</td>
<td>Treatment 1 Significant (P-value &lt; .05)</td>
</tr>
<tr>
<td>Liao,C.D., 2013</td>
<td>High Quality</td>
<td>Balance-Function(functional reach test measured as ratio of functional reach to body height)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT (90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>0.19 (0.05)</td>
<td>Post-Op: No Structured Exercise Program (control) (60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>55</td>
<td>0.13 (0.04)</td>
<td>Mean Difference</td>
<td>0.06 (0.04, 0.7)</td>
<td>Treatment 1 Significant (P-value &lt; .05)</td>
</tr>
<tr>
<td>Liao,C.D., 2013</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function timed chair rising test, 30 sec</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT (90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>3.32 (1.39)</td>
<td>Post-Op: No Structured Exercise Program (control) (60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>55</td>
<td>2.13 (1.57)</td>
<td>Mean Difference</td>
<td>1.19 (0.64, 1.74)</td>
<td>Treatment 1 Significant (P-value &lt; .05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
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<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
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<tr>
<td>Liao, C.D., 2013</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function(10-m walk test, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>-4.03(1.55)</td>
<td>Post-Op: No Structured Exercise Program (control)(60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>58</td>
<td>-2.58(1.68)</td>
<td>Mean Differe</td>
<td>-1.45(-2.04, -0.86)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Liao, C.D., 2013</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function(Time Up-and-Go, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>-3.01(1.52)</td>
<td>Post-Op: No Structured Exercise Program (control)(60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>55</td>
<td>-1.67(1.50)</td>
<td>Mean Differe</td>
<td>-1.34(-1.90, -0.78)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Liao, C.D., 2013</td>
<td>High Quality</td>
<td>Timed Functional Test (lower scores better, units of time)- Function(stair climbing test, sec)</td>
<td>2 months</td>
<td>Post-Op: Structured Exercise Program or PT(90 minute sessions of functional training and balance exercises over 8 weeks)</td>
<td>58</td>
<td>-4.17(1.35)</td>
<td>Post-Op: No Structured Exercise Program (control)(60 minute sessions of functional training exercises only over 8 weeks)</td>
<td>55</td>
<td>-2.39(1.55)</td>
<td>Mean Differe</td>
<td>-1.78(-2.32, -1.24)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Moffet, H., 2004</td>
<td>High Quality</td>
<td>SF-36 Physical Functioning- Function( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>58.9(23.80)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>56.8(23.70)</td>
<td>Mean Differe</td>
<td>2.1(-8.58,12.78)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Physical Functioning-Function( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT (12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>62.4(23.80)</td>
<td>Post-Op: No Structured Exercise Program (control) (All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>58.3(18.90)</td>
<td>Mean Difference 4.1(1.56, 13.81)</td>
<td>Not Significant (P-value &gt;.05)</td>
<td></td>
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<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Physical Functioning-Function( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>63.8(24.30)</td>
<td>Post-Op: No Structured Exercise Program (control) (All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>60.3(20.40)</td>
<td>Mean Difference 3.5(1.7, 7.05)</td>
<td>Not Significant (P-value &gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Physical Role Functioning-Function( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT (12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>44.7(39.90)</td>
<td>Post-Op: No Structured Exercise Program (control) (All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>50.7(42.10)</td>
<td>Mean Difference -6.4(1.34, 2.44)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Physical Role Functioning-Function( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT (12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>69.1(38.30)</td>
<td>Post-Op: No Structured Exercise Program (control) (All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>52.7(44.40)</td>
<td>Mean Difference 16.4(-2.39, 35.19)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
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<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Physical Role Functioning( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>70.4(37.60)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>72.6(36.10)</td>
<td>Mean Difference</td>
<td>-2.2(-19.65,15.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Social Role Functioning( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>78.9(22.90)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>79.3(17.00)</td>
<td>Mean Difference</td>
<td>-0.4(-9.47,8.67)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Social Role Functioning( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>82.6(20.90)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>78.7(16.60)</td>
<td>Mean Difference</td>
<td>3.9(-4.63,12.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Social Role Functioning( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>84.9(22.00)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>84.3(16.10)</td>
<td>Mean Difference</td>
<td>0.6(-8.40,9.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
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<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function(6 minute walk test (in meters))</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>377.7(74.50)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>346.7(95.30)</td>
<td>Mean Difference</td>
<td>31(-7.46, 69.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function(6 minute walk test (in meters))</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>392.1(92.20)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>360.3(77.40)</td>
<td>Mean Difference</td>
<td>31.8(-6.69, 70.29)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function(6 minute walk test (in meters))</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>399.7(94.20)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>369.7(80.10)</td>
<td>Mean Difference</td>
<td>30(-11.14, 71.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>13.6(15.00)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>18.9(17.70)</td>
<td>Mean Difference</td>
<td>-5.3(-12.68, 2.08)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>12.4(14.40)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>18.6(18.70)</td>
<td>Mean Differece</td>
<td>-6.2(-13.77,1.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>12(14.80)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>15.8(17.60)</td>
<td>Mean Differece</td>
<td>-3.8(-11.58,3.98)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Vuorenmaa,M., 2014</td>
<td>High Quality</td>
<td>Muscle Strength-Function(isometric knee strength-extension, kg)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>15.1(9.46)</td>
<td>Post-Op: No Structured Exercise Program (control)(No additional guidance; standard care)</td>
<td>53</td>
<td>13.1(11.14)</td>
<td>Mean Differece</td>
<td>2(-1.90,5.90)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Vuorenmaa,M., 2014</td>
<td>High Quality</td>
<td>Muscle Strength-Function(isometric knee strength-flexion, kg)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>4.4(4.92)</td>
<td>Post-Op: No Structured Exercise Program (control)(No additional guidance; standard care)</td>
<td>53</td>
<td>2.4(3.71)</td>
<td>Mean Differece</td>
<td>2(0.36,3.64)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Effect Measure</td>
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<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (active extension deficit)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>-5.9 (5.30)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>-6 (3.71)</td>
<td>Mean Difference</td>
<td>0.1 (-1.62, 1.82)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Range of Motion (extension) - Function (passive extension deficit)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>-3.7 (4.92)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>-3.5 (4.09)</td>
<td>Mean Difference</td>
<td>-0.2 (-1.90, 1.50)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (active flexion)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>14.4 (11.35)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>14.2 (14.49)</td>
<td>Mean Difference</td>
<td>0.2 (-4.72, 5.12)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Range of Motion (flexion) - Function (passive flexion)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>13.2 (10.97)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>13.9 (11.89)</td>
<td>Mean Difference</td>
<td>-0.7 (-5.02, 3.62)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function(Time up and go, s)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>-1.58(3.59)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>-1.43(2.15)</td>
<td>Mean Difference</td>
<td>-0.15(-1.26,0.96)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (max walking speed, m/s)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>0.32(0.23)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>0.17(0.26)</td>
<td>Mean Difference</td>
<td>0.15(0.06,0.24)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>-18(22.70)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>-13(18.57)</td>
<td>Mean Difference</td>
<td>-5(-12.81,2.81)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen, A., 2010</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function (Habitual walking speed, over 10m. (m/s))</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT (12 week group course with aquatic based exercises.)</td>
<td>25</td>
<td>1.41(0.24)</td>
<td>Post-Op: No Structured Exercise Program (control) (No intervention.)</td>
<td>21</td>
<td>1.29(0.26)</td>
<td>Mean Difference</td>
<td>0.12(-0.03,0.27)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Valtonen,A., 2010</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (higher scores better, distance, distance/time)-Function(Maximal walking speed, over 3m. (m/s))</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 week group course with aquatic based exercises.)</td>
<td>25</td>
<td>1.96(0.31)</td>
<td>Post-Op: No Structured Exercise Program (control)(No intervention.)</td>
<td>21</td>
<td>1.87(0.52)</td>
<td>Mean Difference</td>
<td>0.09(-0.16,0.34)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen,A., 2010</td>
<td>Moderate Quality</td>
<td>Timed Functional Test (lower scores better, units of time)-Function(Stair test - ascending (in seconds))</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 week group course with aquatic based exercises.)</td>
<td>25</td>
<td>4.27(1.67)</td>
<td>Post-Op: No Structured Exercise Program (control)(No intervention.)</td>
<td>21</td>
<td>4.71(1.74)</td>
<td>Mean Difference</td>
<td>-0.44(-1.43,0.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen,A., 2010</td>
<td>Moderate Quality</td>
<td>Womac-function averaged VAS Version (0-100)( )</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 week group course with aquatic based exercises.)</td>
<td>25</td>
<td>18.5(9.40)</td>
<td>Post-Op: No Structured Exercise Program (control)(No intervention.)</td>
<td>21</td>
<td>17(11.50)</td>
<td>Mean Difference</td>
<td>1.5(-4.65,7.65)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen,A., 2010</td>
<td>Moderate Quality</td>
<td>Knee extensor power (KEP) - operated leg (watts)</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 week group course with aquatic based exercises.)</td>
<td>23</td>
<td>145.6(64)</td>
<td>Post-Op: No Structured Exercise Program (control)(No intervention.)</td>
<td>20</td>
<td>129.3(44.8)</td>
<td>Mean Difference</td>
<td>16.3(-18.18,5.78)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen,A., 2010</td>
<td>Moderate Quality</td>
<td>Knee flexor power (KFP) - operated leg (watts)</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 week group course with aquatic based exercises.)</td>
<td>23</td>
<td>135.9(60)</td>
<td>Post-Op: No Structured Exercise Program (control)(No intervention.)</td>
<td>20</td>
<td>160.4(56.9)</td>
<td>Mean Difference</td>
<td>-24.5(-60.62,1.62)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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</table>
### TABLE 131: PART 2- STRUCTURED EXERCISE VERSUS NO/LESS STRUCTURED EXERCISE DURING LATE STAGE POST SURGERY (AFTER 2 MONTHS): OTHER OUTCOMES

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>SF-36 Mental Health-Function( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT (12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>78.4(22.90)</td>
<td>Post-Op: No Structured Exercise Program (control)</td>
<td>38</td>
<td>80.9(14.40)</td>
<td>Mean Difference</td>
<td>-2.5(-11.10,6.10)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>SF-36 Mental Health-Function( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT (12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>76.3(15.50)</td>
<td>Post-Op: No Structured Exercise Program (control)</td>
<td>37</td>
<td>83.4(12.10)</td>
<td>Mean Difference</td>
<td>-7.1(-13.38,-0.82)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>SF-36 Mental Health-Function( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>76.4(17.70)</td>
<td>Post-Op: No Structured Exercise Program (control)</td>
<td>31</td>
<td>82.7(14.00)</td>
<td>Mean Difference</td>
<td>-6.3(-13.78,1.18)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
### TABLE 132: PART 2- STRUCTURED EXERCISE VERSUS NO/LESS STRUCTURED EXERCISE DURING LATE STAGE POST SURGERY (AFTER 2 MONTHS): PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>. %</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kauppila, A.M., 2010</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>. %</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet, H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Bodily Pain- Pain( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>58.8(22.90)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>57.5(19.40)</td>
<td>Mean Difference</td>
<td>1.3(-8.24,10.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet, H., 2004</td>
<td>High Quality</td>
<td>Sf-36 Bodily Pain- Pain( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>63.6(22.70)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>63.2(22.20)</td>
<td>Mean Difference</td>
<td>0.4(-9.76,10.56)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>SF-36 Bodily Pain- Pain()</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>63.7(21.40)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>63.6(19.00)</td>
<td>Mean Difference</td>
<td>0.1(-9.44,9.64)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>9.6(11.50)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>17.2(17.10)</td>
<td>Mean Difference</td>
<td>-7.6(-14.15,-1.05)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>8.9(9.60)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>16(18.10)</td>
<td>Mean Difference</td>
<td>-7.1(-13.68,-0.52)</td>
<td>Treatment 1 Significant (P-value&lt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>9.4(12.40)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>11.8(13.00)</td>
<td>Mean Difference</td>
<td>-2.4(-8.44,3.64)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Vuorenmaa, M., 2014</td>
<td>High Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>-15(18.92)</td>
<td>Post-Op: No Structured Exercise Program (control) (No additional guidance; standard care)</td>
<td>53</td>
<td>-14(18.57)</td>
<td>Mean Difference</td>
<td>-1(-8.07, 6.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen, A., 2010</td>
<td>Moderate Quality</td>
<td>Womac-Pain averaged VAS Version (0-100)( )</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT (12 week group course with aquatic based exercises.)</td>
<td>25</td>
<td>13(8.70)</td>
<td>Post-Op: No Structured Exercise Program (control) (No intervention.)</td>
<td>21</td>
<td>15.5(12.40)</td>
<td>Mean Difference</td>
<td>-2.5(-8.81, 3.81)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>HRQoL 15D( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT (10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>. %</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>HRQoL 15D( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT (10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>0.034(0.09)</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>0.035(0.08)</td>
<td>Mean Difference</td>
<td>-0.001(-0.04,0.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
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**TABLE 134: PART 2- STRUCTURED EXERCISE VERSUS NO/LESS STRUCTURED EXERCISE DURING LATE STAGE POST SURGERY (AFTER 2 MONTHS): STIFFNESS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>. %</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Kauppila,A.M., 2010</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(10 day multidisciplinary rehab program 2-4 months after surgery. Supervised group sessions.)</td>
<td>36</td>
<td>. %</td>
<td>Post-Op: No Structured Exercise Program (control)(Standard amount of post-op PT)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)( )</td>
<td>4 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>22.1(25.30)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>38</td>
<td>28.8(25.70)</td>
<td>Mean Difference</td>
<td>-6.7(-18.17,4.77)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
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</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)</td>
<td>6 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>16.2(19.60)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>37</td>
<td>25.2(24.90)</td>
<td>Mean Difference</td>
<td>-9(-19.16,1.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Moffet,H., 2004</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(12 supervised rehab session with physical therapist starting 2 months after TKA.)</td>
<td>38</td>
<td>13.7(16.80)</td>
<td>Post-Op: No Structured Exercise Program (control)(All patients taught home-exercises in hospital. No additional care after discharge.)</td>
<td>31</td>
<td>19.3(20.90)</td>
<td>Mean Difference</td>
<td>-5.6(-14.69,3.49)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Vuorenmaa,M., 2014</td>
<td>High Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)</td>
<td>1 year</td>
<td>Post-Op: Structured Exercise Program or PT(Individual guidance at baseline with check-ups at 3 and 6 months post-operatively to adjust exercise program)</td>
<td>55</td>
<td>-25(26.49)</td>
<td>Post-Op: No Structured Exercise Program (control)(No additional guidance; standard care)</td>
<td>53</td>
<td>-17(29.71)</td>
<td>Mean Difference</td>
<td>-8(-18.63,2.63)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Valtonen,A., 2010</td>
<td>Moderate Quality</td>
<td>Womac-stiffness averaged VAS Version (0-100)</td>
<td>3 months</td>
<td>Post-Op: Structured Exercise Program or PT(12 week group course with aquatic based exercises.)</td>
<td>25</td>
<td>25.9(20.60)</td>
<td>Post-Op: No Structured Exercise Program (control)(No intervention.)</td>
<td>21</td>
<td>30.3(25.50)</td>
<td>Mean Difference</td>
<td>-4.4(-17.97,9.17)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
I. APPENDIXES

APPENDIX I. GUIDELINE DEVELOPMENT GROUP ROSTER

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Former Staff
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Research Analyst, Evidence-Based Medicine Analyst
APPENDIX II
AAOS BODIES THAT APPROVED THIS CLINICAL PRACTICE GUIDELINE

Committee on Evidence Based Quality and Value

The committee on Evidence Based Quality and Value (EBQV) consists of twenty AAOS members who implement evidence-based quality initiatives such as clinical practice guidelines (CPGs) and appropriate use criteria (AUCs). They also oversee the dissemination of related educational materials and promote the utilization of orthopaedic value products by the Academy’s leadership and its members.

Council on Research and Quality

The Council on Research and Quality promotes ethically and scientifically sound clinical and translational research to sustain patient care in musculoskeletal disorders. The Council also serves as the primary resource for educating its members, the public, and public policy makers regarding evidenced-based medical practice, orthopaedic devices and biologics, regulatory pathways and standards development, patient safety, occupational health, technology assessment, and other related important errors.

The Council is comprised of the chairs of the committees on Biological Implants, Biomedical Engineering, Occupational Health and Workers’ Compensation, Patient Safety, Research Development, U.S. Bone and Joint Decade, and chair and Appropriate Use Criteria and Clinical Practice Guideline section leaders of the Evidence Based Quality and Value committee. Also on the Council are the second vice-president, three members at large, and representatives of the Diversity Advisory Board, Women's Health Issues Advisory Board, Board of Specialty Societies (BOS), Board of Councilors (BOC), Communications Cabinet, Orthopaedic Research Society (ORS), Orthopedic Research and Education Foundation (OREF).

Board of Directors

The 17 member Board of Directors manage the affairs of the AAOS, set policy, and oversee the Strategic Plan.
### APPENDIX III
**PICO QUESTIONS USED TO DEFINE LITERATURE SEARCH**

<table>
<thead>
<tr>
<th>Short Title</th>
<th>PICO Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drains</td>
<td>In adult patients with osteoarthritis undergoing TKA who have a drain put in at the time of surgery, is there a reduction in complications or an improvement in outcomes compared with patients who do not have a drain placed?</td>
</tr>
<tr>
<td>Antibiotic bone cement</td>
<td>In adult patients with osteoarthritis undergoing cemented KA, does the use of antibiotic bone cement improve outcomes when compared to patients with bone cement without antibiotics?</td>
</tr>
<tr>
<td>Unicompartmental</td>
<td>In adult patients with osteoarthritis undergoing unicompartmental KA for predominantly unicompartmental OA, are outcomes and/or implant survivorship improved compared to those patients undergoing osteotomy (distal femoral for lateral compartment involvement, proximal tibial for medial compartment involvement, and tibial tubercle for patellofemoral involvement) or TKA? (2 questions)</td>
</tr>
<tr>
<td>Regional Anesthesia</td>
<td>In adult patients with osteoarthritis undergoing KA and with no known contraindications to specific anesthesia, does neuraxial anesthesia reduce complications or improve outcomes compared to general anesthesia?</td>
</tr>
<tr>
<td>Peripheral Nerve Blockade</td>
<td>In adult patients with osteoarthritis undergoing KA and with no known contraindications to specific anesthesia, does peri-operative peripheral nerve block for pain control reduce complications or improve outcomes compared to using no peripheral nerve block?</td>
</tr>
<tr>
<td>Tranexamic acid</td>
<td>In adult patients with osteoarthritis undergoing KA and with no known contraindications to the use of tranexamic acid, does the use of topical or intravenous tranexamic acid reduce complications and / or improve outcomes compared to not using tranexamic acid?</td>
</tr>
</tbody>
</table>
| Bone Cement       | a) In adult patients with osteoarthritis undergoing KA, does the use of bone cement fixation for one or more of the knee arthroplasty components improve outcomes or reduce complications when compared with use of bony ingrowth components (hybrid vs no use of bone cement)?  
b) In adult patients with osteoarthritis undergoing KA, does the use of bone cement fixation for all knee arthroplasty components improve outcomes or reduce complications when compared with use of bony ingrowth components (completely cemented vs no use of bone cement)?  
c) In adult patients with osteoarthritis undergoing KA, does the use of bone cement fixation for one or more of the knee arthroplasty components improve outcomes or reduce complications when compared with use of bone cement fixation for all knee arthroplasty components (hybrid vs completed cement)? |
<p>| Bilateral TKA     | In adult patients with bilateral osteoarthritis undergoing TKA and with no known contraindications, does bilateral simultaneous KA (both knee surgeries during the same anesthetic) have improved outcomes or reduced complications compared with the combined complications of both individual KA (two knee surgeries, with two separate anesthetics) either within 90 days or within 6 months? |
| Surgical Navigation | In adult patients with osteoarthritis undergoing KA and with no known contraindications to surgical navigation, does intraoperative surgical navigation improve outcomes or decrease complications compared with not using surgical navigation? |
| Radiographs       | In adult patients with osteoarthritis undergoing KA, does the use of a preoperative long-standing (hip to ankle) AP or PA radiograph improve outcomes or decrease complications compared with not using this radiograph? |</p>
<table>
<thead>
<tr>
<th>Short Title</th>
<th>PICO Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial Imaging</td>
<td>In adult patients with osteoarthritis undergoing KA and with no known contraindications to MRI or CT scan, does obtaining a preoperative MRI or CT scan (diagnostic imaging) in addition to standard pre-operative radiographs improve outcomes or decrease complications compared with not obtaining an MRI or CT scan?</td>
</tr>
<tr>
<td>Delay TKA</td>
<td>In adult patients with osteoarthritis undergoing KA (who have already failed non-surgical management), does a delay of X days/weeks/months in surgical intervention lead to worse outcomes or higher complications compared to no delay?</td>
</tr>
</tbody>
</table>
| Risk Stratification      | a) Obesity: In obese adult patients (using the WHO definitions) with osteoarthritis undergoing KA, are outcomes diminished or complications increased compared with non-obese patients undergoing KA?  
                              b) Depression: In depressed adult patients with osteoarthritis undergoing KA, are outcomes diminished or complications increased compared with non-depressed patients undergoing KA?  
                              c) Diabetes: In diabetic adult patients with osteoarthritis undergoing KA, are outcomes diminished or complications increased compared with non-diabetic patients undergoing KA?  
                              d) Smoking: In adult currently tobacco-smoking patients with osteoarthritis undergoing KA, are outcomes diminished or complications increased compared with non-currently tobacco-smoking patients undergoing KA?  
                              e-n) Additional Risk Factors: Search literature for metabolic syndrome, osteoporosis, anemia, liver disease, renal insufficiency, chronic pain, sleep apnea, HIV, neurologic disease and formulate questions similar to those above |
<p>| Physical Therapy         | In adult patients with osteoarthritis undergoing KA, does active participation in a pre-operative structured exercise program improve outcomes or decrease complications compared with not engaging in such a program? |
| Tourniquet               | In adult patients with osteoarthritis undergoing TKA and with no known contraindications, does using a tourniquet during surgery improve outcomes or decrease complications compared with not using a tourniquet? |
| Post-operative mobilization | In adult patients with osteoarthritis undergoing TKA and with no known contraindications, does (accelerated) mobilization on the day of surgery improve outcomes and/or decrease complications compared with (non-accelerated) mobilization on post-operative day number 1 (the day after surgery)? |
| Continuous Passive Motion (CPM) | In adult patients with osteoarthritis undergoing KA and with no known contraindications, does the use of a continuous passive motion (CPM) machine during the post-operative hospital stay improve outcomes and/or decrease complications compared to not using CPM in the hospital? |
| Transfusion              | In adult patients with osteoarthritis and acute post-op anemia undergoing KA, does use of a restricted transfusion protocol (define as X) improve outcomes and/or decrease complications compared with not using such a protocol? |
| Rehabilitation Facility  | In adult patients with osteoarthritis undergoing KA, does discharge to an acute rehabilitation facility or skilled nursing facility improve outcomes and/or decrease complications compared with discharge to home, with or without home services? |
| Manipulation             | In adult patients with osteoarthritis and stiffness/poor range of motion after KA and with no known contraindications, does manipulation under anesthesia postoperatively improve outcomes and/or decrease complications compared with non-manipulation (under anesthesia) interventions for post-operative stiffness? |
| Cryotherapy              | In adult patients with osteoarthritis undergoing KA and with no known contraindications, does post-operative cryotherapy (all cooling techniques) improve outcomes and/or decrease complications compared with no use of cryotherapy? |</p>
<table>
<thead>
<tr>
<th>Short Title</th>
<th>PICO Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home CPM</td>
<td>In adult patients with osteoarthritis undergoing KA and with no known contraindications, does the use of a continuous passive motion (CPM) machine after hospital discharge improve outcomes and / or decrease complications compared not using CPM after hospital discharge?</td>
</tr>
</tbody>
</table>
| MSSA/MRSA             | a) In adult patients with osteoarthritis scheduled for TKA, does pre-operative screening and treatment for MRSA and MSSA improve outcomes and / or decrease complications compared to not screening and treating for MRSA and MSSA?  
|                       | b) In adult patients with osteoarthritis scheduled for KA, does pre-operative screening and treatment for MRSA and MSSA improve outcomes and / or decrease complications compared to universal treatment (e.g., bactroban, hibiclens w/o screening) for MRSA and MSSA? |
| Skin Treatment        | In adult patients with osteoarthritis scheduled for TKA, does pre-operative skin treatment with chlorhexidine showers and/or skin wipes improve outcomes and/or decrease complications compared to not treating with chlorhexidine showers and/or skin wipes? |
| Skin Prep             | In adult patients with osteoarthritis undergoing KA, does pre-operative skin preparation with a pre-prepared (second generation) alcohol based skin preparation solution (e.g. Chloroprep or Duraprep) improve outcomes and / or decrease complications compared to not treating with a pre-prepared (second generation) alcohol based skin preparation solution? |
| Body Isolation suits  | In adult patients with osteoarthritis undergoing KA, does intraoperative use of body isolation suits (space suits or exhaust suits) by one or more of the surgical team improve outcomes and / or decrease complications compared to not using body isolation suits (space suits or exhaust suits)? |
| OR Environment        | In adult patients with osteoarthritis undergoing TKA, do alterations of the OR environment (uv light, low traffic, use of bear hugger, laminar airflow, minimizing door swings) improve outcomes and / or decrease complications compared to not altering OR environment? |
| Patellar Resurfacing  | In adult patients with osteoarthritis undergoing TKA, does patellar resurfacing improve outcomes or decrease complications when compared to patients without patellar resurfacing? |
| Cruciate Retaining Arthroplasty | In adult patients with osteoarthritis undergoing TKA, does the use of cruciate retaining arthroplasty design improve outcomes or decrease complications when compared to patients with posterior stabilized arthroplasty design? |
| Patient Specific Technology | In adult patients with osteoarthritis undergoing KA, does the use of patient specific technology improve outcomes and / or decrease complications when compared to standard knee replacement technique? |
| Volume                | a) In adult patients with osteoarthritis undergoing KA, does surgery performed at a high volume center improve outcomes and / or decrease complications when compared to patients undergoing surgery at a lower volume center  
<p>|                       | b) In adult patients with osteoarthritis undergoing KA, does surgery performed by a high volume surgeon improve outcomes and / or decrease complications when compared to patients undergoing surgery by a lower volume surgeon? |</p>
<table>
<thead>
<tr>
<th>Short Title</th>
<th>PICO Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured Exercise Program</td>
<td>In adult patients with osteoarthritis who have undergone KA, does a post-operative, prescribed, supervised, structured exercise program at either short-term (three months or less) or long-term (greater than 3 months) improve outcomes or decrease complications compared with not engaging in such a program?</td>
</tr>
<tr>
<td>Peri-articular Local Infiltration</td>
<td>In adult patients with osteoarthritis undergoing KA and with no known contraindications to specific medications used, does peri-articular local infiltration (anesthetic and/or anti-inflammatory and/or analgesic) reduce complications or improve outcomes compared to not injecting this mixture?</td>
</tr>
<tr>
<td>Poly-tibias</td>
<td>In adult patients with osteoarthritis undergoing KA, does use of an all-polyethylene tibial component increase complications or diminish outcomes compared to a modular (metal and polyethylene) tibial component?</td>
</tr>
</tbody>
</table>
APPENDIX IV
STUDY ATTRITION FLOWCHART

13,783 abstracts reviewed, final search performed on January 12, 2015

12,415 articles excluded from title and abstract review

1,293 articles recalled from abstract review

75 articles added after doing manual bibliography search of published reviews

1,368 articles recalled for guideline

1,042 articles excluded after full text review for not meeting the inclusion criteria or not best available evidence

224 articles included after full text review and quality analysis
APPENDIX V  
LITERATURE SEARCH STRATEGIES

Database: PubMed (PubMed.gov interface)  
Date searched: December 9, 2013 [updated search January 29, 2015]

#1 "Osteoarthritis, Knee"[mh] OR gonitis[tiab] OR gonarthritis[tiab] OR gonarthros*[tiab]  
#4 (#1 OR #2) AND #3  
#5 English[la]  
#7 (#4 AND #5) NOT #6

Database: EMBASE (Embase.com interface)  
Date searched: December 9, 2013 [updated search January 29, 2015]

#1 'knee osteoarthritis'/exp OR gonitis:ab,ti OR gonarthritis:ab,ti OR gonarthros*:ab,ti  
#2 ('knee'/exp OR 'knee':ab,ti OR 'knees':ab,ti OR 'patellofemoral':ab,ti) AND ('osteoarthritis'/de OR 'arthritis'/de OR osteoarthr*:ab,ti OR arthriti*:ab,ti OR 'arthrosis':ab,ti)  
#3 'knee arthroplasty'/exp OR 'knee prosthesis'/exp OR ‘arthroplasty’:ab,ti OR ‘arthroplasties’:ab,ti OR ‘replacement’:ab,ti OR ‘replacements’:ab,ti OR ‘resurfacing’:ab,ti  
#4 (#1 OR #2) AND #3  
#5 [english]/lim  
#6 cadaver/de OR 'in vitro study'/exp OR 'abstract report'/de OR book/de OR editorial/de OR note/de OR (letter/de NOT 'types of study'/exp)  
#7 (#4 AND #5) NOT #6

Database: The Cochrane Library (Wiley interface)  
Date searched: December 9, 2013 [updated search January 29, 2015]

#1 MeSH descriptor: [Osteoarthritic, Knee] explode all trees  
#2 MeSH descriptor: [Knee Joint] explode all trees  
#3 MeSH descriptor: [Knee] explode all trees  

500
Supplementary Anesthesia Search (PICOs #4-5)

Database: PubMed (PubMed.gov interface)
Date searched: December 23, 2014

#2 (Knee[tiab] OR knees[tiab]) AND (arthroplast*[tiab] OR replacement*[tiab] OR operat*[tiab] OR surg*[tiab])
#3 #1 OR #2
#4 Anesthesia, Conduction[mh] OR Anesthesia[mh:noexp]
#6 #4 OR #5
#7 #3 AND #6
#8 English[la]
#10 (#7 AND #8) NOT #9

Database: EMBASE (Embase.com interface)
Date searched: January 7, 2015

#1 'knee surgery'/exp
#2knee:ab,ti OR knees:ab,ti AND (arthroplast*:ab,ti OR replacement*:ab,ti OR operat*:ab,ti OR surg*:ab,ti)
#3’anesthesia'/exp
#4’neuraxial’:ab,ti OR ’epidural’:ab,ti OR 'nerve block’:ab,ti OR 'nerve blocks’:ab,ti OR ’nerve blockade’:ab,ti
#5(#1 OR #2) AND (#3 OR #4)
#6[english]/lim NOT [medline]/lim
#7’cadaver'/de OR ‘in vitro study'/exp OR 'abstract report'/de OR 'book'/de OR ’editorial'/de OR 'note'/de OR ('letter'/de NOT 'types of study'/exp)
#8’meta analysis’:de,ab,ti OR 'systematic review’:de,ab,ti OR medline:de,ab,ti
#9random*:de,ab,ti OR 'clinical trial’:de,ab,ti OR 'health care quality'/exp
#10#5 AND #6 NOT #7
#11#10 AND #8
#12#10 AND #9 NOT #8
#13#10 NOT (#8 OR #9)

Database: The Cochrane Library (Wiley interface)
Date searched: January 12, 2015

#1MeSH descriptor: [Knee] explode all trees and with qualifier(s): [Surgery - SU]
#2MeSH descriptor: [Knee Joint] explode all trees and with qualifier(s): [Surgery - SU]
#3MeSH descriptor: [Knee] explode all trees
#4MeSH descriptor: [Knee Joint] explode all trees
#5MeSH descriptor: [Arthroplasty, Replacement, Knee] explode all trees
#6MeSH descriptor: [Orthopedic Procedures] explode all trees
#7MeSH descriptor: [Anesthesia, Conduction] explode all trees
#8MeSH descriptor: [Anesthesia] this term only
#9”neuraxial” or ”epidural” or ”nerve block” or ”nerve blocks” or ”nerve blockade”
#10”knee” or ”knees”:ti,ab,kw (Word variations have been searched)
#11#1 or #2 or #5 or (#6 and (#3 or #4)) or #10
#12#11 and (#7 or #8 or #9)
APPENDIX VI
OPINION BASED RECOMMENDATIONS
A guideline can contain recommendations for which there is no evidence. Guideline development groups might make the decision to issue opinion-based recommendations. Although expert opinion is a form of evidence, it is also important to avoid liberal use in a guideline since research shows that expert opinion can be incorrect.

Opinion-based recommendations are developed only in instances where not establishing a recommendation would lead to catastrophic consequences for a patient (e.g. loss of life or limb). To ensure that an opinion-based recommendation is absolutely necessary, the AAOS has adopted rules to guide the content of the rationales that are based on those outlined by the U.S. Preventive Services Task Force (USPSTF). Specifically, rationales based on expert opinion must:

- Not contain references to or citations from articles not included in the systematic review.
- Not contain the AAOS guideline language “the practitioner should/should not”, “the practitioner could/could not” or “The practitioner might/might not.”
- Contain an explanation of the potential preventable burden of disease. This involves considering both the incidence and/or prevalence of the disease, disorder, or condition and the associated burden of suffering. To paraphrase the USPSTF, when evidence is insufficient, provision of a treatment (or diagnostic) for a serious condition might be viewed more favorably than provision of a treatment (or diagnostic) for a condition that does not cause as much suffering. The AAOS understands that evaluating the “burden of suffering” is subjective and involves judgment. This evaluation should be informed by patient values and concerns. It is not appropriate for a guideline to recommend widespread use of a technology backed by little data and for which there is limited experience. Such technologies are addressed in the AAOS’ Technology Overviews.
- Address potential harms.
- Address apparent discrepancies in the logic of different recommendations. If there are no relevant data for several recommendations and the guideline development group chooses to issue an opinion-based recommendation in some cases but not in other cases, the rationales must explain why.
- Consider current practice. The USPSTF specifically states that clinicians justifiably fear not providing a service that is practiced on a widespread basis will lead to litigation. Not providing a service that is not widely available or commonly used has less serious consequences than not providing a treatment accepted by the medical profession that patients expect. The patient’s “expectation of treatment” must be tempered by the treating physician’s guidance about the reasonable outcomes that the patient can expect.
Guideline development group members write the rationales for opinion based recommendations on the first day of the final guideline development group meeting. When the guideline development group reconvenes on the second day, members approve the rationales. If the guideline development group cannot adopt a rationale after three votes, the rationale and the opinion-based recommendation will be withdrawn, and a “recommendation” stating that the group can neither recommend for or against the recommendation in question will appear in the guideline.

Sometimes guideline development group members change their views. At any time during the discussion of the rationales, any member of the guideline development group can make a motion to withdraw a recommendation. The guideline will state that the guideline development group can neither recommend for or against the recommendation in question.

**COMPANION CONSENSUS STATEMENTS**

For PICO questions which returned no evidence and do not meet the AAOS criteria for developing a consensus statement, the guideline development group is asked to refer the question to a relevant specialty society to form a companion consensus statement.

If the designated specialty society accepts the invitation to create a consensus companion statement, the AAOS Evidence-Based Medicine Unit assists the society in assembling a writing panel and voting panel made up of their members. After the panels are assembled, the AAOS EBM Unit guides them through a modified Delphi process to construct a companion consensus statement. If the companion consensus statement is approved by the designated specialty society and AAOS bodies, it is published in a separate document alongside the guideline on the AAOS website: [www.aaos.org/guidelines](http://www.aaos.org/guidelines)
APPENDIX VII
PARTICIPATING PEER REVIEW ORGANIZATIONS
Peer review of the guideline is completed by interested external organizations. The AAOS solicits reviewers for each guideline. They consist of experts in the topic area and represent professional societies other than AAOS. Review organizations are nominated by the guideline development group at the introductory meeting. For this guideline, 21 organizations were invited to review the full guideline. Six societies participated in the review of the guideline on surgical management of osteoarthritis of the knee and have given consent to be listed below:

American Association of Hip and Knee Surgeons
American College of Radiology
American Geriatrics Society
American Society of Regional Anesthesia and Pain Medicine
American Society of Anesthesiologists
American Physical Therapy Association

Peer review comments will be available on [www.aaos.org](http://www.aaos.org).

**Participation in the AAOS guideline peer review process does not constitute an endorsement nor does it imply that the reviewer supports this document.**
**STRUCTURED PEER REVIEW FORM**

Peer reviewers are asked to read and review the draft of the clinical practice guideline with a particular focus on their area of expertise. Their responses to the answers below are used to assess the validity, clarity, and accuracy of the interpretation of the evidence.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
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<tr>
<td>1. The overall objective(s) of the guideline is (are) specifically described.</td>
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<td>2. The health question(s) covered by the guideline is (are) specifically described.</td>
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<td>3. The guideline’s target audience is clearly described.</td>
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<td>4. The guideline development group includes individuals from all the relevant professional groups.</td>
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<td>5. There is an explicit link between the recommendations and the supporting evidence.</td>
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<td>6. Given the nature of the topic and the data, all clinically important outcomes are considered.</td>
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<td>7. The patients to whom this guideline is meant to apply are specifically described.</td>
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<td>8. The criteria used to select articles for inclusion are appropriate.</td>
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<td>9. The reasons why some studies were excluded are clearly described.</td>
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<td>10. All important studies that met the article inclusion criteria are included.</td>
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<td>11. The validity of the studies is appropriately appraised.</td>
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<td>12. The methods are described in such a way as to be reproducible.</td>
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<td>13. The statistical methods are appropriate to the material and the objectives of this guideline.</td>
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<td>14. Important parameters (e.g., setting, study population, study design) that could affect study results are systematically addressed.</td>
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<td>15. Health benefits, side effects, and risks are adequately addressed.</td>
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<td>16. The writing style is appropriate for health care professionals.</td>
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<td>17. The grades assigned to each recommendation are appropriate.</td>
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Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline.

Would you recommend these guidelines for use in clinical practice?*

- Strongly Recommend
- Recommend
- Would Not Recommend
- Unsure

Additional Comments:

To view an example of the structured peer review form, please select the following link: Structured Peer Review Form
APPENDIX VIII
INTERPRETING THE FOREST PLOTS
We use descriptive diagrams known as forest plots to present data from studies comparing the differences in outcomes between two treatment groups when a meta-analysis has been performed (combining results of multiple studies into a single estimate of overall effect). The overall effect is shown at the bottom of the graph as a diamond to illustrate the confidence intervals. The standardized mean difference or odds ratio are measures used to depict differences in outcomes between treatment groups. The horizontal line running through each point represents the 95% confidence interval for that point estimate. The solid vertical line represents “no effect” and is where the standardized mean difference = 0 or odds ratio = 1.
APPENDIX IX
CONFLICT OF INTEREST
Prior to the development of this guideline, guideline development group members disclose conflicts of interest (COI). They disclose COIs in writing to the American Academy of Orthopaedic Surgeons via a private on-line reporting database and also verbally at the recommendation approval meeting.

Disclosure Items: (n) = Respondent answered 'No' to all items indicating no conflicts. 1 = Royalties from a company or supplier; 2 = Speakers bureau/paid presentations for a company or supplier; 3A = Paid employee for a company or supplier; 3B = Paid consultant for a company or supplier; 3C = Unpaid consultant for a company or supplier; 4 = Stock or stock options in a company or supplier; 5 = Research support from a company or supplier as a PI; 6 = Other financial or material support from a company or supplier; 7 = Royalties, financial or material support from publishers; 8 = Medical/Orthopaedic publications editorial/governing board; 9 = Board member/committee appointments for a society.

Brian Joseph McGrory, MD, Workgroup Chair: American Association of Hip and Knee Surgeons: Board or committee member; Arthroplasty Today: Editorial or governing board; Submitted on: 10/05/2014

Kristy L Weber, MD, Workgroup Co-Chair: Current Surgery Reviews: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Musculoskeletal Tumor Society: Board or committee member Orthopaedic Research Society: Board or committee member; Ruth Jackson Orthopaedic Society: Board or committee member; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support; Submitted on: 12/12/2014

Gregory Alexander Brown, MD, PhD: AAOS: Board or committee member; ASTM: Board or committee member; International Standards Organization: Board or committee member; KareMetrix LLC: Stock or stock Options; Orthopaedic Solutions LLC: Stock or stock Options; Smith & Nephew: Paid presenter or speaker; Research support; Submitted on: 04/07/2015

Vinod Dasa, MD: Bioventus: Paid consultant; Paid presenter or speaker; Cropper medical: Research support; Ferring Pharmaceuticals: Paid consultant; Myoscience: Paid consultant; SKK Japan: Consultant; Submitted on: 10/03/2014

Charles M Davis III, MD: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Submitted on: 12/22/2014

COL. (ret) Tad L Gerlinger, MD: Smith & Nephew: Paid consultant; Society of Military Orthopaedic Surgeons: Board or committee member; Submitted on: 04/02/2015

James R Hebl, MD: Minnesota Society of Anesthesiologists: Board or committee member; Oxford University Press: Publishing royalties, financial or material support;
Regional Anesthesia and Pain Medicine: Editorial or governing board; Submitted on: 03/18/2015

Atul F Kamath, MD: AAOS: Board or committee member; BMC Musculoskeletal Disorders: Editorial or governing board; Procter & Gamble: Stock or stock Options; Submitted on: 10/01/2014

John A Lynott, MD: (This individual reported nothing to disclose); Submitted on: 04/01/2014

Sara Piva, PT, PhD: (This individual reported nothing to disclose); Submitted on: 03/18/2015

John C Richmond, MD: American Orthopaedic Society for Sports Medicine: Board or committee member; Arthroscopy Association of North America: Board or committee member; Eastern Orthopaedic Association: Board or committee member; Histogenics Corporation: Paid consultant; Mitek: Paid consultant; Springer: Publishing royalties, financial or material support; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support; Submitted on: 02/17/2015

Tomas Villanueva, DO, MBA, FACPE: Bristol-Myers Squibb: Paid presenter or speaker; Johnson & Johnson: Paid presenter or speaker; Norvartis: Paid presenter or speaker; Pfizer: Paid presenter or speaker; Sanofi-Aventis: Paid presenter or speaker; Submitted on: 04/08/2015

Chick J Yates Jr, MD: American Association of Hip and Knee Surgeons: Board or committee member; Submitted on: 10/10/2014

David Jevsevar, MD, MBA (This individual reported nothing to disclose); Submitted on: 10/02/2014

William O Shaffer, MD: (This individual reported nothing to disclose); Submitted on: 04/13/2014

Deborah S Cummins, PhD: (This individual reported nothing to disclose); Submitted on: 05/22/2014

Jayson Murray, MA: (This individual reported nothing to disclose); Submitted on: 05/19/2014

Ben Brenton: (This individual reported nothing to disclose); Submitted on 07/31/2014

Patrick Donnelly: (This individual reported nothing to disclose); Submitted on: 04/09/2015

Nilay Patel: (This individual reported nothing to disclose); Submitted on 07/31/2014
Anne Woznica: (This individual reported nothing to disclose); Submitted on: 04/01/2015

Erica Linskey: (This individual reported nothing to disclose); Submitted on: 06/29/2015

Kaitlyn Sevarino: (This individual reported nothing to disclose); Submitted on: 04/02/2015

Peter Shores: (This individual reported nothing to disclose); Submitted on: 10/06/2014
APPENDIX X

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INTRODUCTION AND METHODS


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**LOWER QUALITY STUDIES THAT MET THE INCLUSION CRITERIA BUT WERE EXCLUDED FOR NOT BEST AVAILABLE EVIDENCE**

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<th>Authors</th>
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<tr>
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Cruciate-Retaining Total Knee Arthroplasty in Patients with at Least Fifteen Degrees of Coronal Plane Deformity
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<td>not relevance comparison. drains were used in both groups, so does not answer pico question</td>
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(Pico 1: no patient oriented outcomes or any important)
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<td>2012</td>
<td>Quantitative magnetic-resonance-imaging measures of cartilage predict knee replacement - a case-control study from the osteoarthritis initiative</td>
<td>Abstract</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>Quantitative assessment of cartilage status in osteoarthritis by quantitative magnetic resonance imaging: technical validation for use in analysis of cartilage volume and further morphologic assessment</td>
<td>Doesn't assess surgery outcomes, only compares cartilage sizes of diff imaging techniques.</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>Systematic review of the concurrent and predictive validity of MRI biomarkers in OA</td>
<td>Systematic Review (reviewed bibsearch)</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>Abnormal preoperative MRI does not correlate with failure of UKA</td>
<td>re abnormal MRIs, not MRI as a measurement tool</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>Characterization of human osteoarthritic cartilage using optical and magnetic resonance imaging</td>
<td>in vitro</td>
</tr>
<tr>
<td>Authors</td>
<td>Year</td>
<td>Title</td>
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<tr>
<td>2007</td>
<td>Imaging the knee Intero-Observer Precision and Physiologic Variability of MRI Landmarks Used to Determine Rotational Alignment in Conventional and Patient-Specific TKA</td>
<td>systematic review?</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>What is the predictive value of MRI for the occurrence of hard clinical endpoints in knee osteoarthritis?</td>
<td>systematic review?</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>What is the predictive value of MRI for the occurrence of knee replacement surgery in knee osteoarthritis?</td>
<td>narrative review</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
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<tr>
<td>Raynauld, J.P.; Rizzoli, R.;</td>
<td>2014</td>
<td>Multiparametric MRI assessment of human articular cartilage degeneration: Correlation with quantitative histology and mechanical properties</td>
<td>Not relevant, does not answer pico question</td>
</tr>
<tr>
<td>Zilkens, C.; Roemer, F.W.;</td>
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<tr>
<td>Martel-Pelletier, J.; Guermazi, A.</td>
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<td>Rautiainen, J.; Nissi, M.J.;</td>
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<tr>
<td>Salo, E.N.; Tittu, V.</td>
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<td>Finnila, M.A.; Aho, O.M.</td>
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<td>Saarakkala, S.; Lehenkari, P.;</td>
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<tr>
<td>Ellermann, J.; Nieminen, M.T.</td>
<td></td>
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</tr>
<tr>
<td>Sharpe, I.; Tyrrell, P.N.;</td>
<td>2001</td>
<td>Magnetic resonance imaging assessment for unicompartmental knee replacement: a limited role</td>
<td>Not relevant, study of MRI and ACL</td>
</tr>
<tr>
<td>White, S.H.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Spencer, B.A.; Mont, M.A.;</td>
<td>2009</td>
<td>Initial experience with custom-fit total knee replacement: intra-operative events and long-leg coronal alignment</td>
<td>Not relevant to PICO 11</td>
</tr>
<tr>
<td>McGrath, M.S.; Boyd, B.;</td>
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<tr>
<td>Mitrick, M.F.</td>
<td></td>
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<tr>
<td>Takai, S.; Yoshino, N.;</td>
<td>2003</td>
<td>Kneeling view: A new roentgenographic technique to assess rotational deformity and alignment of the distal femur</td>
<td>Not relevant, does not answer the PICO question</td>
</tr>
<tr>
<td>Isshiki, T.; Hirasawa, Y.</td>
<td></td>
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<tr>
<td>Bay-Jensen, A.C.; Dam, E.B.</td>
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<tr>
<td>Vincken, P.W.J.; Ter Braak, B.P.M.; Van Erkel, A.R.;</td>
<td></td>
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<tr>
<td>Coerkamp, E.G.; De Rooy, T.P.W.; Mallens, W.M.C.; Bloem, J.L.</td>
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<tr>
<td>Wang, Y.; Wluka, A.E.; Jones, G.; Ding, C.; Cicuttini, F.M.; Desmeules, F.; Dionne, C.E.; Belzile, E.; Bouronnais, R.; Fremont, P.</td>
<td>2012</td>
<td>Use magnetic resonance imaging to assess articular cartilage</td>
<td>narrative review</td>
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<td></td>
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<td></td>
<td></td>
<td>The burden of wait for knee replacement surgery: effects on pain, function and health-related quality of life at the time of surgery</td>
<td>Not relevant, no data after KA</td>
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<tr>
<td>Hoogeboom, T.J.; van den Ende, C.H.; van der Sluis, G.; Elings, J.;</td>
<td>2009</td>
<td>The impact of waiting for total joint replacement on pain and functional status: a systematic review</td>
<td>systematic review (reviewed bibsearch)</td>
</tr>
<tr>
<td>Dronkers, J.J.; Aiken, A.B.; van Meeteren, N.L.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Kirwan, J.R.; Currey, H.L.; Freeman, M.A.; Snow, S.; Young, P.J.</td>
<td>1994</td>
<td>Overall long-term impact of total hip and knee joint replacement surgery on patients with osteoarthritis and rheumatoid arthritis</td>
<td>Includes RA subjects</td>
</tr>
<tr>
<td>Kopta, J.A.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Williams, J.I.; Llewellyn, Thomas H.; Arshinoff, R.; Young, N.;</td>
<td>1997</td>
<td>Is longer waiting time associated with health and social services utilization before treatment? A randomized study</td>
<td>Knee and Hip data not separated</td>
</tr>
<tr>
<td>Naylor, C.D.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Amin, A.K.; Sales, J.D.; Brenkel, I.J.</td>
<td>2006</td>
<td>Obesity and total knee and hip replacement review</td>
<td></td>
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<tr>
<td>Warren, S.; Jones, C.A.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Anand, E.; Scott, L.; Harrison, W.</td>
<td>2012</td>
<td>Hip and Knee Replacement in the HIV positive patient review</td>
<td></td>
</tr>
<tr>
<td>Astephens-Wilson, J.L.; Wilson, D.A.; Dunbar, M.J.; Deluzio, K.J.</td>
<td>2010</td>
<td>Preoperative gait patterns and BMI are associated with tibial component migration</td>
<td>unclear if all patients have osteoarthritis</td>
</tr>
<tr>
<td>Baumann, C.; Rat, A.C.; Osnowycz, G.; Mainard, D.</td>
<td>2006</td>
<td>Do clinical presentation and pre-operative quality of life predict satisfaction with care after total hip or knee replacement?</td>
<td>less than 90% of patients had knee OA</td>
</tr>
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<tr>
<td>Delagoutte, J.P.; Cuny, C.; Guillemin, F. Berend, K.R.; Lombardi, A.V., Jr.; Adams, J.B.</td>
<td>2007</td>
<td>Obesity, young age, patellofemoral disease, and anterior knee pain: identifying the unicompartmental arthroplasty patient in the United States Does preoperative anxiety and depression predict satisfaction after total knee replacement?</td>
<td>the BMI cutoff of 32 did not meet the WHO criteria for obesity. unclear if all patients have osteoarthritis</td>
</tr>
<tr>
<td>Bliddal, H.; Christensen, R. Bostman, O.M.</td>
<td>2006</td>
<td>Prevalence of obesity among patients admitted for elective orthopaedic surgery</td>
<td>does not answer if any relevant prognostic factors affect outcome for knee arthroplasty</td>
</tr>
<tr>
<td>Callahan, C.M.; Drake, B.G.; Heck, D.A.; Dittus, R.S. Cameron, H.U.; Cameron, G.</td>
<td>2013</td>
<td>Obesity and total joint arthroplasty. A literature based review</td>
<td>review</td>
</tr>
<tr>
<td>Cameron, H.U.; Cameron, G.</td>
<td>1994</td>
<td>Patient outcomes following tricompartmental total knee replacement. A meta-analysis Stress-relief osteoporosis of the anterior femoral condyles in total knee replacement. A study of 185 patients</td>
<td>systematic review does not look at risk factors relevant to pico question</td>
</tr>
<tr>
<td>Chen, J.; Cui, Y.; Li, X.; Miao, X.; Wen, Z.; Xue, Y.; Tian, J.</td>
<td>2013</td>
<td>Risk factors for deep infection after total knee arthroplasty: a meta-analysis</td>
<td>meta-analysis</td>
</tr>
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</tr>
<tr>
<td>de,Guia N.; Zhu,N.; Keresteci,M.; Shi,J.E.</td>
<td>2006</td>
<td>Obesity and joint replacement surgery in Canada: findings from the Canadian Joint Replacement Registry (CJRR)</td>
<td>unclear if all patients have osteoarthritis</td>
</tr>
<tr>
<td>Deleuran,T.; Vilstrup,H.V.; Overgaard,S.; Jepsen,P.</td>
<td>2013</td>
<td>Cirrhosis patients' risk of complications after total hip or knee replacement for primary osteoarthritis—a Danish population-based cohort study</td>
<td>not full text. abstract only</td>
</tr>
<tr>
<td>Deleuran,T.; Vilstrup,H.; Overgaard,S.; Jepsen,P.</td>
<td>2014</td>
<td>Cirrhosis patients have increased risk of complications after hip or knee arthroplasty</td>
<td>Hip and knee</td>
</tr>
<tr>
<td>Deshmukh,R.G.; Hayes,J.H.; Pinder,I.M.</td>
<td>2002</td>
<td>Does body weight influence outcome after total knee arthroplasty? A 1-year analysis</td>
<td>insufficient data reporting. data was presented in a manner where we cannot determine the individual effect of BMI from the statistical model</td>
</tr>
<tr>
<td>Authors</td>
<td>Year</td>
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<tr>
<td>Gadinsky, N.E.;</td>
<td>2012</td>
<td>Increased operating room time in patients with obesity during primary total knee arthroplasty: conflicts for scheduling</td>
<td>unclear if all patients have osteoarthritis</td>
</tr>
<tr>
<td>Manuel, J.B.; Lyman, S.; Westrich, G.H.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gao, F.Q.; Li, Z.J.; Zhang, K.; Huang, D.; Liu, Z.J.</td>
<td>2011</td>
<td>Risk factors for lower limb swelling after primary total knee arthroplasty</td>
<td>inadequate presentation of results. the study present regression analyses for swelling below and above the knee. The text says BMI was a significant predictor below the knee, but the table says it was significant above the knee. unsure which side is actually significant</td>
</tr>
<tr>
<td>Gillespie, G.N.; Porteous, A.J.</td>
<td>2007</td>
<td>Obesity and knee arthroplasty</td>
<td>review</td>
</tr>
<tr>
<td>Hahm, M.H.; Won, Y.Y.</td>
<td>2013</td>
<td>Bone mineral density changes after total knee replacement in women over the age of 65</td>
<td>No relevant outcomes. Doesn't answer question. less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Hamoui, N.; Kantor, S.; Vince, K.; Crookes, P.F.</td>
<td>2006</td>
<td>Long-term outcome of total knee replacement: does obesity matter?</td>
<td>No relevant outcomes. Doesn't answer question. less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Authors</td>
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</tr>
<tr>
<td>Harrison,M.M.; Childs,A.; Carson,P.E.</td>
<td>2003</td>
<td>Incidence of undiagnosed sleep apnea in patients scheduled for elective total joint arthroplasty</td>
<td>not relevant. the outcome was requiring knee arthroplasty</td>
</tr>
<tr>
<td>Harrysson,O.L.; Robertsson,O.; Nayfeh,J.F.</td>
<td>2004</td>
<td>Higher cumulative revision rate of knee arthroplasties in younger patients with osteoarthritis</td>
<td>no risk factors applicable to PICO question</td>
</tr>
<tr>
<td>Howard,K.J.; Ellis,H.B.; Khaleel,M.A.</td>
<td>2010</td>
<td>Psychological factors that may influence outcome after joint replacement surgery</td>
<td>review</td>
</tr>
<tr>
<td>Issa,K.; Rifai,A.; Boylan,M.R.; Pourtaheri,S.; McInerney,V.K.; Mont,M.A.</td>
<td>2014</td>
<td>Do Various Factors Affect the Frequency of Manipulation Under Anesthesia After Primary Total Knee Arthroplasty?</td>
<td>Any TKA patient regardless of diagnosis. Not specific to OA.</td>
</tr>
<tr>
<td>Jarvholm,B.; Lewold,S.; Malchau,H.; Vingard,E.</td>
<td>2005</td>
<td>Age, bodyweight, smoking habits and the risk of severe osteoarthritis in the hip and knee in men</td>
<td>not relevant. assess the risk of osteoarthritis among patients who did not have OA at baseline</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>Identifying comorbid conditions that affect the 6 month recovery pattern of total knee arthroplasty</td>
<td>Abstract</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>Differences between actual and expected leisure activities after total knee arthroplasty for osteoarthritis</td>
<td>no risk factors relevant to pico question</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>Hand osteoarthritis severity and severe hip OA combine with bmi as major risk factors for total knee joint replacement. the AGES-Reykjavik Study</td>
<td>not relevant. outcome is having TKA</td>
</tr>
<tr>
<td>Authors</td>
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<tr>
<td>Ingvarsson,T.; Harris,T.B.; Launer,L.; Gudnason,V.</td>
<td>2012</td>
<td>The influence of obesity on the complication rate and outcome of total knee arthroplasty: a meta-analysis and systematic literature review (Provisional abstract)</td>
<td>meta-analysis (reviewed bib search)</td>
</tr>
<tr>
<td>Kerkhoffs,G.M.; Servien,E.; Dunn,W.; Dahm,D.; Bramer,J.A.; Haverkamp,D.</td>
<td>2012</td>
<td>The influence of obesity on the complication rate and outcome of total knee arthroplasty: a meta-analysis and systematic literature review</td>
<td>meta-analysis (reviewed bib search)</td>
</tr>
<tr>
<td>Kim,G.K.; Mortazavi,S.M.; Purtill,J.J.; Sharkey,P.F.; Hozack,W.J.; Parvizi,J.</td>
<td>2010</td>
<td>Stiffness after revision total knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
</tr>
<tr>
<td>Kramers-de Quervain,I.A.; Kampfen,S.; Munzinger,U.; Mannion,A.F.; Lalmohamed,A.; Vestergaard,P.; De,Boer A.; Leufkens,H.G.; van Staa,T.P.; de,Vries F.</td>
<td>2012</td>
<td>Prospective study of gait function before and 2 years after total knee arthroplasty</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Leung,Y.Y.; Ang,L.W.; Thumboo,J.; Wang,R.; Yuan,J.M.; Koh,W.P.</td>
<td>2012</td>
<td>All-Patient Refined Diagnosis-Related Groups in Primary Arthroplasty</td>
<td>unclear how many patients had knee oa</td>
</tr>
<tr>
<td>Liabaud,B.; Patrick,D.A.,Jr.; Geller,J.A; Liljensoe,A.; Lauersen,J.O.; Soballe,K.; Mechlenburg,I.</td>
<td>2013</td>
<td>Osteoporosis affects component positioning in computer navigation-assisted total knee arthroplasty</td>
<td>no relevant risk factors are used to predict patient oriented outcomes</td>
</tr>
<tr>
<td>Liabaud,B.; Patrick,D.A.,Jr.; Geller,J.A; Liljensoe,A.; Lauersen,J.O.; Soballe,K.; Mechlenburg,I.</td>
<td>2013</td>
<td>Higher body mass index leads to longer operative time in total knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
</tr>
<tr>
<td>Liabaud,B.; Patrick,D.A.,Jr.; Geller,J.A; Liljensoe,A.; Lauersen,J.O.; Soballe,K.; Mechlenburg,I.</td>
<td>2013</td>
<td>Overweight preoperatively impairs clinical outcome after knee arthroplasty: a cohort study of 197 patients 3-5 years after surgery</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
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<tr>
<td>Lingard,E.A.; Katz,J.N.; Wright,E.A.; Sledge,C.B.</td>
<td>2004</td>
<td>Predicting the outcome of total knee arthroplasty</td>
<td>results for relevant predictors are not reported.</td>
</tr>
<tr>
<td>Liu,B.; Balkwill,A.; Banks,E.; Cooper,C.; Green,J.; Beral,V.</td>
<td>2007</td>
<td>Relationship of height, weight and body mass index to the risk of hip and knee replacements in middle-aged women</td>
<td>not relevant. outcome is having TKA</td>
</tr>
<tr>
<td>Losina,E.; Collins,J.; Lerner,V.; Reichmann,W.M.; Wright,J.</td>
<td>2012</td>
<td>Trajectories of functional recovery post TKR: Does BMI matter?</td>
<td>not full text. abstract only</td>
</tr>
<tr>
<td>Macaulay,W.; Geller,J.A.; Brown,A.R.; Cote,L.J.; Kiernan,H.A.</td>
<td>2012</td>
<td>Better outcomes in severe and morbid obese patients (BMI &gt; 35 kg/m2) in primary Endo-Model rotating-hinge total knee arthroplasty</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Macaulay,W.; Geller,J.A.; Brown,A.R.; Cote,L.J.; Kiernan,H.A.</td>
<td>2014</td>
<td>Association Between Body Mass Index Change and Outcome in the First Year After Total Knee Arthroplasty</td>
<td>Patient population includes all TKA patients in 5 year period regardless of diagnosis. Study unclear if these are only OA patients.</td>
</tr>
<tr>
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<tr>
<td>Malinzak,R.A.; Ritter,M.A.; Berend,M.E.; Meding,J.B.; Olberding,E.M.; Davis,K.E.</td>
<td>2009</td>
<td>Morbidly Obese, Diabetic, Younger, and Unilateral Joint Arthroplasty Patients Have Elevated Total Joint Arthroplasty Infection Rates</td>
<td>the percentage of patients with knee osteoarthritis among TKA patients was unclear</td>
</tr>
<tr>
<td>Masselin-Dubois,A.; Attal,N.; Fletcher,D.; Jayr,C.; Albi,A.; Fermanian,J.; Bouhassira,D.; Baudic,S.</td>
<td>2013</td>
<td>Are psychological predictors of chronic postsurgical pain dependent on the surgical model? A comparison of total knee arthroplasty and breast surgery for cancer</td>
<td>not relevant. The study is concerned with depressive symptoms (measured by beck depression scale) only on the day before surgery, and therefore excludes patients diagnosed with major depression.</td>
</tr>
<tr>
<td>Matharu,G.; Robb,C.; Baloch,K.; Pynsent,P.</td>
<td>2012</td>
<td>The Oxford medial unicompartmental knee replacement: survival and the affect of age and gender</td>
<td>no relevant risk factors</td>
</tr>
<tr>
<td>McGovern,T.F.; Ammeen,D.J.; Collier,J.P.; Currier,B.H.; Engh,G.A. Mnatzaganian,G.; Ryan,P.; Reid,C.M.; Davidson,D.C.; Hiller,J.E.</td>
<td>2002</td>
<td>Rapid polyethylene failure of unicompartmental tibial components sterilized with gamma arradiation in air and implanted after a long shelf life in 54,288 elderly men and women</td>
<td>no relevant risk factors are used</td>
</tr>
<tr>
<td>Mont,M.A.; Mathur,S.K.; Krackow,K.A.; Loewy,J.W.; Hungerford,D.S. Mulhall,K.J.; Ghomrawi,H.M.; Mihalko,W.; Cui,Q.; Saleh,K.J.</td>
<td>1996</td>
<td>Cementless total knee arthroplasty in obese patients: A comparison with a matched control group</td>
<td>not relevant. Outcome is requiring tka</td>
</tr>
<tr>
<td></td>
<td>2007</td>
<td>Adverse effects of increased body mass index and weight on survivorship of total knee arthroplasty and subsequent outcomes of revision TKA</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
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<td></td>
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<td>Patterson, B.M.; Insall, J.N.</td>
<td>1992</td>
<td>Surgical management of gonarthrosis in patients with poliomyelitis</td>
<td>Less than 10 patients per group</td>
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<td>Perruccio, A.V.; Hogg-Johnson, S.; Davis, A.</td>
<td>2009</td>
<td>The significance of self-rated health and mental well-being in predicting outcomes following TJR surgery for OA</td>
<td>combines hip and knee patients</td>
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<td>Peters, T.J.; Sanders, C.; Dieppe, P.; Donovan, J.</td>
<td>2005</td>
<td>Factors associated with change in pain and disability over time: a community-based prospective observational study of hip and knee osteoarthritis</td>
<td>unclear if 90% of patients had knee OA</td>
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<tr>
<td>Authors</td>
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<td>Pivec,R.; Johnson,A.J.; Naziri,Q.; Issa,K.; Mont,M.A.; Bonutti,P.M. Riddle,D.L.; Wade,J.B.; Jiranek,W.A.; Kong,X.</td>
<td>2013</td>
<td>Lumbar spinal stenosis impairs function following total knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Robertson,F.; Geddes,J.; Ridley,D.; McLeod,G.; Cheng,K.</td>
<td>2012</td>
<td>Patients with Type 2 diabetes mellitus have a worse functional outcome post knee arthroplasty: a matched cohort study</td>
<td>no patient oriented outcomes</td>
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<td>Rossi,R.; Bruzzone,M.; Bonasia,D.E.; Ferro,A.; Castoldi,F.</td>
<td>2010</td>
<td>No early tibial tray loosening after surface cementing technique in mobile-bearing TKA</td>
<td>less than 90% of patients had knee OA</td>
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<td>Salih,S.; Sutton,P.</td>
<td>2013</td>
<td>Obesity, knee osteoarthritis and knee arthroplasty: a review</td>
<td>review (reviewed bib search)</td>
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<td>Serna,F.; Mont,M.A.; Krackow,K.A.; Hungerford,D.S.</td>
<td>1994</td>
<td>Total knee arthroplasty in diabetic patients. Comparison to a matched control group</td>
<td>less than 90% of patients had knee OA</td>
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<td>Seyler,T.M.; Mont,M.A.; Lai,L.P.; Xie,J.; Marker,D.R.; Zywiel,M.G.; Bonutti,P.M. Silber,J.H.; Rosenbaum,P.R.; Kelz,R.R.; Reinke,C.E.;</td>
<td>2009</td>
<td>Mid-term results and factors affecting outcome of a metal-backed unicompartmental knee design: a case series</td>
<td>less than 90% of patients had knee OA</td>
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<td></td>
<td>2012</td>
<td>Medical and financial risks associated with surgery in the elderly obese</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Authors</td>
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<td>Neuman,M.D.; Ross,R.N.;</td>
<td>2011</td>
<td>Higher body mass index is not associated with worse pain outcomes after primary or revision total knee arthroplasty</td>
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<td>Singh,J.A.; Gabriel,S.E.;</td>
<td>2011</td>
<td>Early postoperative mortality following joint arthroplasty: a systematic review</td>
<td>systematic review</td>
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<td>Lewallen,D.G.</td>
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<td>Singh,J.A.; Kundukulam,J.;</td>
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<td>Sex and surgical outcomes and mortality after primary total knee arthroplasty: a risk-adjusted analysis</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Riddle,D.L.; Strand,V.;</td>
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<td>Tugwell,P.</td>
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<td>Singh,J.A.; Kwoh,C.K.;</td>
<td>2013</td>
<td>The effect of patient weight on the functional outcome of total knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
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<tr>
<td>Richardson,D.; Chen,W.;</td>
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<td>Ibrahim,S.A.</td>
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<td>Smith,B.E.; Askew,M.J.;</td>
<td>1992</td>
<td>The effect of patient weight on the functional outcome of total knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Gradisar,Jr.; Gradisar,J.S.;</td>
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<td>Lew,M.M.</td>
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<td>Sosdian,L.; Dobson,F.;</td>
<td>2014</td>
<td>Longitudinal changes in knee kinematics and moments following knee arthroplasty: A systematic review</td>
<td>systematic review</td>
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<td>Wrigley,T.V.; Paterson,K.;</td>
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<td>Bennell,K.; Dowsey,M.;</td>
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<td>Choong,P.; Allison,K.; Hinman,</td>
<td>2001</td>
<td>Body mass index as a predictor of outcome in total knee replacement</td>
<td>unclear how many patients had knee oa versus post traumatic arthritis</td>
</tr>
<tr>
<td>R.S.</td>
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<td>Jr.; Curry,J.I.; Suthers,K.E.;</td>
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<td>Smith,M.W.</td>
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<td>Stevens-Lapsley,J.E.; Pettersen</td>
<td>2011</td>
<td>Previous fracture surgery is a major risk factor of infection after total knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
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<tr>
<td>S.C.; Mizner,R.L.; Snyder-</td>
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<td>Mackler,L.</td>
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<td>Suzuki,G.; Saito,S.; Ishii,T.;</td>
<td>2009</td>
<td>Introduction of total knee arthroplasty in Lithuania: Results from the first 10 years</td>
<td>none of the risk factors studied are relevant to pico question</td>
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<td>Authors</td>
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<tr>
<td>Thornqvist,C.; Gislason,G.H.; Kober,L.; Jensen,P.F.; Torp-Pedersen,C.; Andersson,C.</td>
<td>2014</td>
<td>Body mass index and risk of perioperative cardiovascular adverse events and mortality in 34,744 Danish patients undergoing hip or knee replacement</td>
<td>Only 45% knee patients. The rest are hip patients. Results not reported separately. The N's aren't adequately presented for the control group, so we can't tell if the Minimum N criteria is met for each follow up</td>
</tr>
<tr>
<td>Tinning,C.G.; Cochrane,L.A.; Singer,B.R.</td>
<td>2013</td>
<td>Primary total knee arthroplasty in patients with Parkinson's disease: analysis of outcomes</td>
<td>Does not compare diabetic patients to non diabetic patients</td>
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<tr>
<td>Utrillas-Compaired,A.; De la Torre-Escuredo BJ; Tebar-Martinez,A.J.; Asunsolo-Del,Barco A.</td>
<td>2014</td>
<td>Does preoperative psychologic distress influence pain, function, and quality of life after TKA?</td>
<td>Does not compare diabetic patients to non diabetic patients</td>
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<tr>
<td>Vaidya,S.V.; Arora,A.; Mathesul,A.A.</td>
<td>2013</td>
<td>Effect of total knee arthroplasty on type II diabetes mellitus and hypertension: A prospective study</td>
<td>Does not compare diabetic patients to non diabetic patients</td>
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<tr>
<td>Viens,N.A.; Hug,K.T.; Marchant,M.H.; Cook,C.; Vail,T.P.; Bolognesi,M.P. Vince,K.G.; Insall,J.N.; Bannerman,C.E. Wagner,P.; Olsson,H.; Lidgren,L.; Robertsson,O.; Ranstam,J. Wallace,G.; Judge,A.; Prieto-Alhambra,D.; de,Vries F.; Arden,N.K.; Cooper,C.</td>
<td>2012</td>
<td>Role of diabetes type in perioperative outcomes after hip and knee arthroplasty in the United States Total knee arthroplasty in the patient with Parkinson's disease Increased cancer risks among arthroplasty patients: 30 year follow-up of the Swedish Knee Arthroplasty Register The effect of body mass index on the risk of post-operative complications during the 6 months following total hip replacement ortotal knee replacement surgery</td>
<td>Unclear if all patients have osteoarthritis; retrospective case series; does not look at risk factors relevant to pico question; Patient population does not meet inclusion criteria. Not specific to OA.</td>
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<tr>
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<td>Wang,S.; Zhao,Y.</td>
<td>2013</td>
<td>Diabetes Mellitus and the Incidence of Deep Vein Thrombosis after Total Knee Arthroplasty: A Retrospective Study</td>
<td>unclear if 90% of patients had knee OA</td>
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<td>Whiteside,L.A.; Vigano,R.</td>
<td>2007</td>
<td>Young and heavy patients with a cementless TKA do as well as older and lightweight patients</td>
<td>comparison does not adequately answer if bmi is an independent risk factor</td>
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<td>Wylde,V.; Hewlett,S.; Learmonth,I.D.; Dieppe,P.</td>
<td>2011</td>
<td>Persistent pain after joint replacement: prevalence, sensory qualities, and postoperative determinants</td>
<td>unclear if all patients have osteoarthritis</td>
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<tr>
<td>Yeung,E.; Thornton-Bott,P.; Walter,W.L.</td>
<td>2010</td>
<td>Patient obesity: A growing concern of successful total knee arthroplasty</td>
<td>review</td>
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<td>Fox,J.L.; Poss,R.</td>
<td>1981</td>
<td>The role of manipulation following total knee replacement</td>
<td>Does not compare manipulation to any other nonsurgical techniques.</td>
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<td>Namba,R.S.; Inacio,M.C.; Paxton,E.W.; Ake,C.F.; Wang,C.; Gross,T.P.; Marinac-Dabic,D.; Sedrakyan,A.</td>
<td>2012</td>
<td>Risk of revision for fixed versus mobile-bearing primary total knee replacements</td>
<td>appraised as moderate quality prognostic study for risk stratification, but is not best available evidence for bmi and revision. If appraised as a</td>
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<tr>
<td>Authors</td>
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<tr>
<td>Scuderi,G.R.; Insall,J.N.;</td>
<td>1989</td>
<td>Survivorship of cemented knee replacements</td>
<td>treatment study for hospital volume, it would be very low quality due to being retrospective and because of high risk form multicolinearity by including hospital and surgeon volume in the same model less than 90% of patients had knee OA</td>
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<tr>
<td>Windsor,R.E.; Moran,M.C.</td>
<td></td>
<td>Effects of neuromuscular training (NEMEX-TJR) on patient-reported outcomes and physical function in severe primary hip or knee osteoarthritis: a controlled before-and-after study</td>
<td>Not relevant, no data after KA</td>
</tr>
<tr>
<td>Ageberg,E.; Nilsdotter,A.;</td>
<td>2013</td>
<td>The effect of a preoperative exercise and education program on functional recovery, health related quality of life, and health service utilization following primary total knee arthroplasty</td>
<td>Not relevant, osteoarthritis patients not specified in the study</td>
</tr>
<tr>
<td>Kosek,E.; Roos,E.M.</td>
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<td>Brouwer,R.W.; van Raaij,T.M.;</td>
<td>2006</td>
<td>Brace treatment for osteoarthritis of the knee: a prospective randomized multi-centre trial</td>
<td>Not relevant, not pre KA rehab study, brace study</td>
</tr>
<tr>
<td>Verhaar,J.A.N.; Coene,L.N.J.E.;</td>
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<td>Bierma-Zeinstra,S.M.A.</td>
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<td>Casale,R.; Damiani,C.; Rosati,V.; Atzeni,F.; Sarzi-Puttini,P.; Nica,A.S.</td>
<td>2012</td>
<td>Efficacy of a comprehensive rehabilitation programme combined with pharmacological treatment in reducing pain in a group of OA patients on a waiting list for total joint replacement</td>
<td>no arthroplasty</td>
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<td>Cheatham,S.W.</td>
<td>2013</td>
<td>Do patient factors and prehabilitation improve outcomes after total knee arthroplasty? Activity, air boots, and aspirin as thromboembolism prophylaxis in knee arthroplasty. A multiple regimen approach</td>
<td>lit review</td>
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<tr>
<td>Clayton,M.L.; Thompson,T.R.</td>
<td>1987</td>
<td></td>
<td>Not relevant, not pre KA rehab study</td>
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<tr>
<td>Authors</td>
<td>Year</td>
<td>Title</td>
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<tr>
<td>Crowe,J.; Henderson,J.</td>
<td>2003</td>
<td>Pre-arthroplasty rehabilitation is effective in reducing hospital stay</td>
<td>Not relevant, KA data not seperated from HA</td>
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<tr>
<td>Desmeules,F.; Hall,J.; Woodhouse,L.J.</td>
<td>2013</td>
<td>Prehabilitation improves physical function of individuals with severe disability from hip or knee osteoarthritis</td>
<td>Data includes both Hip and knee patients</td>
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<td>Foster,N.</td>
<td>2007</td>
<td>The role of physical activity and therapeutic exercise in development and management of knee osteoarthritis</td>
<td>reiew</td>
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<td>Gill,S.D.; McBurney,H.</td>
<td>2013</td>
<td>Does exercise reduce pain and improve physical function before hip or knee replacement surgery? A systematic review and meta-analysis of randomized controlled trials (Structured abstract)</td>
<td>Systematic review, bib search</td>
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<tr>
<td>Huang,S.W.; Chen,P.H.; Chou,Y.H.</td>
<td>2012</td>
<td>Effects of a preoperative simplified home rehabilitation education program on length of stay of total knee arthroplasty patients (Provisional abstract)</td>
<td>Duplicate</td>
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<td>Ishii,Y.; Noguchi,H.; Matsuda,Y.; Takeda,M.; Kiga,H.; Toyabe,S.-I.</td>
<td>2008</td>
<td>Range of motion during the perioperative period in total knee arthroplasty</td>
<td>No prehab intervention..</td>
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<td>Lenssen,A.F.; de Bie,R.A.</td>
<td>2006</td>
<td>Role of physiotherapy in peri-operative management in total knee and hip surgery</td>
<td>Commentary</td>
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<td>Li,C.S.; Ayeni,O.R.; Sprague,S.; Truong,V.; Bhandari,M.</td>
<td>2013</td>
<td>Knee implant system for Knee osteoarthritis: A systematic review</td>
<td>Systematic review, bib search</td>
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<td>Authors</td>
<td>Year</td>
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<td>Matassi,F.; Duerinckx,J.; Vanderneuecker,H.; Belemans,J.; McDonald,Steve; Hetrick,Sarah E.; Green,Sally</td>
<td>2012</td>
<td>Range of motion after total knee arthroplasty: the effect of a preoperative home exercise program</td>
<td>Not relevant, osteoarthritis patients not specified in the study</td>
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<tr>
<td>McDonald,Steve; Hetrick,Sarah E.; Green,Sally</td>
<td>2004</td>
<td>Pre-operative education for hip or knee replacement</td>
<td>Systematic Review (reviewed bib search)</td>
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<td>Akiyama,H.; Kakinoki,R.; Fujita,Y.; Nishimura,J.; Yoshioka,Y.; Kawai,H.; Matsuda,S.</td>
<td>2013</td>
<td>Preoperative prediction of ambulatory status at 6 months after total hip arthroplasty</td>
<td>Hip arthroplasty study</td>
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<td>Reeves,N.D.; Bowling,F.L.</td>
<td>2011</td>
<td>Conservative biomechanical strategies for knee osteoarthritis</td>
<td>Systematic Review</td>
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<td>Santa,Mina D.; Clarke,H.; Ritvo,P.; Leung,Y.W.; Matthew,A.G.; Katz,J.;</td>
<td>2014</td>
<td>Effect of total-body prehabilitation on postoperative outcomes: A systematic review and meta-analysis</td>
<td>Systematic review, bib search2</td>
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<td>Authors</td>
<td>Year</td>
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<td>Trachtenberg,J.; Alibhai,S.M.H.</td>
<td>2012</td>
<td>Does preoperative rehabilitation improve patient-based outcomes in persons who have undergone total knee arthroplasty? A systematic review</td>
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<td>Silkman,Baker C.; McKeon,J.M.</td>
<td>2012</td>
<td>Severe knee osteoarthritis: A study of combined acupuncture and physiotherapy vs home exercise advice in patients awaiting total knee arthroplasty</td>
<td>systematic review</td>
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<td>Soni,A.; Mudge,N.; Joshi,A.; Wyatt,M.; Williamson,L.</td>
<td>2010</td>
<td>Prehabilitation before total knee arthroplasty increases strength and function in older adults with severe osteoarthritis</td>
<td>Abstract</td>
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<td>Swank,A.M.; Kachelman,J.B.; Bibeau,W.; Quesada,P.M.; Nyland,J.; Malkani,A.; Topp,R.V.</td>
<td>2011</td>
<td>Preoperative strength training for elderly patients awaiting total knee arthroplasty</td>
<td>No follow up after KA</td>
</tr>
<tr>
<td>Van Leeuwen,D.M.; De Ruiter,C.J.; Nolte,P.A.; De,Haan A.</td>
<td>2014</td>
<td>Immediate efficacy of neuromuscular exercise in patients with severe osteoarthritis of the hip or knee: a secondary analysis from a randomized controlled trial Pre-operative interventions (non-surgical and non-pharmacological) for patients with hip or knee osteoarthritis awaiting joint replacement surgery - a systematic review and meta-analysis (Provisional abstract)</td>
<td>Does not have 10 in each group at post-op follow ups</td>
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<tr>
<td>Walls,R.J.; McHugh,G.; Moyna,N.M.; O'Byrne,J.M.</td>
<td>2010</td>
<td>Immediate efficacy of neuromuscular exercise in patients with severe osteoarthritis of the hip or knee: a secondary analysis from a randomized controlled trial Pre-operative interventions (non-surgical and non-pharmacological) for patients with hip or knee osteoarthritis awaiting joint replacement surgery - a systematic review and meta-analysis (Provisional abstract)</td>
<td>Systematic Review (reviewed bib search)</td>
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<tr>
<td>Logerstedt,D.; Zeni,Sr; Snyder-Mackler,L.</td>
<td>2013</td>
<td>Different recovery groups 2 years after total knee arthroplasty</td>
<td>Not full text.</td>
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<tr>
<td>Chiu,F.Y.; Hung,S.H.; Chuang,T.Y.; Chiang,S.C.</td>
<td>2012</td>
<td>The impact of exsanguination by Esmarch bandage on venous hemodynamic changes in total knee arthroplasty - A prospective randomized study of 38 knees</td>
<td>not relevant to pico question. compares application of esmarch bandage before tourniquet inflation to elevation before tourniquet application</td>
</tr>
<tr>
<td>Huang,Z.Y.; Pei,F.X.; Ma,J.; Yang,J.; Zhou,Z.K.; Kang,P.D.; Shen,B.</td>
<td>2014</td>
<td>Comparison of three different tourniquet application strategies for minimally invasive total knee arthroplasty: a prospective non-randomized clinical trial</td>
<td>all groups get tourniquet</td>
</tr>
<tr>
<td>Husted,H.; Toftgaard,Jensen T.</td>
<td>2005</td>
<td>Influence of the pneumatic tourniquet on patella tracking in total knee arthroplasty: a prospective randomized study in 100 patients</td>
<td>doesn't answer pico question. compares tourniquet on straight leg versus flexed leg less than 90% of patients had knee OA</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>The efficacy of tourniquet assisted total knee arthroplasty on patient-reported and performance-based physical function: a randomized controlled trial protocol</td>
<td>does not answer pico question. compares application of compression bandage before tourniquet release vs no bandage</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>Postoperative blood loss management in total knee arthroplasty: a comparison of four different methods</td>
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<td>Authors</td>
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<tr>
<td>Marson, B.M.; Tokish, J.T.</td>
<td>1999</td>
<td>The effect of a tourniquet on intraoperative patellofemoral tracking during total knee arthroplasty</td>
<td>not relevant. All groups get tourniquet</td>
</tr>
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<td>Olivecrona, C.; Tidermark, J.; Hamberg, P.; Ponzer, S.; Cederfjall, C.; Prasad, N.; Padmanabhan, V.; Mullaji, A.</td>
<td>2006</td>
<td>Skin protection underneath the pneumatic tourniquet during total knee arthroplasty: a randomized controlled trial of 92 patients</td>
<td>does not answer pico question. All groups get tourniquet, and skin protection techniques are compared</td>
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<tr>
<td>Prasad, N.; Padmanabhan, V.; Mullaji, A.</td>
<td>2007</td>
<td>Blood loss in total knee arthroplasty: an analysis of risk factors</td>
<td>less than 90% of patients had knee OA</td>
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<td>Ratchford, S.M.; Bailey, A.N.; Senesac, H.A.; Hocker, A.D.; Smolkowski, K.; Lantz, B.A.; Jewett, B.A.; Gilbert, J.S.; Dreyer, H.C.</td>
<td>2012</td>
<td>Proteins regulating cap-dependent translation are downregulated during total knee arthroplasty</td>
<td>not relevant. Tourniquet is not compared to no tourniquet</td>
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<td>2001</td>
<td>Nerve injury after primary total knee arthroplasty</td>
<td>less than 90% of patients had knee OA</td>
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<td>Early high-intensity rehabilitation following total knee arthroplasty improves outcomes</td>
<td>2011</td>
<td>Efficiency of immediate postoperative inpatient physical therapy following total knee arthroplasty: an RCT</td>
<td>Less than 10 patients per group.</td>
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<td>2007</td>
<td>Functional problems associated with the knee-Part two: Rehabilitation fundamentals for common knee conditions</td>
<td>Narrative review not relevant to the question of interest.</td>
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<td>Peerbhoy, D.</td>
<td>1999</td>
<td>The systematic assessment of short-term functional recovery after major joint arthroplasty</td>
<td>Patient population does not meet inclusion criteria (hip and knee patients).</td>
</tr>
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<td>Authors</td>
<td>Year</td>
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<td>Zietek, P.; Zietek, J.; Szczytior, K.; Safranow, K.</td>
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<td>Effect of adding one, 15-minute walk on the day of surgery to fast-track rehabilitation after total knee arthroplasty: A randomized, single-blind study</td>
<td>Not relevant to PICO. Does not answer question.</td>
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<td>Postoperative treatment and rehabilitation after total knee arthroplasty</td>
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<td>Hospital stay and discharge outcomes after knee arthroplasty</td>
<td>Patient population does not meet inclusion criteria (OA and RA patients, total and partial knee arthroplasty). Outcomes of interest not addressed. Narrative review. Not relevant to question of interest.</td>
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<td>Westby, M.D.</td>
<td>2012</td>
<td>Rehabilitation and total joint arthroplasty Use of inpatient continuous passive motion versus no CPM in computer-assisted total knee arthroplasty</td>
<td>Does not meet required OA/RA cutoff.</td>
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<td>Alkire, M.R.; Swank, M.L.</td>
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<td>Exercise combined with continuous passive motion or slider board therapy compared with exercise only: a randomized controlled trial of patients following total knee arthroplasty</td>
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<td>Brosseau, L.; Milne, S.; Wells, G.; Tugwell, P.; Robinson, V.; Casimiro, L.; Pelland, L.; Noel, M.J.; Davis, J.; Drouin, H.</td>
<td>2004</td>
<td>Continuous passive motion following total knee arthroplasty in people with arthritis</td>
<td>systematic review</td>
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<td>Harvey, L.A.; Brosseau, L.; Herbert, R.D.; He, Mao Lin; Xiao, Zeng Ming; Lei, Ming; Li, Ting Song; Wu, Hao; Liao, Jun</td>
<td>2014</td>
<td>Continuous passive motion for preventing venous thromboembolism after total knee arthroplasty</td>
<td>systematic review</td>
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<td>Lake, P.; Moore, F.</td>
<td>1990</td>
<td>Continuous passive mobilisation following total knee replacement: A retrospective review</td>
<td>Very Low Quality</td>
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<td>2012</td>
<td>Correction of lateral tibial plateau depression and valgus malunion of the proximal tibia</td>
<td>No comparison group. Not relevant to question of interest.</td>
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<td>Shih, K.Z.; Liu, T.K.</td>
<td>1990</td>
<td>The role of continuous passive motion following total knee arthroplasty</td>
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<td>2004</td>
<td>The use of Continuous Passive Motion (CPM) in the rehabilitation of patients after total knee arthroplasty</td>
<td>Not in English</td>
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<td>Vince,K.G.; Kelly,M.A.; Beck,J.; Insall,J.N.</td>
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<td>Efficacy of continuous passive motion following total knee arthroplasty: a metaanalysis (Structured abstract)</td>
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<td>Pelland,L.; Noel,M.J.; Davis,J.; Drouin,H.</td>
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<td>Blood transfusion requirement prediction in patients undergoing primary total hip and knee arthroplasty</td>
<td>No protocols in place to guide transfusion policy.</td>
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<td>Geesink,R.J.; van den Brandt,P.A.; de Bie,R.A.</td>
<td></td>
<td>Use of the blood transfusion service in total knee replacement arthroplasty. The cost implications</td>
<td>Retrospective study where there was no specific transfusion protocol in place. Outcomes in study are purely cost related; no important clinical outcomes reported.</td>
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<td>Shulman,K.B.; Steindorf,S.; Poss,R.; Liang,M.H.</td>
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<td>Guerin,S.; Collins,C.; Kapoor,H.; McClean,I.; Collins,D.</td>
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<td>Hadjianastassiou,V.G.; Virich,G.; Lennox,I.A.</td>
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<td>Use of the blood transfusion service in total knee replacement arthroplasty. The cost implications</td>
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<td>2002</td>
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<td>Pre-operative autologous blood donation versus no blood donation in total knee arthroplasty: A prospective randomised trial</td>
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<td>2013</td>
<td>Blood transfusion and drainage catheter clamping are associated with ecchymosis formation at the surgical site after total knee arthroplasty: An analysis of 102 unilateral cases</td>
<td>Study not relevant to PICO. No comparison of transfusion protocols.</td>
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<td>2009</td>
<td>Value of the autotransfusion of blood recovered from the post-operative wound in arthroplasty patients</td>
<td>Patient population does not meet inclusion criteria (hip and knee patients). Does not answer question of interest.</td>
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<td>Kolisek, F.R.; Gilmore, K.J.; Peterson, E.K.</td>
<td>2000</td>
<td>Slide and flex, tighten, extend (SAFTE): a safe, convenient, effective, and no-cost approach to rehabilitation after total knee arthroplasty</td>
<td>Patient population does not meet inclusion criteria (OA and RA patients, hip and knee).</td>
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<td>Bose, W.J.; Gearen, P.F.;</td>
<td>1995</td>
<td>Long-term outcome of 42 knees with chronic infection after total knee arthroplasty</td>
<td>patients in both groups get antibiotic cement. not all patients had knee OA</td>
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<td>Randall, J.C.; Petty, W.</td>
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<td>Cameron, H.U.; Jung, Y.B.</td>
<td>1993</td>
<td>Noncemented stem tibial component in total knee replacement: the 2- to 6-year results</td>
<td>does not compare antibiotic bone cement to no antibiotic bone cement</td>
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<td>Borre, S.; Ghisellini, F.;</td>
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<td>Fornara, P.; Bruggio, G.;</td>
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<td>Ritter, M.A.</td>
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<td>Gandhi, R.; Razak, F.; Pathy, R.;</td>
<td>2009</td>
<td>Antibiotic bone cement and the incidence of deep infection after total knee arthroplasty</td>
<td>very low quality: the groups were treated by different surgeons, no test for multicolinearity, and less than 10 infections per independent variable in the model could lead to overfitted statistical model. not all patients had knee OA</td>
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<td>Syed, K.; Mahomed, N.N.</td>
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<td>Jia, Y.-T.; Zhang, Y.; Ding, C.;</td>
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<td>Antibiotic-loaded articulating cement spacers in twostage revision for infected total knee arthroplasty: Individual antibiotic treatment and early results of 21 cases</td>
<td>does not compare antibiotic bone cement to no antibiotic bone cement</td>
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<td>Zhang, D.-H.; Sun, Z.-H.;</td>
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<td>Tian, M.-Q.; Liu, J.</td>
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<td>2009</td>
<td>Outcomes of Routine Use of Antibiotic-Loaded Cement in Primary Total Knee Arthroplasty</td>
<td>very low quality: study had to be downgraded because the registry did not have data on BMI, which could not be included as a covariate in the analysis. also, some variables had large amounts of missing data, and it is unclear if any imputation method was used. not all patients had knee OA</td>
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<tr>
<td>Slipchenko, T.; Fithian, D.C.</td>
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<td>Hanssen, A.D.; Rand, J.A.;</td>
<td>1994</td>
<td>Treatment of the infected total knee arthroplasty with insertion of another prosthesis: The effect of antibiotic-impregnated bone cement</td>
<td>Not relevant</td>
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<td>Osmon, D.R.</td>
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<td>Namba,R.S.; Inacio,M.C.; Paxton,E.W.</td>
<td>2013</td>
<td>Risk factors associated with deep surgical site infections after primary total knee arthroplasty: an analysis of 56,216 knees</td>
<td>very low quality if used as a therapeutic study; the authors note that potential confounding factors, such as wound classification, were not measured in the registry and could not be controlled for; also, there could be residual confounding present because higher risk patients may have been more likely to get antibiotic bone cement. For also, not all patients had knee OA comparison isn’t relevant to pico 7 or pico 2. Anti biotic bone cement is compared to patients who get uncemented arthroplasties.</td>
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<td>Bae,D.K.; Lee,H.K.; Cho,J.H.</td>
<td>1995</td>
<td>Arthroscopy of symptomatic total knee replacements</td>
<td>Appraised as Very Low Quality systematic review (reviewed bib search)</td>
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<td>Ellis,T.J.; Beshires,E.; Brindley,G.W.; Adams,R.L.; Preece,C. Ghani,H.; Maffulli,N.; Khanduja,V.</td>
<td>1999</td>
<td>Knee manipulation after total knee arthroplasty</td>
<td>comparison groups not relevant. Classes not relevant.</td>
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<td>2014</td>
<td>The effect of timing of manipulation under anesthesia to improve range of motion and functional outcomes following total knee arthroplasty</td>
<td>Comparison groups not relevant; Early vs late manipulation, but no control group not receiving manipulation.</td>
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<tr>
<td>Joon,Cheol Choi; Seulco,T.P.</td>
<td>1999</td>
<td>Manipulation after total knee replacement</td>
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<td>Year</td>
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<td>Lee, D.C.; Kim, D.H.; Scott, R.D.; Suthers, K.</td>
<td>1998</td>
<td>Intraoperative flexion against gravity as an indication of ultimate range of motion in individual cases after total knee arthroplasty</td>
<td>Patient population does not meet inclusion criteria (OA and RA patients). Not relevant to question of interest.</td>
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<td>2002</td>
<td>The stiff total knee arthroplasty: evaluation and management</td>
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<td>Stiffness after Total Knee Arthroplasty</td>
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<td>Total condylar knee replacement. A study of factors influencing range of motion as late as two years after arthroplasty</td>
<td>less than 10 patients had staged bilateral surgery. Also, less than 50 percent of the knees had surgery for OA</td>
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<td>2006</td>
<td>Stiffness after total knee arthroplasty: prevalence, management and outcomes</td>
<td>Patient population: OA and RA. Comparison groups do not meet criteria: MUA vs surgical.</td>
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<td>2012</td>
<td>Cryotherapy following total knee replacement</td>
<td>systematic review (reviewed bib search)</td>
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<td>Patterson, M.</td>
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<td>Effects of thermal therapy on rehabilitation after total knee arthroplasty. A prospective randomized study</td>
<td>Not relevant to PICO since it does not study use of a</td>
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<td>cryotherapy device</td>
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<td>Effects of Low-intensity Pulsed Ultrasound and Cryotherapy on Recovery of Joint Function and C-reactive Protein Levels in Patients</td>
<td>Comparison groups not relevant.</td>
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<td>Continuous-flow cold therapy after total knee arthroplasty</td>
<td>homa made device that would not be used in standard practice</td>
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<td>Intraoperative music reduces perceived pain after total knee arthroplasty: a blinded, prospective, randomized, placebo-controlled clinical trial</td>
<td>Not relevant, not an OR environment study</td>
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<td>Long-term complications after total knee arthroplasty with or without resurfacing of the patella</td>
<td>no results included in article. It is only a methodology description</td>
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<td>Reininha,I.H.; van Raay,J.J.</td>
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<td>Indications for patellar resurfacing in total knee arthroplasty</td>
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<td>Narrative review</td>
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<td>Patellar resurfacing versus nonresurfacing in total knee arthroplasty: a meta-analysis of randomised controlled trials</td>
<td>Systematic review</td>
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<td>Jin,J.; Qian,W.; Wang,W.;</td>
<td>2014</td>
<td>Long term follow up of clinical outcome between patellar resurfacing and nonresurfacing in total knee arthroplasty: Chinese experience</td>
<td>less than 90% of patients had knee OA</td>
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<td>Qiu,G.</td>
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<tr>
<td>Forster, M.C.</td>
<td>2004</td>
<td>Patellar resurfacing in total knee arthroplasty for osteoarthritis: a systematic review (Structured abstract)</td>
<td>systematic review</td>
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<td>Hanssen, A.D.</td>
<td>2002</td>
<td>Extra-articular migration of the patellar component following total knee arthroplasty</td>
<td>Case report</td>
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<td>Harrington, K.D.</td>
<td>1992</td>
<td>Orthopaedic crossfire—All patellae should be resurfaced during primary total knee arthroplasty: in the affirmative Long-term results for the McKeever patellar resurfacing prosthesis used as a salvage procedure for severe chondromalacia patellae</td>
<td>Systematic review? does not compare patellar resurfacing to no resurfacing</td>
</tr>
<tr>
<td>He, J.-Y.; Jiang, L.-S.; Dai, L.-Y.</td>
<td>2011</td>
<td>Is patellar resurfacing superior than nonresurfacing in total knee arthroplasty? A meta-analysis of randomized trials</td>
<td>meta-analysis (reviewed bib search)</td>
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<td>Holt, G.E.; Dennis, D.A.</td>
<td>2003</td>
<td>The role of patellar resurfacing in total knee arthroplasty Comparison of patellar retention versus resurfacing in LCS mobile-bearing total knee arthroplasty</td>
<td>very low quality; very low quality</td>
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<tr>
<td>Hwang, B.H.; Yang, I.H.; Han, C.D.</td>
<td>2012</td>
<td>Patellar resurfacing versus no resurfacing in two-stage revision of infected total knee arthroplasty Why not resurface the patella?</td>
<td>unclear if all patients have osteoarthritis; Retrospective Review; majority RA</td>
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<tr>
<td>Levai, J.P.; McLeod, H.C.; Freeman, M.A.</td>
<td>1983</td>
<td>Total knee arthroplasty without patellar resurfacing. Clinical outcomes and long-term follow-up evaluation</td>
<td>Retrospective Review</td>
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<td>Levitsky, K.A.; Harris, W.J.; McManus, J.; Scott, R.D.</td>
<td>1993</td>
<td>Comparison of clinical outcomes between patellar resurfacing and nonresurfacing in total knee arthroplasty</td>
<td>very low quality</td>
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<td>Li, B.; Bai, L.; Fu, Y.; Wang, G.; He, M.; Wang, J.</td>
<td>2012</td>
<td>Comparison of clinical outcomes between patellar resurfacing and nonresurfacing in total knee arthroplasty</td>
<td>very low quality</td>
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<td>Lygre,S.H.L.; Espehaug,B.; Havelin,L.I.; Vollset,S.E.; Furnes,O.</td>
<td>2010</td>
<td>Does patella resurfacing really matter? Pain and function in 972 patients after primary total knee arthroplasty: An observational study from the Norwegian Arthroplasty Register</td>
<td>Not best available evidence</td>
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<td>Myles,C.M.; Rowe,P.J.; Nutton,R.W.; Burnett,R.</td>
<td>2006</td>
<td>The effect of patella resurfacing in total knee arthroplasty on functional range of movement measured by flexible electrogoniometry</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>2011</td>
<td>Long-term results of primary total knee arthroplasty with and without patellar resurfacing</td>
<td>very low quality</td>
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<tr>
<td>2011</td>
<td>Patella in total knee arthroplasty: to resurface or not to--a cohort study of staged bilateral total knee arthroplasty</td>
<td>less than 90% of patients had knee OA</td>
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</tr>
<tr>
<td>2003</td>
<td>Prospective trial of resurfaced patella versus non-resurfaced patella in simultaneous bilateral total knee replacement</td>
<td>Not best available evidence</td>
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<tr>
<td>Authors</td>
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<td>Picetti III,G.D.; McGann,W.A.; Welch,R.B.</td>
<td>1990</td>
<td>The patellofemoral joint after total knee arthroplasty without patellar resurfacing</td>
<td>not relevant, does not compare patellar resurfacing to no patellar resurfacing</td>
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<td>Rae,P.J.; Noble,J.; Hodgkinson,J.P.</td>
<td>1990</td>
<td>Patellar resurfacing in total condylar knee arthroplasty</td>
<td>less than 90% of patients had knee OA</td>
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<tr>
<td>Scott,W.N.; Kim,H.</td>
<td>2001</td>
<td>Resurfacing the patella offers lower complication and revision rates</td>
<td>Systematic review?</td>
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<td>Scott,W.N.; Clarke,H.D.; Shen,J.; Ye,Q.; Li,S.; Qiu,G.</td>
<td>2003</td>
<td>Routine patellar resurfacing: a viable option</td>
<td>Narrative review</td>
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<td>Waikakul,S.; Vanadurongwan,V.; Bintachitt,P.</td>
<td>2000</td>
<td>The effects of patellar resurfacing in total knee arthroplasty on position sense: a prospective randomized study</td>
<td>inadequate reporting of relevant outcomes, the authors say they use the hospital for special surgery score in the methods section, but report knee rating scale in results, unclear if the knee rating scale is supposed to be the HSS, other patient oriented outcomes are not validated</td>
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<td>Zha,G.-C.; Sun,J.-Y.; Dong,S.-J.</td>
<td>2014</td>
<td>Less anterior knee pain with a routine lateral release in total knee arthroplasty without patellar resurfacing: A prospective, randomized study</td>
<td>all patients did not get resurfacing</td>
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<td>Aglietti,P.; Buzzi,R.; Gaudenzi,A.</td>
<td>1988</td>
<td>Patellofemoral functional results and complications with the posterior stabilized total condylar knee prosthesis</td>
<td>does not compare patellar resurfacing to no resurfacing</td>
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<td>Stiehl, J.B.; Hamelynck, K.J.; Voorhorst, P.E.</td>
<td>2006</td>
<td>International multi-centre survivorship analysis of mobile bearing total knee arthroplasty</td>
<td>the osteoarthritis data that is relevant to the pico question is low quality. the higher quality analysis includes less than 90% OA patients</td>
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<td>Abdel, M.P.; Morrey, M.E.; Jensen, M.R.; Morrey, B.F.</td>
<td>2011</td>
<td>Increased long-term survival of posterior cruciate-retaining versus posterior cruciate-stabilizing total knee replacements</td>
<td>less than 90% of patients had knee OA</td>
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<td>Bin Abd Razak, H.R.; Pang, H.N.; Yeo, S.J.; Tan, M.H.; Lo, N.N.; Chong, H.C.; Boom, L.G.; Brouwer, R.W.; Akker, Scheek, I.; Bulstra, S.K.; Raaij, J.J.</td>
<td>2013</td>
<td>Joint line changes in cruciate-retaining versus posterior-stabilized computer-navigated total knee arthroplasty</td>
<td>very low quality retrospective and differences in baseline bmi not adjusted for</td>
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<tr>
<td>Bradley, M.P.; Mayor, M.B.; Collier, J.P.</td>
<td>2004</td>
<td>Differences in articular track area of posterior-stabilized and cruciate-retaining retrieved total knee implants</td>
<td>no results presented: methodology description for future study</td>
</tr>
<tr>
<td>Breugem, S.J.; van, Ooij B.; Haverkamp, D.; Sierveelt, I.N.; van Dijk, C.N.</td>
<td>2012</td>
<td>No difference in anterior knee pain between a fixed and a mobile posterior stabilized total knee arthroplasty after 7.9 years</td>
<td>would be appraised as very low quality since baseline differences were not assessed or controlled for in statistical analysis, and because it was retrospective</td>
</tr>
<tr>
<td>Carvalho, L.H., Jr.; Temponi, E.F.; Soares, L.F.; Goncalves, M.J.</td>
<td>2014</td>
<td>Relationship between range of motion and femoral rollback in total knee arthroplasty</td>
<td>not relevant. does not compare posterior stabilized arthroplasty to cruciate retaining arthroplasty</td>
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<tr>
<td>Choi, W.C.; Lee, S.; Seong, S.C.; Jung, J.H.; Lee, M.C.</td>
<td>2010</td>
<td>Comparison between standard and high-flexion posterior-stabilized rotating-platform mobile-bearing total knee arthroplasties: a randomized controlled study</td>
<td>no patient oriented outcomes and would be appraised as very low quality due to using clinical characteristics to decide which patients got pcl sacrifice. this would cause selection bias</td>
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<td></td>
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<td></td>
<td>not relevant. compares two different posterior stabilized designs</td>
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<tr>
<td>Gidwani,S.; Langkamer,V.G.</td>
<td>2001</td>
<td>Recurrent dislocation of a posterior-stabilized prosthesis: a series of three cases Clinical outcomes in high flexion total knee arthroplasty were not superior to standard posterior stabilized total knee arthroplasty. A multicenter, prospective, randomized study Evaluation of postoperative range of motion and functional outcomes after cruciate-retaining and posterior-stabilized high-flexion total knee arthroplasty</td>
<td>very low quality for the patient oriented outcomes relevant to this question</td>
</tr>
<tr>
<td>Han,C.W.; Yang,I.H.; Lee,W.S.; Park,K.K.; Han,C.D.</td>
<td>2012</td>
<td>Muscle strength after successful total knee replacement: a 6- to 13-year followup</td>
<td>no patient oriented outcomes, and would likely be very low quality due to different follow up times, and no adjustment for confounding</td>
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<tr>
<td>Huang,C.H.; Cheng,C.K.; Lee,Y.T.; Lee,K.S.</td>
<td>1996</td>
<td>Retention versus removal of the posterior cruciate ligament in total knee replacement: a systematic review (reviewed bib search)</td>
<td>no patient oriented outcomes, and would likely be very low quality due to different follow up times, and no adjustment for confounding</td>
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<tr>
<td>Jacobs,W.C.; Clement,D.J.; Wymenga,A.B.</td>
<td>2005</td>
<td>Retention versus removal of the posterior cruciate ligament in total knee replacement: a systematic review (reviewed bib search)</td>
<td>no patient oriented outcomes, and would likely be very low quality due to different follow up times, and no adjustment for confounding</td>
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<tr>
<td>Laskin, R.S.</td>
<td>1997</td>
<td>Cemented total knee replacement in patients with osteoarthritis: A five-year follow-up study using a prosthesis allowing both retention and resection of the posterior cruciate ligament</td>
<td>very low quality</td>
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<tr>
<td>Lattanzio, P.-J.; Chess, D.G.; MacDermid, J.C.</td>
<td>1998</td>
<td>Effect of the posterior cruciate ligament in knee-joint proprioception in total knee arthroplasty</td>
<td>very low quality</td>
</tr>
<tr>
<td>Luna, J.T.; Sembrano, J.N.; Gioe, T.J.</td>
<td>2010</td>
<td>Mobile and fixed-bearing (all-polyethylene tibial component) total knee arthroplasty designs: surgical technique</td>
<td>not relevant. description of surgical technique</td>
</tr>
<tr>
<td>Morrison, T.A.; Liabaud, B.; Geller, J.A.</td>
<td>2013</td>
<td>Functional results of cruciate-retaining total knee arthroplasty using inside-out soft-tissue balancing in the valgus knee</td>
<td>not relevant. does not compare posterior stabilized arthroplasty to cruciate retaining arthroplasty</td>
</tr>
<tr>
<td>Murphy, M.; Journeaux, S.; Hides, J.; Russell, T.</td>
<td>2012</td>
<td>Does flexion of the femoral implant in total knee arthroplasty increase knee flexion: A randomised controlled trial</td>
<td>not relevant. compares two cruciate retaining methods</td>
</tr>
<tr>
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<tr>
<td>Okamoto,N.; Breslauer,L.; Hedley,A.K.; Mizuta,H.; Banks,S.A.</td>
<td>2011</td>
<td>In vivo knee kinematics in patients with bilateral total knee arthroplasty of 2 designs</td>
<td>most patients in control group also get cruciate retaining arthroplasty</td>
</tr>
<tr>
<td>Paletta,Jr; Laskin,R.S.</td>
<td>1995</td>
<td>Total knee arthroplasty after a previous patellectomy</td>
<td>less than 10 patients per group</td>
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<tr>
<td>Peters,C.L.; Mulkey,P.; Erickson,J.; Anderson,M.B.; Pelt,C.E.; Pritchett,J.W.</td>
<td>2014</td>
<td>Comparison of total knee arthroplasty with highly congruent anterior-stabilized bearings versus a cruciate-retaining design knee</td>
<td>less than 90% of patients had knee OA</td>
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<td>Sumino,T.; Rubash,H.E.; Li,G.</td>
<td>2013</td>
<td>Does cruciate-retaining total knee arthroplasty enhance knee flexion in Western and East Asian patient populations? A meta-analysis</td>
<td>very low quality</td>
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<tr>
<td>Thomsen,M.G.; Husted,H.; Bencke,J.; Curtis,D.; Holm,G.; Troelsen,A.</td>
<td>2012</td>
<td>Do we need a gender-specific total knee replacement? A randomised controlled trial comparing a high-flex and a gender-specific posterior design</td>
<td>meta-analysis</td>
</tr>
<tr>
<td>van den Boom,L.G.; Brouwer,R.W.; van den Akker-Scheek,I.; Bulstra,S.K.; van Raaij,J.J.; Warren,P.J.; Olanlokun,T.K.; Cobb,A.G.; Bentley,G.; Hui,C.; Salmon,L.; Maeno,S.; Roe,J.; Walsh,W.; Pinczewski,L.</td>
<td>1993</td>
<td>Retention of the posterior cruciate ligament versus the posterior stabilized design in total knee arthroplasty: a prospective randomized controlled clinical trial</td>
<td>not relevant. compares different posterior stabilized arthroplasties</td>
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<tr>
<td>Cho,W.-S.; Youm,Y.-S.</td>
<td>2009</td>
<td>Proprioception after knee arthroplasty. The influence of prosthetic design</td>
<td>no patient oriented outcomes</td>
</tr>
<tr>
<td>Forster,M.C.</td>
<td>2003</td>
<td>Migration of Polyethylene Fixation Screw After Total Knee Arthroplasty</td>
<td>not relevant. does not compare posterior stabilized arthroplasty to cruciate retaining arthroplasty combines results from multiple other studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Survival analysis of primary cemented total knee arthroplasty: which designs last?</td>
<td>&lt;10 patients per group</td>
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<td>Alnahdi,A.H.; Zeni,J.A.; Snyder-Mackler,L.</td>
<td>2011</td>
<td>Gait after unilateral total knee arthroplasty: frontal plane analysis</td>
<td>does not compare UKA to TKA or osteotomy</td>
</tr>
<tr>
<td>Aly,T.; Mousa,W.; El-Sallakh,S.</td>
<td>2010</td>
<td>The Oxford unicompartmental knee prosthesis: Midterm follow-up High tibial osteotomy for the treatment of unicompartmental arthritis of the knee</td>
<td>Not relevant, does not compare UKA to HTO/TKA</td>
</tr>
<tr>
<td>Amendola,A.; Panarella,L.</td>
<td>2005</td>
<td>High tibial osteotomy with Puddu plate for the treatment of unicompartmental arthritis of the knee</td>
<td>systematic review?</td>
</tr>
<tr>
<td>Asik,M.; Sen,C.; Kilic,B.; Goksan,S.B.; Ciftci,F.; Taser,O.F.</td>
<td>2006</td>
<td>High tibial osteotomy with Puddu plate for the treatment of varus gonarthrosis</td>
<td>Does not answer PICO question. uk is not compared to osteotomy or TKA</td>
</tr>
<tr>
<td>Barck,A.L.</td>
<td>1989</td>
<td>10-year evaluation of compartmental knee arthroplasty</td>
<td>Compares diff UKA prostheses not UKA to HTO/TKA</td>
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<td>Benzakour,T.; Hefti,A.; Lemseffer,M.; El Ahmadi,J.D.; Bouyasmine,H.; Benzakour,A.</td>
<td>2010</td>
<td>High tibial osteotomy for medial osteoarthritis of the knee: 15 years follow-up</td>
<td>Does not answer PICO question. uk is not compared to osteotomy or TKA</td>
</tr>
<tr>
<td>Bert,J.M.</td>
<td>2008</td>
<td>Unicompartmental arthroplasty for unicompartmental knee arthritis</td>
<td>systematic review?</td>
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<td>Callahan,C.M.; Drake,B.G.; Heck,D.A.; Dittus,R.S.</td>
<td>1995</td>
<td>Patient outcomes following unicompartmental or bicompartimental knee arthroplasty: a meta-analysis (Structured abstract)</td>
<td>meta-analysis</td>
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<tr>
<td>Cameron,H.U.; Jung,Y.B.</td>
<td>1988</td>
<td>Clinical results with an uncemented plastic tibial component in unicompartmental knee replacement</td>
<td>not relevant, does not compare uka to tka or osteotomy</td>
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<tr>
<td>Cartier,P.; Mammeri,M.; Villers,P.</td>
<td>1982</td>
<td>Clinical and radiographic evaluation of modular knee replacement. A review of 95 cases</td>
<td>&lt;90% OA patients</td>
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<td>Chung,J.Y.; Min,B.-H.</td>
<td>2013</td>
<td>Is bicompartimential knee arthroplasty more favourable to knee muscle strength and physical performance compared to total knee arthroplasty?</td>
<td>study of bicompartimental knee arthroplasty</td>
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<td>Collier,M.B.; McAuley,J.P.; Szuszczechwicz,E.S.; Engh,G.A. Confalonieri,N.; Manzotti,A.; Cerveri,P.; De,Momi E.</td>
<td>2004</td>
<td>Proprioceptive deficits are comparable before unicondylar and total knee arthroplasties, but greater in the more symptomatic knee of the patient</td>
<td>pre-op measures</td>
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<td>Coventry,M.B.; Coventry,M.B.; Ilistrup,D.M.; Wallrichs,S.L.</td>
<td>1993</td>
<td>Bi-unicompartmental versus total knee arthroplasty: a matched paired study with early clinical results</td>
<td>patients have bicompartimental arthritis, not unicompartmental RA</td>
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<tr>
<td>Craik,J.D.; El Shafie,S.A.; Singh,V.K.; Twyman,R.S.</td>
<td>2014</td>
<td>Revision of Unicompartmental Knee Arthroplasty Versus Primary Total Knee Arthroplasty</td>
<td>Does not answer PICO question. Osteotomy is not compared to unicompartmental arthroplasty would be appraised as very low quality since it is retrospective and does not adjust for preoperative differences in age and BMI</td>
</tr>
<tr>
<td>Dahl,A.; Robertsson,O.; Lidgren,L.</td>
<td>2010</td>
<td>Surgery for knee osteoarthritis in younger patients</td>
<td>very low quality</td>
</tr>
<tr>
<td>Dahl,A.; Robertsson,O.; Lohmander,L.S.</td>
<td>2012</td>
<td>High tibial osteotomy in Sweden, 1998-2007: a population-based study of the use and rate of revision to knee arthroplasty</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
</tr>
<tr>
<td>Dalury,D.F.; Jiranek,W.A.</td>
<td>1999</td>
<td>A comparison of the midvastus and paramedian approaches for total knee arthroplasty</td>
<td>not relevant to pico question. compares to TKA approaches</td>
</tr>
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<td>Dalury,D.F.; Fisher,D.A.;</td>
<td>2009</td>
<td>Unicompartmental knee arthroplasty compares favorably to total knee</td>
<td>Not retrievable</td>
</tr>
<tr>
<td>Adams,M.J.; Gonzales,R.A.</td>
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<td>arthroplasty in the same patient</td>
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<tr>
<td>El Amrani,M.H.; Levy,B.;</td>
<td>2010</td>
<td>Patellar height relevance in opening-wedge high tibial osteotomy</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
</tr>
<tr>
<td>Scharycki,S.; Asselineau,A.</td>
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<tr>
<td>Emerson, Jr; Head,W.C.; Peters, Jr</td>
<td>1992</td>
<td>Soft tissue balance and alignment in medical unicompartmental knee</td>
<td>mobile v fixed bearing</td>
</tr>
<tr>
<td>Emerson, Jr</td>
<td></td>
<td>arthroplasty</td>
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<tr>
<td>Engh,G.A.; Parks,N.L.;</td>
<td>2014</td>
<td>Unicompartmental mobile-bearing knee arthroplasty</td>
<td>mobile v fixed bearing</td>
</tr>
<tr>
<td>Whitney,C.E.</td>
<td></td>
<td>A Prospective Randomized Study of Bicompartmental vs. Total Knee</td>
<td>not relevant comparison, compares bicompartent arthroplasty to total knee arthroplasty</td>
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<td></td>
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<td>Arthroplasty with Functional Testing and Short Term Outcome</td>
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<td>osteotomy; technical issues early clinical radiological results</td>
<td></td>
</tr>
<tr>
<td>Fu,D.; Li,G.; Chen,K.; Zhao,Y.; Hua,Y.; Cai,Z.</td>
<td>2013</td>
<td>High tibial osteotomy compared with unicompartent al knee arthroplasty</td>
<td>retrospective review</td>
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<td></td>
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<td>for the treatment of medial compartment osteoarthritis: a meta-</td>
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<tr>
<td></td>
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<td>analysis (Provisional abstract)</td>
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<tr>
<td>Fu,D.; Li,G.; Chen,K.; Zhao,Y.; Hua,Y.; Cai,Z.</td>
<td>2013</td>
<td>High tibial osteotomy compared with unicompartent al knee arthroplasty</td>
<td>systematic review</td>
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<td>analysis (Structured abstract)</td>
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<tr>
<td>Gandhi,R.; Ayeni,O.; Davey,J.R.; Mahomed,N.N.</td>
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<td>High tibial osteotomy compared with unicompartent al knee arthroplasty</td>
<td>meta-analysis</td>
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<td>Gandhi,R.; Ayeni,O.; Davey,J.R.; Mahomed,N.N.</td>
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<td>for the treatment of medial compartment osteoarthritis: A meta-</td>
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<td>analysis</td>
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<td>Gioe,T.J.; Killeen,K.K.;</td>
<td>2003</td>
<td>Analysis of unicompartmental knee arthroplasty in a community-based implant registry</td>
<td>unclear all of the TKA patients had unicompartmental arthroplasty</td>
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<td>Gstottner,M.; Pedross,F.; Liebensteiner,M.; Bach,C.</td>
<td>2008</td>
<td>Long-term outcome after high tibial osteotomy</td>
<td>does not answer pico question. does not compare uk to osteotomy or tka</td>
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<td>Hay,G.C.; Kampshoff,J.; Kuster,M.S.</td>
<td>2010</td>
<td>Lateral subvastus approach with osteotomy of the tibial tubercle for total knee replacement: a two-year prospective, randomised, blinded controlled trial</td>
<td>Does not answer PICO question. uk is not compared to osteotomy or TKA would not answer the pico question. compares subvastus arthroplasty combined with osteotomy to medial parapatellar arthroplasty. comparison could not prove the comparative effectiveness of arthroplasty or osteotomy, because both groups get arthroplasty</td>
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<td>Heyse,T.J.; Reinhardt,K.; Tibesku,C.O.; Mayman,D.J.; Pearle,A.D.</td>
<td>2012</td>
<td>Different compartments, different operation: A comparison of the technique and indications for medial and lateral unicondylar knee arthroplasty</td>
<td>Systematic review</td>
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<td>Hui,C.; Salmon,L.J.; Kok,A.; Williams,H.A.; Hockers,N.; van der Tempel,W.M.; Chana,R.; Pinczewski,L.A.</td>
<td>2011</td>
<td>Long-term survival of high tibial osteotomy for medial compartment osteoarthritis of the knee</td>
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<td>1991</td>
<td>Rehabilitation after high tibial osteotomy and unicompartmental arthroplasty. A comparative study</td>
<td>very low quality</td>
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<td>Jarvenpaa,J.; Kettunen,J.; Miettinen,H.; Kroger,H.</td>
<td>2010</td>
<td>The clinical outcome of revision knee replacement after unicompartmental knee arthroplasty versus primary total knee arthroplasty: 8-17 years follow-up study of 49 patients</td>
<td>primary v revision comparison</td>
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<td>Johnson,T.C.; Tatman,P.J.; Mehle,S.; Gioe,T.J.; Karabatsos,B.; Mahomed,N.N.; Maistrelli,G.L.; Karamitev,S.S.; Stavrev,V.P.; Chifligarov,A.G.</td>
<td>2012</td>
<td>Revision surgery for patellofemoral problems</td>
<td>not relevant compares TKA to bicompartamental arthroplasty</td>
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<td>Karpman,R.R.; Volz,R.G.</td>
<td>1982</td>
<td>Osteotomy versus unicompartmental prosthetic replacement in the treatment of unicompartmental arthritis of the knee</td>
<td>very low quality. study was retrospective and due to small numbers, no adjsusment could be made for differences in severity level not all patients had knee OA</td>
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<td>Kazakos,K.J.; Chatzipapas,C.; Verettas,D.; Galanis,V.; Xarchas,K.C.; Psillakis,I.</td>
<td>2008</td>
<td>Mid-term results of total knee arthroplasty after high tibial osteotomy</td>
<td>TKA not primary (post HTO)</td>
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<td>1994</td>
<td>The case for unicompartmental knee arthroplasty</td>
<td>Systematic review</td>
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<td>Keene, G.C.R.; Forster, M.C.</td>
<td>2005</td>
<td>(iii) Modern unicompartmental knee replacement</td>
<td>Systematic review</td>
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<td>2004</td>
<td>Radiological changes ten years after St. Georg Sled unicompartmental knee replacement</td>
<td>does not compare uka to tka or osteotomy</td>
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<td>Khanna, G.; Levy, B.A.</td>
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<td>1989</td>
<td>The relationship of stride characteristics to pain before and after total knee arthroplasty</td>
<td>does not compare tka to osteotomy or uka</td>
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<td>2003</td>
<td>An Evaluation of the Safety and Efficacy of Simultaneous Bilateral Total Knee Arthroplasty</td>
<td>less than 90% had knee oa. also would likely be low quality evidence due to lack of adjustment for confounding</td>
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<td>Li, C.S.; Bhandari, M.</td>
<td>2013</td>
<td>Cost-effectiveness of unicompartmental knee arthroplasty, high tibial osteotomy, and KineSpring (registered trademark) knee implant system for unicompartmental osteoarthritis of the knee</td>
<td>cost-efficacy review</td>
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<td>Liddle, A.D.; Judge, A.; Pandit, H.; Murray, D.W.</td>
<td>2014</td>
<td>Adverse outcomes after total and unicompartmental knee replacement in 101 330 matched patients: a study of data from the National Joint Registry for England and Wales</td>
<td>unclear if all patients in tkr group had unicompartmental arthroplasty</td>
</tr>
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<td>Madan,S.; Rushforth,G.F.</td>
<td>2002</td>
<td>Clinical effectiveness of high tibial osteotomy for osteoarthritis of the knee</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
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<td>Madelaine,A.; Villa,V.; Yela,C.; Lording,T.; Lustig,S.; Servien,E.; Neyret,P.</td>
<td>2014</td>
<td>Results and complications of single-stage total knee arthroplasty and high tibial osteotomy</td>
<td>does not answer pico question. all patients receive osteotomy and uka, and the procedures are not compared</td>
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<td>Mallory,T.H.; Danyi,J.</td>
<td>1983</td>
<td>Unicompartmental total knee arthroplasty. A five- to nine-year follow-up study of 42 procedures</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
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<td>Mallory,T.H.; Danyi,J.</td>
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<td>Changes in knee alignment after total knee arthroplasty</td>
<td>does not compare uka to tka or osteotomy</td>
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<td>McAllister,C.M.</td>
<td>2008</td>
<td>The role of unicompartmental knee arthroplasty versus total knee arthroplasty in providing maximal performance and satisfaction</td>
<td>Systematic review</td>
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<td>Meeks,L.; Sohar,G.; Galty,H.; Wellinger,K.; Toth,K.</td>
<td>2010</td>
<td>The arthroscopic evaluation and characteristics of severe polyethylene wear in total knee arthroplasty</td>
<td>does not compare tka to uka or osteotomy</td>
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<td>Mizner,R.L.; Stevens,J.E.; Snyder-Mackler,L.</td>
<td>2003</td>
<td>Eliminating patellofemoral complications in total knee arthroplasty: clinical and radiographic results of 121 consecutive cases using the Duracon system</td>
<td>Does not answer PICO question. does not compare tka and unicompartmental ka</td>
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<td>Mont,M.A.; Yoon,T.R.; Krackow,K.A.; Hungerford,D.S.</td>
<td>1999</td>
<td>Long term follow-up of unicompartmental arthroplasty</td>
<td>not full text. abstract only</td>
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<td>Morrey, B.F.</td>
<td>1989</td>
<td>Upper tibial osteotomy for secondary osteoarthritis of the knee</td>
<td>Does not answer PICO question. Osteotomy is not compared to unicompartamental arthroplasty</td>
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<td>Morsi, E.; Habib, M.E.; Hadhoud, M.</td>
<td>2014</td>
<td>Comparison Between Results of High Tibial Osteotomy Above and Below Tibial Tubercle in Relation to Future Total Knee Arthroplasty</td>
<td>both groups get osteotomy</td>
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<td>Myles, C.M.; Rowe, P.J.; Walker, C.R.; Nutton, R.W.</td>
<td>2002</td>
<td>Knee joint functional range of movement prior to and following total knee arthroplasty measured using flexible electrogoniometry</td>
<td>not relevant. compares knee oa patients to health patients'</td>
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<td>Noticewala, M.S.; Geller, J.A.; Lee, J.H.; Macaulay, W.</td>
<td>2012</td>
<td>Unicompartmental knee arthroplasty relieves pain and improves function more than total knee arthroplasty</td>
<td>patients in the TKA group did not have unicompartamental OA</td>
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<td>O'Donnell, T.; Neil, M.J.</td>
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<td>The Repicci II(R) unicompartmental knee arthroplasty: 9-year survivorship and function</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
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<td>2001</td>
<td>High tibial osteotomy: Will new techniques provide better results?</td>
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<td>2012</td>
<td>Unicompartmental knee replacement provides early clinical and functional improvement stabilizing over time</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
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<td>Partio, E.; Orava, T.; Lehto, M.U.; Lindholm, S.T.</td>
<td>1994</td>
<td>Survival of the Townley knee: 360 cases with 8 (0.1–15) years' follow-up</td>
<td>Does not answer PICO question. does not compare tka and unicompartamental ka</td>
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<td>Pennington, D.W.; Swienckowski, J.J.; Lutes, W.B.; Drake, G.N.; Preston, C.F.; Fulkerson, E.W.; Meislin, R.; Di Cesare, P.E.</td>
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<td></td>
<td></td>
<td>Minimum 20-year follow-up of the Oxford mobile bearing unicompartamental knee arthroplasty</td>
<td>not full text. abstract only</td>
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<td>Technique and Outcomes of Opening Wedge High Tibial Osteotomy</td>
<td>non-comparative</td>
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<td>1999</td>
<td>Use of unicompartmental instead of tricompartmental prostheses for unicompartmental arthrosis in the knee is a cost-effective alternative. 15,437 primary tricompartmental prostheses were compared with 10,624 primary medial or lateral unicompartmental prostheses Unicompartmental arthroplasty. Results in Sweden 1986-1995</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Lewold,S.; Lidgren,L.</td>
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<td>Robertsson,O.</td>
<td>2000</td>
<td>Painful unicompartmental knee prostheses: Wrong indication, wrong surgical technique or wrong implant choice?</td>
<td>very low quality</td>
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<td>2012</td>
<td>10 year outcome of high tibial osteotomy for medial compartment osteoarthritis of the knee</td>
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<td>Masera M.; Roe,J.; Salmon,L.; Waller,A.;</td>
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<td>The role of high tibial osteotomy in the varus knee</td>
<td>Does not answer PICO question.</td>
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<td>Scanell,J.; Pinczewski,L.; Rossi,R.;</td>
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<td>Unicompartmental knee arthroplasty for osteoarthritis of the knee: remaining postoperative flexion contracture affecting overall results</td>
<td>Osteotomy is not compared to unicompartmental arthroplasty</td>
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<td>2011</td>
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<td>narrative review</td>
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<td>2003</td>
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<td>Robert Brigham unicompndylar knee surgical technique</td>
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<td>Unicondylar arthroplasty: redefining itself How to select candidates for lateral unicompartmental prosthesis</td>
<td>Commentary study design &quot;personal experience..?&quot;</td>
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<td>Servien,E.; Aitsiselmi,T.; Neyret,P.;</td>
<td>2008</td>
<td>Mid-term outcomes of unicompartmental knee arthroplasty</td>
<td>not full text. abstract only</td>
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<td>Verdonk,P.; Sessa,V.; Forconi,F.; Celentano,U.; Trovato,U.</td>
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<td>2012</td>
<td>Unicompartmental knee arthroplasty versus total knee arthroplasty in the same patient: A comparative study on 12 patients</td>
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<td>2006</td>
<td>Cost-effectiveness analysis of unicompartmental knee arthroplasty as an alternative to total knee arthroplasty for unicompartmental osteoarthritis (Structured abstract)</td>
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<td>Stukenborg,Colsman C.; Wirth,C.J.; Lazovic,D.; Wefer,A.</td>
<td>2001</td>
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<td>repeat article</td>
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<td>2013</td>
<td>Bicompartmental versus total knee arthroplasty for medial and patellofemoral osteoarthritis</td>
<td>patients had bicompartmental oa and not unicompartamental not relevant. does not compare uka to tka or osteotomy not relevant does not compare uka to tka or osteotomy</td>
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<td>Waimann,C.A.; Fernandez-Mazarambroz,R.J.; Cantor,S.B.; Lopez-Olivo,M.; Zhang,H.; Landon,G.C.; Siff,S.J.</td>
<td>2011</td>
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<td>1999</td>
<td>Does arthritis progress in the retained compartments after 'Oxford' medial unicompartmental arthroplasty? A clinical and radiological study with a minimum ten-year follow-up</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
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<td>Webster, K.E.; Wittwer, J.E.; Feller, J.A.</td>
<td>2003</td>
<td>Quantitative gait analysis after medial unicompartmental knee arthroplasty for osteoarthritis</td>
<td>does not compare uka to tka or osteotomy</td>
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<td>Winder, R.P.; Severson, E.P.; Trousdale, R.T.; Pagnano, M.W.; Wood-Wentz, C.M.; Sierra, R.J.</td>
<td>2014</td>
<td>No difference in 90-day complications between bilateral unicompartmental and total knee arthroplasty</td>
<td>unclear if all tka patients had oa</td>
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<td>Wright, J.M.; Crockett, H.C.; Slawski, D.P.; Madsen, M.W.; Windsor, R.E.</td>
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<td>High tibial osteotomy</td>
<td>Systematic review (reviewed bib search)</td>
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<td>2003</td>
<td>Minimally invasive unicompartmental versus total condylar knee arthroplasty: early results of a matched-pair comparison (Structured abstract)</td>
<td>very low strength</td>
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<td>Zhang, Q.; Guo, W.; Zhang, Q.; Sun, R.; Liu, Z.; Cheng, L.; Xia, Y.; Chen, G.; Ding, R.; Zhu, D.; Li, Z.</td>
<td>2010</td>
<td>Comparison of high tibial osteotomy and unicompartmental knee arthroplasty at a minimum follow-up of 3 years</td>
<td>very low quality</td>
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<td>Zelicof,S.B.; Scott,R.D.; Ewald,F.C.</td>
<td>1991</td>
<td>Unicompartmental versus total knee arthroplasty in the same patient. A comparative study</td>
<td>unclear if the TKA operated knees were for unicompartmental arthroplasty</td>
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<td>Spicer,D.D.; Curry,J.I.; Pomeroy,D.L.; Badenhausen,W.E.,Jr.; Schaper,L.A.; Suthers,K.E.; Smith,M.W.</td>
<td>2002</td>
<td>Range of motion after arthroplasty for the stiff osteoarthritic knee</td>
<td>not relevant. does not compare uka to tka or osteotomy</td>
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<td>Thadani,P.J.; Spitzer,A.I.</td>
<td>2000</td>
<td>Primary total knee arthroplasty: Indications and long-term results</td>
<td>Systematic review</td>
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<td>2014</td>
<td>Analgesic drug consumption increases after knee arthroplasty: a pharmacoepidemiological study investigating postoperative pain</td>
<td>unclear if all patients getting tka had unicompartmental oa</td>
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<td>Lecuire,F.; Fayard,J.-P.; Simottel,J.-C.; Charmion,L.; Edorh,G.</td>
<td>2008</td>
<td>Results of unicompartmental knee arthroplasty at a minimum of ten years of follow-up</td>
<td>Does not answer PICO question. uka is not compared to osteotomy or TKA</td>
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<td>Mid-term results of a new cementless hydroxyapatite coated anatomic unicompartmental knee arthroplasty</td>
<td>lack of a comparison group means this study can't answer any pico questions</td>
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<td>Li, M.G.; Nilsson, K.G.</td>
<td>2000</td>
<td>The effect of the preoperative bone quality on the fixation of the tibial component in total knee arthroplasty</td>
<td>no patient oriented outcomes</td>
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<td>Changes in bone mineral density of the proximal tibia after uncemented total knee arthroplasty. A 3-year follow-up of 25 knees Influence of pre-operative bone mineral content of the proximal tibia on revision rate after uncemented knee arthroplasty</td>
<td>Does not answer PICO question. does not compare tka and unicompartmental ka very low quality</td>
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<td>2003</td>
<td>The kinematic total knee arthroplasty. A 10- to 15-year follow-up and survival analysis</td>
<td>Does not answer PICO question. does not compare tka and unicompartmental ka it is unlikely that all of the TKA patients had unicompartmental arthritis does not compare uka to tka or osteotomy very low quality due to preoperative demographic differences, and different lengths of follow up, not all patients had knee OA description of navigation technique</td>
<td></td>
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<tr>
<td>2007</td>
<td>A comparison of bilateral uncemented total knee arthroplasty</td>
<td>very low quality</td>
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<td>2005</td>
<td>Mini-invasive computer assisted bi-unicompartmental knee replacement Unicompartmental versus computer-assisted total knee replacement for medial compartment knee arthritis: a matched paired study</td>
<td>very low quality</td>
<td></td>
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<tr>
<td>Patient-specific instrumentation improved mechanical alignment, while early clinical outcome was comparable to conventional instrumentation in TKA</td>
<td>2014</td>
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<td>Bali,K.; Walker,P.; Bruce,W.</td>
<td>2012</td>
<td>Custom-fit total knee arthroplasty: our initial experience in 32 knees</td>
<td>for data relevant to this PICO question, there are less than 10 patients per group</td>
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<td>Barrett,W.; Hoeffel,D.; Dalury,D.; Mason,J.B.; Murphy,J.; Himden,S.</td>
<td>2013</td>
<td>In-Vivo Alignment Comparing Patient Specific Instrumentation with both Conventional and Computer Assisted Surgery (CAS) Instrumentation in Total Knee Arthroplasty</td>
<td>not all patients had knee OA</td>
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<tr>
<td>Boyd,J.L.; Kurtenbach,C.A.; Sikka,R.S.</td>
<td>2014</td>
<td>Patient-Specific Instrumentation and Return to Activities After Unicondylar Knee Arthroplasty</td>
<td>Narrative review</td>
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<tr>
<td>Collins,M.J.</td>
<td>2014</td>
<td>The impact patient-specific instrumentation has had on my practice in the last 5 years</td>
<td>non quantitative data presented</td>
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<td>Conteduca,F.; Iorio,R.; Mazza,D.; Caperna,L.; Bolle,G.; Argento,G.; Ferretti,A.</td>
<td>2013</td>
<td>Evaluation of the accuracy of a patient-specific instrumentation by navigation</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>DeHaan,A.M.; Adams,J.R.; DeHart,M.L.; Huff,T.W.</td>
<td>2014</td>
<td>Patient-specific versus conventional instrumentation for total knee arthroplasty: Peri-operative and cost differences</td>
<td>would be very low quality due to being retrospective and due to having significant gender differences that were not adjusted for</td>
</tr>
<tr>
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<td>Dossett, H.G.; Swartz, G.J.; Estrada, N.A.; LeFevre, G.W.; Kwasman, B.G.</td>
<td>2012</td>
<td>Kinematically versus mechanically aligned total knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Ensini, A.; Timoncini, A.; Cenni, F.; Belvedere, C.; Fusai, F.; Leardini, A.; Giannini, S.</td>
<td>2014</td>
<td>Intra- and post-operative accuracy assessments of two different patient-specific instrumentation systems for total knee replacement</td>
<td>compares two type of patient specific instrumentation</td>
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<td>Gerus, P.; Sartori, M.; Besier, T.F.; Fregly, B.J.; Delp, S.L.; Banks, S.A.; Pandy, M.G.; D’Lima, D.D.; Lloyd, D.G.</td>
<td>2013</td>
<td>Subject-specific knee joint geometry improves predictions of medial tibiofemoral contact forces</td>
<td>not relevant. biomechanical study</td>
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<td>Karpman, R.R.; Smith, H.L.</td>
<td>2009</td>
<td>Comparison of the early results of minimally invasive vs standard approaches to total knee arthroplasty: a prospective, randomized study</td>
<td>not relevant. not about patient specific instrumentation</td>
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<td>McAllister, C.M.; Stepanian, J.D.</td>
<td>2008</td>
<td>The Impact of Minimally Invasive Surgical Techniques on Early Range of Motion After Primary Total Knee Arthroplasty</td>
<td>not relevant. compares minimally invasive surgery to conventional surgery</td>
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<td>Moopanar, T.R.; Amaranath, J.E.; Sorial, R.M.</td>
<td>2014</td>
<td>Component position alignment with patient-specific jigs in total knee arthroplasty</td>
<td>does not compare PSI to conventional instrumentation</td>
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<tr>
<td>Nam, D.; Maher, P.A.; Rebolledo, B.J.; Nawabi, D.H.; McLawhorn, A.S.; Pearle, A.D.</td>
<td>2013</td>
<td>Patient specific cutting guides versus an imageless, computer-assisted surgery system in total knee arthroplasty</td>
<td>unclear if 90% of patients had knee OA</td>
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<td>Ng, V.Y.; DeClaire, J.H.; Berend, K.R.; Gulick, B.C.; Lombardi, A.V., Jr.</td>
<td>2012</td>
<td>Improved accuracy of alignment with patient-specific positioning guides compared with manual instrumentation in TKA</td>
<td>unclear if all patients have osteoarthritis</td>
</tr>
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<td>Authors</td>
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<td>Al-Haddithy,N.; Hanna,S.A.; Al-Khateeb,H.; Carrington,R.W.; Blunn,G.W.;</td>
<td>2012</td>
<td>Custom rotating-hinge total knee replacement in patients with spina bifida and severe neuromuscular dysfunction</td>
<td>n&lt;10</td>
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<td>Skinner,J.A.; Briggs,T.W.</td>
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<td>Silva,A.; Sampaio,R.; Pinto,E.</td>
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<td>Patient-specific instrumentation improves tibial component rotation in TKA</td>
<td>no patient oriented outcomes</td>
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<td>Stronach,B.M.; Pelt,C.E.; Erickson,J.; Peters,C.L.</td>
<td>2013</td>
<td>Patient-specific total knee arthroplasty required frequent surgeon-directed changes</td>
<td>very low quality</td>
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<td>Katz,J.N.; Mahomed,N.N.; Baron,J.A.; Barrett,J.A.; Fossel,A.H.; Creel,A.H.; Wright,J.; Wright,E.A.; Losina,E.</td>
<td>2007</td>
<td>Association of hospital and surgeon procedure volume with patient-centered outcomes of total knee replacement in a population-based cohort of patients age 65 years and older</td>
<td>results are presented in a manner in which we can't tell if the results are caused by hospital or surgeon volume, making it unsuitable to answer this pico question</td>
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<tr>
<td>Peltola,M.; Malmivaara,A.; Paavola,M.</td>
<td>2012</td>
<td>Introducing a knee endoprosthesis model increases risk of early revision surgery</td>
<td>very low quality</td>
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<td>Zhang,Q.; Zhang,Q.; Guo,W.; Liu,Z.; Cheng,L.; Yue,D.; Zhang,N.</td>
<td>2014</td>
<td>The learning curve for minimally invasive Oxford phase 3 unicompartmental knee arthroplasty: cumulative summation test for learning curve (LC-CUSUM)</td>
<td>does not look at hospital knee arthroplasty volume, but rather experience with a new type of endoprosthesis does not look at surgeon volume, but rather the learning curve of a new minimially invasive surgery performed by &quot;an experienced knee surgeon&quot;</td>
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<td>Alnahdi, A.H.; Zeni, J.A.;</td>
<td>2012</td>
<td>The effect of progressive strengthening programs on function and</td>
<td>Not full text</td>
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<td>Snyder-Mackler, L.</td>
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<td>gait mechanics after unilateral total knee arthroplasty: A randomized</td>
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<td>Bade, M.J.; Stevens-Lapsley, J.E.</td>
<td>2012</td>
<td>Restoration of physical function in patients following total knee</td>
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<td>Bedekar, N.; Prabhu, A.;</td>
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<td>Comparative study of conventional therapy and additional yogasanas</td>
<td>Very Low Quality. Outcomes are not validated.</td>
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<td>Shyam, A.; Sancheti, K.;</td>
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<td>for knee rehabilitation after total knee arthroplasty</td>
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<tr>
<td>Sancheti, P.</td>
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<td>A randomized controlled trial of exercise to improve mobility and</td>
<td>Differences in groups do not allow for meaningful comparison needed to answer PICO</td>
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<td>function after elective knee arthroplasty. Feasibility, results and</td>
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<td>methodological difficulties</td>
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<td>Frost, H.; Lamb, S.E.;</td>
<td>2002</td>
<td>Use of Nintendo Wii Fit in the rehabilitation of outpatients</td>
<td>Comparison groups not relevant</td>
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<td>Robertson, S.</td>
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<td>following total knee replacement: a preliminary randomised controlled</td>
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<td>trial</td>
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<td>Fung, V.; Ho, A.; Shaffer, J.;</td>
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<td>Hydrotherapy after total knee arthroplasty. A follow-up study</td>
<td>Not common clinical practices and incomplete descriptions of interventions do not allow for a meaningful comparison. Groups receiving completely different interventions.</td>
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<td>Chung, E.; Gomez, M.</td>
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<td>Giaquinto, S.; Ciotola, E.;</td>
<td>2010</td>
<td>Land-based versus water-based rehabilitation following total knee</td>
<td>No outcomes we can extract.</td>
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<td>Dall’Armi, V.; Margutti, F.</td>
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<td>replacement: a randomized, single-blind trial</td>
<td>Poor reporting.</td>
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<td>The effectiveness of physiotherapy intervention with home exercise</td>
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<td>programme versus patient directed home exercise programme following</td>
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<td>Hensman-Crook, A.</td>
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<td>Kauppinen, T.; Kehlet, H.;</td>
<td>2014</td>
<td>Early progressive strength training to enhance recovery after</td>
<td>Unclear if all patients are receiving TKA for OA.</td>
</tr>
<tr>
<td>Husted, H.; Petersen, J.;</td>
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<td>fast-track total knee arthroplasty: a randomized controlled trial</td>
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<td>Bandholm, T.</td>
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<td>Economic evaluation of multidisciplinary rehabilitation after primary</td>
<td>Cost effectiveness study which is an extension of a previous study</td>
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<td>Aronen, P.</td>
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<td>total knee</td>
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<tr>
<td>Ohtonen,P.; Kyllonen,E.;</td>
<td>2013</td>
<td>arthroplasty based on a randomized controlled trial</td>
<td>already marked for inclusion. No additional outcomes to extract.</td>
</tr>
<tr>
<td>Arokoski,J.P.</td>
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<tr>
<td>Ko,V.; Naylor,J.; Harris,I.;</td>
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<td>One-to-One Therapy Is Not Superior to Group or Home-Based Therapy</td>
<td>Does not state diagnosis. Not an OA paper.</td>
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<td>After Total Knee Arthroplasty: A Randomized, Superiority Trial</td>
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<td>Mittal,R.</td>
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<td>Bourne,R.; Rorabeck,C.;</td>
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<td>total knee arthroplasty</td>
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<td>Vaz,M.</td>
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<td>using lower limbs robot-assisted training system</td>
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<td>2014</td>
<td>Functional outcomes of outpatient balance training following total</td>
<td>Duplicate</td>
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<td>knee replacement in patients with knee osteoarthritis: A randomized</td>
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<tr>
<td>Lowe,C.J.; Barker,K.L.; Holder,R.; Sackley,C.M.</td>
<td>2012</td>
<td>Comparison of postdischarge physiotherapy versus usual care</td>
<td>Duplicate. Already included</td>
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<td>following primary total knee arthroplasty for osteoarthritis: an</td>
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<td>exploratory pilot randomized clinical trial</td>
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<td>2013</td>
<td>Late group-based rehabilitation has no advantages compared with</td>
<td>Two completely different interventions compared, which does not allow for a</td>
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<td></td>
<td>supervised home-exercises after total knee arthroplasty</td>
<td>meaningful comparison to answer the PICO question.</td>
</tr>
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<td>Hansen,T.B.</td>
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<td>2008</td>
<td>Total knee arthroplasty: muscle impairments, functional limitations,</td>
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<td>Peters,C.; Lastayo,P.C.</td>
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<td>Minns Lowe,C.J.; Barker,K.L.; Dewey,M.; Sackley,C.M.</td>
<td>2007</td>
<td>Effectiveness of physiotherapy exercise after knee arthroplasty for</td>
<td>meta-analysis; saved for future reference (reviewed bib search)</td>
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<td>osteoarthritis: systematic review and meta-analysis of randomised</td>
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<tr>
<td>Naylor,J.M.;  Crosbie,J.;  Ko,V.</td>
<td>2014</td>
<td>Is there a role for rehabilitation streaming following total knee arthroplasty? Preliminary insights from a randomized controlled trial</td>
<td>Patient population does not meet inclusion criteria. Not</td>
</tr>
<tr>
<td>Piqueras,M.;  Marco,E.;  Coll,M.;  Escalada,F.;  Ballestre,A.;  Cinca,C.;  Belmonte,R.;  Muniesa,J.M.  Piva,S.R.;  Gil,A.B.;  Almeida,G.I.;  DiGioia,A.M.,III;  Levison,T.J.;  Fitzgerald,G.K.</td>
<td>2013</td>
<td>Effectiveness of an interactive virtual telerehabilitation system in patients after total knee arthroplasty: a randomized controlled trial</td>
<td>Patients getting TKA. Unclear and not stated whether it is OA patients.</td>
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<td>2010</td>
<td>A balance exercise program appears to improve function for patients with total knee arthroplasty: a randomized clinical trial</td>
<td>unclear if diagnosis is for OA</td>
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<td>2009</td>
<td>Comprehensive behavioral intervention compared to standard of care exercise program after total knee arthroplasty: A pilot randomized trial</td>
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<td>2004</td>
<td>No need for outpatient physiotherapy following total knee arthroplasty: a randomized controlled trial of 120 patients</td>
<td>No stated diagnosis of knee OA</td>
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<td>2005</td>
<td>Physiotherapy rehabilitation after total knee or hip replacement: an evidence-based analysis Internet-based outpatient telerehabilitation for patients following total knee arthroplasty: a randomized controlled trial</td>
<td>systematic review (reviewed bib search)</td>
</tr>
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<td>Szots, K.; Konradsen, H.; Solgaard, S.; Oestergaard, B.</td>
<td>2012</td>
<td>Early neuromuscular electrical stimulation to improve quadriceps muscle strength after total knee arthroplasty: a randomized controlled trial Telephone follow-up by nurse following total knee arthroplasty - protocol for a randomized clinical trial (NCT 01771315)</td>
<td>Not relevant to PICO. Does not answer question.</td>
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<td></td>
<td>2012</td>
<td>Not full text. Systematic review.</td>
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<td>Not relevant, does not answer pico question</td>
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<td>2013</td>
<td>Continuous saphenous nerve block as supplement to single-dose local infiltration analgesia for postoperative pain management after total knee arthroplasty</td>
<td>Not relevant, does not answer pico question</td>
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<td>Andersen,L.O.; Husted,H.; Otte,K.S.; Kristensen,B.B.; Kehlet,H.</td>
<td>2008</td>
<td>A compression bandage improves local infiltration analgesia in total knee arthroplasty</td>
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<td>2014</td>
<td>Analgesic efficacy of local infiltration analgesia in hip and knee arthroplasty: a systematic review</td>
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<td>Continuous blockade of the lumbar plexus after knee surgery: a comparison of the plasma concentrations and analgesic effect of bupivacaine 0.250% and 0.125%</td>
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<td>Baldini,A.; Aglietti,P.; Sensi,L.; Coppini,R.</td>
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<td>Efficacy of femoral nerve block in conjunction with epidural analgesia for total knee arthroplasty</td>
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<td>2008</td>
<td>Stimulating catheters for continuous femoral nerve blockade after total knee arthroplasty: a randomized, controlled, double-blinded trial</td>
<td>Not relevant, does not answer pico question</td>
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<td>2009</td>
<td>Functional outcome of femoral versus obturator nerve block after total knee arthroplasty</td>
<td>Not relevant comparison</td>
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<td>2012</td>
<td>Pharmacologic pain management before and after total joint replacement of the hip and knee</td>
<td>Narrative review</td>
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<td>Similar clinical outcome after unicompartmental knee arthroplasty using a conventional or accelerated care program: a randomized, controlled study of 40 patients</td>
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<td>Effects of perioperative analgesic technique on the surgical outcome and duration of rehabilitation after major knee surgery</td>
<td>Not relevant, everyone did not get TKR</td>
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<td>Chan,E.Y.; Fransen,M.; Sathappan,S.; Chua,N.H.; Chan,Y.H.; Chua,N.</td>
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<td>Not relevant; does not answer PICO question</td>
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<td>2013</td>
<td>Perineural morphine: a comparison with epidural morphine</td>
<td>Not relevant, does not answer pico question</td>
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<td>1988</td>
<td>Perineural morphine: a comparison with epidural morphine</td>
<td>Less than 10 patients per group</td>
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<td>Year</td>
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<td>Immediate and prolonged effects of pre- versus postoperative epidural analgesia with bupivacaine and morphine on pain at rest and during mobilisation after total knee arthroplasty</td>
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<td>Epidual infusion or combined femoral and sciatic nerve blocks as perioperative analgesia for knee arthroplasty</td>
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<td>Not relevant patient population, RA and OA patients</td>
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<td>Wilson,I.H.</td>
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<td>Postoperative analgesia by femoral nerve block with ropivacaine 0.2% after major knee surgery: continuous versus patient-controlled techniques</td>
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<td>Comparison of femoral nerve block and fascia iliaca block for analgesia following reconstructive knee surgery in adolescents</td>
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<td>Dobrydnjov,I.; Anderberg,C.;</td>
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<td>Analyzing the effectiveness of ropivacaine for knee surgery</td>
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<td>Olsson,C.; Shapurova,O.;</td>
<td></td>
<td>Epinephrine 4 microg/mL added to a low-dose mixture of ropivacaine and fentanyl for lumbar epidural analgesia after total knee arthroplasty</td>
<td>Not relevant, does not answer pico question</td>
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<td>Angel,K.; Bergman,S.</td>
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<td>Spinal analgesia compared with peripheral nerve blockade after major knee surgery: a</td>
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<td>Drakeford,M.K.; Pettine,K.A.;</td>
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<td>Not relevant patient population</td>
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<td>Not relevant patient population</td>
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<td>Analyzing the effectiveness of ropivacaine for knee surgery</td>
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<td>Pain relief after arthroscopic knee surgery: intravenous morphine, epidural morphine, and intra-articular morphine</td>
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<td>Effect of continuous psoas compartment block and intravenous patient controlled analgesia on postoperative pain control after total knee arthroplasty Not relevant, does not answer pico question</td>
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<td>Not relevant, hip and knee combined</td>
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<td>Not relevant; does not answer PICO question</td>
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<td>2005</td>
<td>The value of adding sciatic block to continuous femoral block for analgesia after total knee replacement</td>
<td>Not relevant; does not answer PICO question</td>
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<td>Not relevant; does not answer PICO question</td>
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<td>Freitas,D.G.; Barnett,J.T.;</td>
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<td>&lt;10 patients per group</td>
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<td>1996</td>
<td>All-polyethylene compared with metal-backed tibial components in total knee arthroplasty at</td>
<td>less than 90% of patients had knee OA</td>
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<td>Chaudhary,M.E.; Walker,P.S.</td>
<td>2014</td>
<td>Analysis of an early intervention tibial component for medial osteoarthritis</td>
<td>no patient oriented outcomes</td>
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<td>Cheng,T.; Zhang,G.; Zhang,X.</td>
<td>2011</td>
<td>Metal-backed versus all-polyethylene tibial components in primary total knee arthroplasty</td>
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<td>De Carvalho,B.R.; Yassaie,O.S.; Muir,D.C.</td>
<td>2013</td>
<td>Modular versus all-polyethylene tibial components: comparison of pre- and early post-operative patient scores in total knee replacement</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Engh,G.A.; Parks,N.L.; Ammeen,D.J.</td>
<td>1994</td>
<td>Tibial osteolysis in cementless total knee arthroplasty: A review of 25 cases treated with and without tibial component revision</td>
<td>very low quality</td>
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<td>Forster,M.C.; Bauze,A.J.; Keene,G.C.</td>
<td>2007</td>
<td>Lateral unicompartmental knee replacement: fixed or mobile bearing?</td>
<td>very low quality</td>
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<td>Gioe,T.J.; Sinner,P.; Mehle,S.; Ma,W.; Killeen,K.K.</td>
<td>2007</td>
<td>Excellent survival of all-polyethylene tibial components in a community joint registry</td>
<td>very low quality due to that the authors attempted to contact those lost to follow up in the poly group but not the metal backed group, revisions would be more under represented in the metal backed group than the poly group.</td>
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<td>2007</td>
<td>All-polyethylene and metal-backed tibias have similar outcomes at 10 years: a randomized level I [corrected] evidence study</td>
<td>unclear if all patients have osteoarthritis does not adequately answer the pico question on polyethylene tibial components. compares a mobile bearing implant to a fixed polyethylene implant. unclear if observed effects are from the being a fixed bearing prosthesis, or polyethylene tibial components</td>
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<td>Gioe,T.J.; Glynn,J.; Sembrano,J.; Suthers,K.; Santos,E.R.; Singh,J.</td>
<td>2009</td>
<td>Mobile and fixed-bearing (all-polyethylene tibial component) total knee arthroplasty designs. A prospective randomized trial</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Hyldahl,H.; Regner,L.; Carlsson,L.; Karrholm,J.; Weidenhielm,L.</td>
<td>2005</td>
<td>All-polyethylene vs. metal-backed tibial component in total knee arthroplasty-a randomized RSA study comparing early</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Hyldahl,H.; Regner,L.;</td>
<td>2005</td>
<td>Horizontally cemented components: AP better fixated than MB</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Carlsson,L.; Karrholm,J.;</td>
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<td>All-polyethylene vs. metal-backed tibial component in total knee arthroplasty-a randomized RSA study comparing early fixation of horizontally and completely cemented tibial components: part 2. Completely cemented components: MB not superior to AP components</td>
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<td>Lewis,P.; Rorabeck,C.H.;</td>
<td>1994</td>
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<td>Concentration of metal elements in the blood and urine in the patients with cementless total knee arthroplasty</td>
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<td>1998</td>
<td>A randomized controlled trial comparing &quot;high-flex&quot; vs &quot;standard&quot; posterior cruciate substituting polyethylene tibial inserts in total knee arthroplasty</td>
<td>compares to different cruciate substituting polyethylene devices</td>
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<td>Chang,C.H.; Yang,R.S.</td>
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<td>McCalden,R.W.; MacDonald,S.J.;</td>
<td>2009</td>
<td>Total knee arthroplasty with 4.4 mm of tibial polyethylene: 10-year followup Fracture of the polyethylene tibial post in posterior stabilized (Insall Burstein II) total knee arthroplasty</td>
<td>less than 90% of patients had knee OA</td>
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<td>Bourne,R.B.; Marr,J.T.</td>
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<td>Meding,J.B.; Ritter,M.A.;</td>
<td>2001</td>
<td>Surface grafting of biocompatible phospholipid polymer MPC provides wear resistance of tibial polyethylene insert in artificial knee joints</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Faris,P.M.</td>
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<td>Mestha,P.; Shenava,Y.;</td>
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<td>d'Arcy,J.C.</td>
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<td>Moro,T.; Takatori,Y.;</td>
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<td>Kyomoto,M.; Ishihara,K.;</td>
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<td>Saiga,K.; Nakamura,K.;</td>
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<td>Najibi,S.; Iorio,R.;</td>
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<td>Surdam,J.W.; Whang,W.;</td>
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<td>Appleby,D.; Healy,W.L.;</td>
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<td>Oonishi,H.; Aono,M.;</td>
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<td>Murata,N.; Kushitani,S.</td>
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<td>Regner,L.; Carlsson,L.;</td>
<td>1998</td>
<td>Ceramic coating improves tibial component fixation in total knee arthroplasty</td>
<td>doesn't answer pico questions. compares ceramic coating to no</td>
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<td>Karrholm,J.; Herberts,P.</td>
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<td>Rodolfo, Masera F.</td>
<td>2011</td>
<td>Unicompartmental knee prostheses: Comparison between tibial All-Poly and metal-back. Personal experience</td>
<td>ceramic coating in uncemented tka's</td>
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<td>2001</td>
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<td>not full text. abstract only</td>
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<td>2011</td>
<td>Superior fixation of pegged trabecular metal over screw-fixed pegged porous titanium fiber mesh: a randomized clinical RSA study on cementless tibial components</td>
<td>less than 90% of patients had knee OA</td>
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<td>1985</td>
<td>Unicompartmental and bicompartamental arthroplasty of the knee with a finned metal tibial-plateau implant</td>
<td>less than 90% of patients had knee OA</td>
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<td>2000</td>
<td>Ten- to 12-year followup of the Insall-Burstein I total knee prosthesis</td>
<td>doesn't answer pico question. does not compare metal to polyethylene tibial components</td>
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<td>2001</td>
<td>Matched-pair analysis of all-polyethylene versus metal-backed tibial components</td>
<td>less than 90% OA</td>
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<td>1994</td>
<td>Wear patterns on retrieved polyethylene tibial inserts and their relationship to technical considerations during total knee arthroplasty</td>
<td>less than 90% OA</td>
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<td>2013</td>
<td>Results of 1,000 Performance knees: cementless versus cemented fixation Hydroxyapatite-coated tibial implants compared with cemented tibial fixation in primary total knee arthroplasty. A randomized trial of outcomes at five years</td>
<td>less than 90% oak</td>
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<td>1998</td>
<td>Repeat of AAOS ID 13317</td>
<td>repeat of AAOS ID 13317</td>
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<td>Authors</td>
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<tr>
<td>Beckmann,J.; Luring,C.;</td>
<td>2011</td>
<td>Fixation of revision TKA: a review of the literature</td>
<td>Systematic review</td>
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<tr>
<td>Springorum,R.; Kock,F.X.;</td>
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<td>Grifka,J.; Tingart,M.</td>
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<td>Brown,T.E.; Harper,B.L.;</td>
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<td>Bjorgul,K.</td>
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<td>Buechel,F.F.; Keblish,P.A.;</td>
<td>2013</td>
<td>Comparison of cemented and uncemented fixation in total knee arthroplasty Low contact stress meniscal</td>
<td>narrative review</td>
</tr>
<tr>
<td>Lee,J.M.; Pappas,M.J.</td>
<td></td>
<td>bearing unicompartmental knee replacement: Long-term evaluation of cemented and cementless results</td>
<td>very low quality study due being retrospective, and because there was no attempt to measure or control for potential confounders systematic review?</td>
</tr>
<tr>
<td>Chaudhry,S.; Dunlop,D.</td>
<td>2012</td>
<td>Bone cement in arthroplasty The outcome of cemented vs. cementless fixation of a femoral component in total knee replacement (TKR) with the identification of radiological signs for the prediction of failure</td>
<td>less than 90% of patients</td>
</tr>
<tr>
<td>Chockalingam,S.; Scott,G.</td>
<td>2000</td>
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<tr>
<td>Cloke,D.J.; Khatri,M.;</td>
<td>2008</td>
<td>284 press-fit Kinemax total knee arthroplasties followed for 10 years: poor survival of uncemented prostheses</td>
<td>less than 90% of patients had knee OA</td>
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<td>Pinder,I.M.; McCaskie,A.W.;</td>
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<td>Lingard,E.A.</td>
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<tr>
<td>Cohen,R.G.; Forrest,C.J.;</td>
<td>1997</td>
<td>Safety and efficacy of bilateral total knee arthroplasty VersaBond bone cement: Prospective randomized study of the clinical properties of a new bone cement in total knee replacement</td>
<td>less than 90% of patients had knee OA not relevant comparison. compares two types of bone cement</td>
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<tr>
<td>Benjamin,J.B.</td>
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<tr>
<td>Dalen,T.; Nilsson,K.G.</td>
<td>2005</td>
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<tr>
<td>Diaz-Borjon,E.; Yamakado,K.;</td>
<td>2004</td>
<td>Cement penetration using a tibial punch cement pressurizer in total knee arthroplasty Total knee arthroplasty fixation. Comparison of the early results of paired cemented versus uncemented porous coated anatomic knee prostheses</td>
<td>no patient oriented outcomes less than 90% of patients had knee OA unclear if 90% of patients had knee OA and would be appraised as very low quality due to being retrospective and using different inclusion criteria for each treatment group</td>
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<tr>
<td>Pinilla,R.; Worland,R.L.</td>
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<td>Dodd,C.A.; Hungerford,D.S.;</td>
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<td>Krackow,K.A.</td>
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<td>Duffy,G.P.; Berry,D.J.; Rand,J.A.</td>
<td>1998</td>
<td>Cement versus cementless fixation in total knee arthroplasty</td>
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<tr>
<td>Epinette,J.A.</td>
<td>2014</td>
<td>Long lasting outcome of hydroxyapatite-coated implants in primary knee arthroplasty: a continuous series of two hundred and seventy total knee arthroplasties at fifteen to twenty two years of clinical follow-up</td>
<td>does not compare uncemented and cemented arthroplasties</td>
</tr>
<tr>
<td>Gao,F.; Henricson,A.; Nilsson,K.G.</td>
<td>2009</td>
<td>Cemented versus uncemented fixation of the femoral component of the NexGen CR total knee replacement in patients younger than 60 years. A Prospective Randomised Controlled RSA Study</td>
<td>doesn't answer pico question. one group has the tibial component cemented and the other has the femoral component cemented. does not answer question as to whether cementing one or more components is better than no cementing or partial cementing. very low quality due to being retrospective, and not being able to measure important covariates.</td>
</tr>
<tr>
<td>Gioe,T.J.; Novak,C.; Sinner,P.; Ma,W.; Mehle,S.</td>
<td>2007</td>
<td>Knee arthroplasty in the young patient: survival in a community registry</td>
<td></td>
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<tr>
<td>Graves,S.; Sedrakyan,A.; Baste,V.; Gioe,T.J.; Namba,R.; Cruz,O.M.; Stea,S.; Paxton,E.; Banerjee,S.; Isaacs,A.J.; Robertsson,O.</td>
<td>2014</td>
<td>International comparative evaluation of knee replacement with fixed or mobile-bearing posterior-stabilized prostheses</td>
<td>all patients got posterior stabilized implants</td>
</tr>
<tr>
<td>Gruber,G.; Schlechta,C.; Sturz,H.</td>
<td>1998</td>
<td>Ten-year follow-up of a bicondylar unlinked knee endoprosthesis with particular reference to mid-term results</td>
<td>less than 90%; also would likely be not best available evidence would be very low quality due to age differences between groups, and an average of 2.7 years difference in follow up</td>
</tr>
<tr>
<td>Hartford,J.M.; Hunt,T.; Kaufer,H.</td>
<td>2001</td>
<td>Low contact stress mobile bearing total knee arthroplasty: results at 5 to 13 years</td>
<td></td>
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<tr>
<td>Helm,A.T.; Kerin,C.; Ghalayini,S.R.; McLauchlan,G.J.</td>
<td>2009</td>
<td>Preliminary results of an uncemented trabecular metal tibial component in total knee arthroplasty</td>
<td>does not compare cemented and uncemented arthroplasty</td>
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<tr>
<td>Hofmann,A.A.; Wyatt,R.W.B.; Beck,S.W.; Alpert,J.</td>
<td>1991</td>
<td>Cementless total knee arthroplasty in patients over 65 years old</td>
<td>review</td>
</tr>
<tr>
<td>Hofmann,A.A.</td>
<td>2010</td>
<td>The design principles of the Natural-Knee system</td>
<td>narrative review</td>
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<tr>
<td>Hooper,G.J.; Maxwell,A.R.; Wilkinson,B.; Mathew,J.; Woodfield,T.B.; Penny,I.D.; Burn,P.J.; Frampton,C.</td>
<td>2012</td>
<td>The early radiological results of the uncemented Oxford medial compartment knee replacement</td>
<td>does not compare cemented and uncemented arthroplasty</td>
</tr>
<tr>
<td>Huddleston,J.I.; Wiley,J.W.; Scott,R.D.</td>
<td>2005</td>
<td>Zone 4 femoral radiolucent lines in hybrid versus cemented total knee arthroplasties: are they clinically significant?</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Kamath,A.F.; Lee,G.-C.; Sheth,N.P.; Nelson,C.L.; Garino,J.P.; Israelite,C.L.</td>
<td>2011</td>
<td>Prospective Results of Uncemented Tantalum Monoblock Tibia in Total Knee Arthroplasty. Minimum 5-Year Follow-up in Patients Younger Than 55 Years</td>
<td>very low quality due to pre-operative differences in knee society score and age that were not controlled for and because of potential conflict of interest very low quality</td>
</tr>
<tr>
<td>Keblish,P.</td>
<td>1991</td>
<td>Results and complications of the LCS (Low Contact Stress) knee system</td>
<td>very low quality</td>
</tr>
<tr>
<td>Kim,Y.H.</td>
<td>1990</td>
<td>The incidence of deep vein thrombosis after cementless and cemented knee replacement A radiological analysis of uncemented PCA tibial implants with a follow-up period of 4-7 years</td>
<td>very low quality not relevant. does not compare cemented to uncemented arthroplasty</td>
</tr>
<tr>
<td>Knahr,K.; Salzer,M.; Schmidt,W.</td>
<td>1990</td>
<td>Total knee arthroplasty using cementless keels and cemented tibial trays: 10-year results</td>
<td>does not compare cemented or hybrid versus uncemented ka</td>
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<tr>
<td>Laskin,R.S.</td>
<td>1988</td>
<td>Tricon-M uncemented total knee arthroplasty. A review of 96 knees followed for longer than 2 years</td>
<td>not relevant, does not compare cemented to uncemented arthroplasty</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>Cementless fixation in Oxford unicompartmental knee replacement: a multicentre study of 1000 knees</td>
<td>very low quality</td>
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<tr>
<td></td>
<td>1988</td>
<td>The PCA unicompartmental knee. A 1-4-year comparison of fixation with or without cement</td>
<td>very low quality</td>
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<tr>
<td></td>
<td>2001</td>
<td>Changes in bone density after cemented total knee arthroplasty: Influence of stem design Early changes in muscle strength after total knee arthroplasty. A 6-month follow-up of 30 knees</td>
<td>&lt;10 patients per group does not compare cemented and uncemented arthroplasty systematic review?</td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>Comparison of cemented and cementless hip and knee replacements Comparison of bone mineral density between porous tantalum and cemented tibial total knee arthroplasty components</td>
<td>no patient oriented outcomes</td>
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<tr>
<td></td>
<td>1990</td>
<td>Total knee arthroplasty in patients (less-than-or-equal to)50 years old</td>
<td>less than 90% of patients had knee OA</td>
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<td></td>
<td>1979</td>
<td>ICLH replacement of the knee: 1977 and 1978</td>
<td>less than 90% of patients had knee OA</td>
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<td></td>
<td>1990</td>
<td>Perioperative blood loss associated with total knee arthroplasty. A comparison of procedures performed with and without cementing</td>
<td>&lt; 10 patients per group in subgroup of patients with OA</td>
</tr>
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<tr>
<td>Nakama,G.Y.; Peccin,M.S.; Almeida,G.J.;</td>
<td>2012</td>
<td>Cemented, cementless or hybrid fixation options in total knee arthroplasty for osteoarthritis and other non-traumatic diseases</td>
<td>meta-analysis</td>
</tr>
<tr>
<td>Lira Neto,Ode A.; Queiroz,A.A.; Navarro,R.D.</td>
<td></td>
<td>Cementless total knee arthroplasty in unselected cases of osteoarthritis and rheumatoid arthritis. A 3-year follow-up study of 103 cases</td>
<td>does not compare cemented and uncemented arthroplasty</td>
</tr>
<tr>
<td>Nielsen,P.T.; Hansen,E.B.; Rechnagel,K.</td>
<td>1992</td>
<td>Evaluation of micromotion in cemented vs uncemented knee arthroplasty in osteoarthrosis and rheumatoid arthritis. Randomized study using roentgen stereophotogrammetric analysis</td>
<td>not full text. abstract only</td>
</tr>
<tr>
<td>Nilsson,K.G.; Karrholm,J.; Ekelund,L.; Magnusson.P.</td>
<td>1991</td>
<td>Femoral component migration in total knee arthroplasty: randomized study comparing cemented and uncemented fixation of the Miller-Galante I design</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Nilsson,K.G.; Henricson,A.; Norgren,B.; Dalen,T.</td>
<td>2006</td>
<td>Uncemented HA-coated implant is the optimum fixation for TKA in the young patient</td>
<td>&lt;90% OA patients</td>
</tr>
<tr>
<td>Oeguder,A.; Firt,A.; Tecimel,O.; Solak,S.; Bozkurt,M.</td>
<td>2010</td>
<td>Two-stage total infected knee arthroplasty treatment with articulating cement spacer</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Onsten,I.; Nordqvist,A.; Carlsson,A.S.; Besjakov,J.; Shott,S.</td>
<td>1998</td>
<td>Hydroxyapatite augmentation of the porous coating improves fixation of tibial components</td>
<td>no patient oriented outcomes</td>
</tr>
<tr>
<td>Pecina,M.; Djapic,T.; Haspl,M.</td>
<td>2000</td>
<td>Survival of cementless and cemented porous-coated anatomic knee replacements: retrospective cohort study</td>
<td>less than 90% of patients had knee OA</td>
</tr>
<tr>
<td>Pelt,C.E.; Gilililand,J.M.; Doble,J.; Stronach,B.M.; Peters,C.L.</td>
<td>2013</td>
<td>Hybrid total knee arthroplasty revisited: Midterm followup of hybrid versus cemented fixation in total knee arthroplasty</td>
<td>very low quality, downgraded for being retrospective, and potential selection bias due to surgeon using clinical criteria to allocate patients to hybrid or cemented fixation.</td>
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<td>Pijls,B.G.; Valstar,E.R.;</td>
<td>2012</td>
<td>The beneficial effect of hydroxyapatite lasts: a randomized radiostereometric trial comparing hydroxyapatite-coated, uncoated, and cemented tibial components for up to 16 years</td>
<td>less than 90% of patients had knee OA</td>
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<td>Kaptein,B.L.; Fiocco,M.;</td>
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<td>Nelissen,R.G.</td>
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<td>Regnér,L.R.; Carlsson,L.V.;</td>
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<td>Karrholm,J.N.; Hansson,T.H.;</td>
<td>1999</td>
<td>Bone mineral and migratory patterns in uncemented total knee arthroplasties: a randomized 5-year follow-up study of 38 knees</td>
<td>no patient oriented outcomes</td>
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<tr>
<td>Herberts,P.G.; Swanpalmer,J.</td>
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<td>Regner,L. R.; Carlsson,L.V.;</td>
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<td>Karrholm,J.N.; Hansson,T.H.;</td>
<td>1999</td>
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<td>Herberts,P.G.; Swanpalmer,J.</td>
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<tr>
<td>Reichen,A.; Ruegsegger,M.</td>
<td>2012</td>
<td>Five-year results of total knee arthroplasty with the Vario Knee System: a prospective analysis 20 Year follow-up of the AGC total knee replacement</td>
<td>very low quality</td>
</tr>
<tr>
<td>Ritter,M.A.</td>
<td>2008</td>
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<td>Not retrievable</td>
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<td>Lewis,P.L.; Nott,L.</td>
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<td>Rorabeck,C.H.</td>
<td>1999</td>
<td>Total knee replacement: should it be cemented or hybrid?</td>
<td>no patient oriented outcomes</td>
</tr>
<tr>
<td>Signorelli,J.J.; Bernini,P.M.</td>
<td>2011</td>
<td>Uncemented total knee arthroplasty: 2-year follow-up of 100 knees with a rotating platform, cruciate-retaining design</td>
<td>doesn't answer PICO question</td>
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<td>Shirreffs,T.G.</td>
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<td>because there is no comparison to cemented arthroplasty</td>
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<tr>
<td>Small,S.R.; Ritter,M.A.;</td>
<td>2013</td>
<td>Changes in tibial bone density measured from standard radiographs in cemented and uncemented total knee replacements after ten years' follow-up</td>
<td>no patient oriented outcomes</td>
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<td>Merchun,J.G.; Davis,K.E.;</td>
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<td>Rogge,R.D.</td>
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<td>Specchiulli,F.; Gabrieli,R.;</td>
<td>2007</td>
<td>Midterm results of mobile-bearing knee replacements</td>
<td>does not compare cemented and uncemented arthroplasty</td>
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<tr>
<td>Borsetti,D.; Di,Carlo,V</td>
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<tr>
<td>Stern, S.H.; Bowen, M.K.; Insall, J.N.; Scuderi, G.R.</td>
<td>1990</td>
<td>Cemented total knee arthroplasty for gonarthrosis in patients 55 years old or younger Early inducible displacement of tibial components in total knee prostheses inserted with and without cement. A randomized study with roentgen stereophotogrammetric analysis Cemented versus hydroxyapatite fixation of the femoral component of the Freeman-Samuelson total knee replacement: a radiostereometric analysis</td>
<td>does not compare cemented and uncemented arthroplasty</td>
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<tr>
<td>Uvehammer, J.; Karrholm, J.; Carlsson, L.</td>
<td>2007</td>
<td>Cemented versus hydroxyapatite fixation of the femoral component of the Freeman-Samuelson total knee replacement: a radiostereometric analysis</td>
<td>no patient oriented outcomes</td>
</tr>
<tr>
<td>Cornell, C.N.; Ranawat, C.S.; Burstein, A.H.</td>
<td>1986</td>
<td>A clinical and radiographic analysis of loosening of total knee arthroplasty components using a bilateral model</td>
<td>all patients get hybrid arthroplasty</td>
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<tr>
<td>Laskin, R.S.</td>
<td>993</td>
<td>Blood loss in total knee arthroplasty</td>
<td>very low quality</td>
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<td>2010</td>
<td>Revision total knee arthroplasty with a cemented posterior stabilized, condylar constrained or fully constrained prosthesis: a minimum 2-year follow-up analysis</td>
<td>does not compare cemented or hybrid versus uncemented knee OA</td>
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<td>1997</td>
<td>Survivorship of cemented total knee arthroplasty</td>
<td>less than 90% of patients had knee OA</td>
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<td>1997</td>
<td>Total knee arthroplasty using an uncemented, polyethylene tibial implant. A seven-year follow-up study</td>
<td>does not compare cemented and uncemented arthroplasty</td>
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<tr>
<td>Adili,A.; Bhandari,M.; Petruccelli,D.; de,Beer J.</td>
<td>2001</td>
<td>Sequential bilateral total knee arthroplasty under 1 anesthetic in patients (greater-than or equal to)75 years old: Complications and functional outcomes</td>
<td>not all patients in the unilateral group had bilateral surgery, since the authors note that 33 right and 49 left knee surgeries were performed in this group</td>
</tr>
<tr>
<td>Alosh,H.; Shah,R.P.; Courtney,P.M.; Virk,S.; Israelite,C.L.</td>
<td>2014</td>
<td>One-week staged bilateral total knee arthroplasty protocol: a safety comparison of intended and completed surgeries</td>
<td>not relevant comparison. staged TKA patients compared to patients who cancelled their second TKA surgery</td>
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<tr>
<td>Bagsby,D.; Pierson,J.L.</td>
<td>2015</td>
<td>Functional outcomes of simultaneous bilateral versus unilateral total knee arthroplasty</td>
<td>not all patient in the unilateral group had staged bilateral surgery</td>
</tr>
<tr>
<td>Benjamin,J.; Tucker,T.; Ballesteros,P.</td>
<td>2001</td>
<td>Is obesity a contraindication to bilateral total knee arthroplasties under one anesthetic?</td>
<td>not all patients had bilateral OA. patients who had simultaneous arthroplasty were compared to a unilateral group, but only some of the unilateral patients had multiple operations. Appraised as very low quality due to preoperative differences in BMI, ASA status, surgeon volume and age which were not controlled for in the analysis. not all patients had knee OA</td>
</tr>
<tr>
<td>Bini,S.A.; Khatod,M.; Inacio,M.C.S.; Paxton,E.W.</td>
<td>2014</td>
<td>Same-Day Versus Staged Bilateral Total Knee Arthroplasty Poses No Increase in Complications in 6672 Primary Procedures</td>
<td>does not compare simultaneous to staged tka</td>
</tr>
<tr>
<td>Capeci,C.M.; Brown,E.C.,III; Scuderi,G.R.; Scott,W.N. Chan,W.C.; Musonda,P.; Cooper,A.S.</td>
<td>2009</td>
<td>Component asymmetry in simultaneous bilateral total knee arthroplasty</td>
<td>very low quality</td>
</tr>
<tr>
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<tr>
<td>Chen,J.Y.; Lo,N.N.; Jiang,L.; Chong,H.C.;</td>
<td></td>
<td>Simultaneous versus staged bilateral unicompartamental knee replacement</td>
<td>would be very low quality due to being retrospective, and for not adjusting for preoperative differences in age, BMI and comorbidities between the staged and simultaneous groups.</td>
</tr>
<tr>
<td>Tay,D.K.; Chin,P.L.; Chia,S.L.; Yeo,S.J.</td>
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<td>Courtney,P.M.; Melnic,C.M.; Alosh,H.</td>
<td>2014</td>
<td>Is Bilateral Total Knee Arthroplasty Staged at a One-Week Interval Safe? A Matched Case Control Study</td>
<td>includes 7 RA subjects</td>
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<td>Shah,R.P.; Nelson,C.L.; Israelite,C.L.</td>
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<td>Dimitris,C.N.; Taylor,B.C.; Mowbray,J.G.;</td>
<td>2011</td>
<td>Perioperative morbidity and mortality of 2-team simultaneous bilateral total knee arthroplasty</td>
<td>intervention is re: anesthetic</td>
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<td>Steensen,R.N.; Gaines,S.T; Fajardo,M.;</td>
<td></td>
<td>Effect of a perioperative intra-articular injection on pain control and early range of motion following bilateral TKA</td>
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<td>Collins,J.; Landa,J.; Adler,E.; Meere,P.;</td>
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<td>Bilateral total knee replacement under one anesthetic</td>
<td>compares unilat &amp; bilat but not staged/simul bilat</td>
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<td>Di Cesare,P.E.</td>
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<td>Gradillas,E.L.; Volz,R.G.</td>
<td>1979</td>
<td>Simultaneous bilateral MIS-TKA results in faster functional recovery</td>
<td>intervention abt minimal invasion</td>
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<td>2008</td>
<td></td>
<td>very low quality rating due to different lengths of follow up between groups (i.e. difference of 8 months) and selective outcomes reporting. Not all patients had knee OA. 38% of the patients had RA and there were less than 10 OA patients in each treatment group</td>
</tr>
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<td>Hardaker,W.T.,Jr.; Ogden,W.S.;</td>
<td>1978</td>
<td>Simultaneous and staged bilateral total knee arthroplasty</td>
<td>unilat v bilat; includes hip arthroplastian</td>
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<td>Musgrave,R.E.; Goldner,J.L.</td>
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<td>appraised as very low quality due to not controlling for preoperative differences in age and knee</td>
</tr>
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<td>Hashmi,F.R.; Barlas,K.; Mann,C.F.;</td>
<td>2007</td>
<td>Staged bilateral hip or knee arthroplasties</td>
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<td>Howell,F.R.; Husted,H.; Troelsen,A.;</td>
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<td>Otte,K.S.; Kristensen,B.B.; Holm,G.;</td>
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<td>Fast-track surgery for bilateral total knee replacement</td>
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<td>Kehlet,H.</td>
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<th>Authors</th>
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<th>Reason for Exclusion</th>
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<td>2006</td>
<td>A comparison of bilateral uncemented total knee arthroplasty: simultaneous or staged?</td>
<td>extension. not all patients had knee OA Study pop includes other diagnoses for TKA</td>
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<td>Ishii,Y.; Noguchi,H.; Takeda,M.; Sato,J.; Toyabe,S.I.; Jain,S.; Wasnik,S.; Mittal,A.; Sohoni,S.; Kasture,S.</td>
<td>2013</td>
<td>Time between the first and second operations for staged total knee arthroplasties when the interval is determined by the patient</td>
<td>case series</td>
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<td>kilincoglu,V.; Unay,K.; Akan,K.; Esenkaya,I.; Poyanli,O.</td>
<td>2010</td>
<td>Component alignment in simultaneous bilateral or unilateral total knee arthroplasty</td>
<td>unclear if control group had operations on both knees.</td>
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<td>Kim,S.; Meehan,J.P.; White,R.</td>
<td>2011</td>
<td>Operative risk of staged bilateral knee arthroplasty is underestimated in retrospective studies</td>
<td>Systematic review (reviewed bib search)</td>
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<td>Kim,S.Y.; An,Y.J.; Kim,S.H.; Kim,H.K.; Park,J.S.; Shin,Y.S.</td>
<td>2011</td>
<td>The effect of postoperative pain on postoperative blood loss after sequential bilateral total knee arthroplasty</td>
<td>Intervention is neither simult nor staged</td>
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<td>Kim,Y.-H.; Kim,J.-S.; Choi,Y.</td>
<td>2009</td>
<td>Osteolysis After Unidirectional and Multidirectional Mobile-Bearing Total Knee Arthroplasty in Young Patients</td>
<td>Intervention is type of prosthesis in simult bilat tka not simult v staged</td>
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<td>Kim,Y.H.; Choi,Y.W.; Kim,J.S.</td>
<td>2009</td>
<td>Simultaneous bilateral sequential total knee replacement is as safe as unilateral total knee replacement</td>
<td>Compares unilat &amp; bilat but not staged/simult bilat</td>
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<td>Liu,T.K.; Chen,S.H.</td>
<td>1998</td>
<td>Simultaneous bilateral total knee arthroplasty in a single procedure</td>
<td>very low quality because allocation was based on clinical characteristics that would have resulted in differences in group demographics. potential confounders were not controlled for in the statistical analysis, resulting in very low quality</td>
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<td>Mangaleshkar,S.R.; Prasad,P.S.; Chugh,S.; Thomas,A.P.; Mantilla,C.B.; Horlocker,T.T.; Schroeder,D.R.; Berry,D.J.; Brown,D.L.</td>
<td>2001</td>
<td>Staged bilateral total knee replacement--a safer approach in older patients</td>
<td>unclear if 90% of patients had knee OA</td>
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<td>Mantilla,C.B.; Horlocker,T.T.; Schroeder,D.R.; Berry,D.J.; Brown,D.L.</td>
<td>2003</td>
<td>Risk factors for clinically relevant pulmonary embolism and deep venous thrombosis in patients undergoing primary hip or knee arthroplasty</td>
<td>combines hip and knee arthroplasty</td>
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<td>1985</td>
<td>Bilateral total knee arthroplasties. Comparison of simultaneous (two-team), sequential, and staged knee replacements</td>
<td>very low quality due to being retrospective, and not adjusting for potential confounders in the analysis. not all patients had knee OA</td>
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<td>Miniaci,A.; Arneja,S.; Jones,M.</td>
<td>2011</td>
<td>Mid term clinical results of a novel knee resurfacing arthroplasty for focal medial compartment</td>
<td>n=5 for interventions of interest</td>
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<td>Murray,A.; Brenkel,I.</td>
<td>2003</td>
<td>Bilateral total knee replacement</td>
<td>systematic review?</td>
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<td>Ritter,M.; Maitlin,L.A.; Melfi,C.A.; Katz,B.P.; Freund,D.A.; Arthur,D.S.</td>
<td>1997</td>
<td>Outcome implications for the timing of bilateral total knee arthroplasties</td>
<td>less than 90% OA and would likely be very low quality due to not adjusting for potential confounding</td>
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<td>Simultaneous knee replacement is better for the patient</td>
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<td>Rossi,M.D.; Brown,L.E.; Whitehurst,M.</td>
<td>2006</td>
<td>Knee extensor and flexor torque characteristics before and after unilateral total knee arthroplasty</td>
<td>Neither simult nor staged bilat TKA intervention</td>
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<td>Sculco,T.P.; Sculco,P.K.</td>
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<td>Simultaneous-bilateral TKA: double trouble opposes</td>
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<td>2009</td>
<td>Bilateral total knee arthroplasty in patients 70 years and older</td>
<td>does not answer the pico question, the unilateral groups did not have contralateral surgery.</td>
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<td>Shah,K.; Smith,J.; Jones,B.; Hullin,M.</td>
<td>2007</td>
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<td>not all patients in control group had bilateral knee arthroplasty</td>
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<td>2005</td>
<td>Staggered bilateral total knee arthroplasty performed four to seven days apart during a single hospitalization</td>
<td>very low quality</td>
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<td>Does bilateral total knee arthroplasty affect gait in women?: comparison of gait analyses before and after total knee arthroplasty compared with normal knees</td>
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<td>does not compare simultaneous to staged tka</td>
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<td>1985</td>
<td>Successive bilateral total knee replacement</td>
<td>very low quality due confounding by indication. patients deemed too unhealthy to undergo anesthesia multiple times were given simultaneous surgery. there was no control for this confounding factor, and not all patients have OA</td>
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<td>Spicer,E.; Thomas,G.R.;</td>
<td>2013</td>
<td>Comparison of the major intraoperative and postoperative complications between unilateral and sequential bilateral total knee arthroplasty in a high-volume community hospital</td>
<td>not all patients had bilateral OA knee</td>
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<td>unclear if all patients had bilateral arthroplasty. the author make the assumption that all patients in the registry who had another arthroplasty within the next hear had bilateral symptoms at baseline.</td>
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<td>Brenkel,I.J.</td>
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<td>2011</td>
<td>[Results of single stage vs. two-stage total knee arthroplasty]</td>
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<td>Mendel,T.; Zeh,A.</td>
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<td>simult compared to unilat not staged</td>
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<td>Safety of bilateral total knee arthroplasty in morbidly obese patients</td>
<td>unclear if all patients had knee OA</td>
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<td>Steensen,R.A.; Gaines,S.T.</td>
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<td>2014</td>
<td>What are the rates and causes of hospital readmission after total knee arthroplasty? Knee Comparison of functional results with navigation-assisted minimally invasive and conventional techniques in bilateral total knee arthroplasty</td>
<td>unclear if all patients had knee OA</td>
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<td>Seon,J.K.; Song,E.K.;</td>
<td>2007</td>
<td>CT-free computer-assisted total knee arthroplasty versus the conventional technique: radiographic results of 100 cases</td>
<td>not relevant comparison. both patient groups get simultaneous tka.</td>
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<td>Cho,S.G.</td>
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<td>BÄthis,H.; Perlick,L.;</td>
<td>2004</td>
<td>The advantages of computer assistance in total knee arthroplasty</td>
<td>no patient oriented outcomes</td>
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<td>Grifka,J.</td>
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<td>Bar,M.C.; Daubresse,F.;</td>
<td>2011</td>
<td></td>
<td>very low quality</td>
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<td>Hugon,S.</td>
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<td>Mechanical accuracy of navigated minimally invasive total knee arthroplasty (MIS TKA)</td>
<td>does not answer pico question. compares minimally invasive navigation to conventional navigation</td>
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<td>Computer navigation-assisted versus minimally invasive TKA: benefits and drawbacks</td>
<td>minimally invasive</td>
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<td>2007</td>
<td>Minimally invasive implantation and computer navigation for a unicompartmental knee system</td>
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<td>Kinematic navigation in total knee replacement—experience from the first 50 cases</td>
<td>very low quality</td>
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<td>Chotanaphuti,T.; Ongnamthip,P.; Teeraleekul,K.; Kraturerk,C.</td>
<td>2008</td>
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<td>2009</td>
<td>Differences between sagittal femoral mechanical and distal reference axes should be considered in navigated TKA</td>
<td>no intervention</td>
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<td>2010</td>
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<td>no patient oriented outcomes</td>
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<td>2003</td>
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<td>unclear if 90% of patients had knee OA</td>
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<td>2005</td>
<td>The use of computer-assisted surgical navigation to prevent malalignment in unicompartmental knee arthroplasty</td>
<td>very low quality</td>
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<td>Accuracy of dynamic tactile-guided unicompartmental knee arthroplasty</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Intra-operative quantification of patello-femoral joint kinematics in total knee arthroplasty and its correlation with femoral component position</td>
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<td>Functional outcome and alignment in computer-assisted and conventionally operated total knee replacements: a multicentre parallel-group randomised controlled trial</td>
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<td>Rotational alignment of femoral components in total knee arthroplasty: nonimage-based</td>
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<td>Hart, R.; Janecek, M.; Chaker, A.; Bucek, P.</td>
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<td>Total knee arthroplasty implanted with and without kinematic navigation</td>
<td>no patient oriented outcomes</td>
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<td>Computer navigation vs conventional total knee arthroplasty: five-year functional results of a prospective randomized trial</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>2011</td>
<td>Randomized trial of computer-assisted knee arthroplasty: impact on clinical and radiographic outcomes</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>2012</td>
<td>More accurate component alignment in navigated total knee arthroplasty has no clinical benefit at 5-year follow-up</td>
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<td>2013</td>
<td>Computer-assisted surgery: A teacher of TKAs</td>
<td>no patient oriented outcomes</td>
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<td>2007</td>
<td>The rationale for navigated minimally invasive unicompartmental knee replacement</td>
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<td>2013</td>
<td>Evaluation of total knee arthroplasty performed with and without computer navigation: a bilateral total knee arthroplasty study</td>
<td>very low quality</td>
</tr>
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<td></td>
<td>2009</td>
<td>Comparison of Minimally Invasive Unicompartmental Knee Arthroplasty With or Without a Navigation System</td>
<td>would be very low quality due to choosing the most symptomatic knee to get navigation. would confound results</td>
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<tr>
<td>Kim, S.J.; MacDonald, M.;</td>
<td>2005</td>
<td>Computer assisted navigation in total knee arthroplasty: Improved coronal alignment</td>
<td>no patient oriented outcomes</td>
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<td>Comparison of operative time and accuracy using conventional fixed navigation cutting blocks and adjustable Pivotal (trademark) cutting blocks</td>
<td>internvention is re cutting blocks not navigation</td>
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<td>Klima, S.; Zeh, A.; Josten, C.</td>
<td>2008</td>
<td>The long-term benefit of computer-assisted surgical navigation in unicompartmental knee arthroplasty</td>
<td>very low quality</td>
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<td>Functional outcome after computer-assisted versus conventional total knee arthroplasty: a randomized controlled study</td>
<td>duplicate</td>
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<td>Spriggins, A.J.</td>
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<td>Accuracy of implant alignment and early results after minimally invasive vs conventional OrthoPilot-navigated Columbus TKA</td>
<td>minimally invasive</td>
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<td>Lützner, J.; Günther, K.P.;</td>
<td>2010</td>
<td>The long-term benefit of computer-assisted surgical navigation in unicompartmental knee arthroplasty</td>
<td>very low quality</td>
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<tr>
<td>Kirschner, S.</td>
<td></td>
<td>Comparison of operative time and accuracy using conventional fixed navigation cutting blocks and adjustable Pivotal (trademark) cutting blocks</td>
<td>internvention is re cutting blocks not navigation</td>
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<td>Lee, D.-H.; Lee, D.-K.; Shin, Y.-S.; Han, S.-B.</td>
<td>2013</td>
<td>Mid-term outcomes of floating platform mobile-bearing total knee arthroplasty under navigational guidance with a minimum 4-year follow-up</td>
<td>not relevant, does not compare surgical navigation to no navigation</td>
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<td>Lee, H.J.; Lee, J.S.; Jung, H.J.; Song, K.S.; Yang, J.J.; Park, C.W.</td>
<td>2011</td>
<td>Comparison of joint line position changes after primary bilateral total knee arthroplasty performed using the navigation-assisted measured gap resection or gap balancing techniques</td>
<td>doesn't answer pico question. compares different navigations techniques</td>
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<td>Lionberger, D.R.; Weise, J.; Ho, D.M.; Haddad, J.L.</td>
<td>2008</td>
<td>How does electromagnetic navigation stack up against infrared navigation in minimally invasive total knee arthroplasties?</td>
<td>does not answer pico question. compares two different types of navigation</td>
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<td>Ma, B.; Rudan, J.; Chakraverty, R.; Grant, H.</td>
<td>2009</td>
<td>Computer-assisted FluorooGuide navigation of unicompartmental knee arthroplasty</td>
<td>very low quality</td>
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<td></td>
<td>2012</td>
<td>Post traumatic knee arthritis: Navigated total knee replacement without hardware removal</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>2010</td>
<td>Tibial stress fracture after computer-navigated total knee arthroplasty</td>
<td>case report</td>
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<td></td>
<td>2004</td>
<td>Prosthetic alignment and sizing in computer-assisted total knee arthroplasty</td>
<td>no patient oriented outcomes</td>
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<td></td>
<td>2011</td>
<td>Computer-assisted navigation software advancements improve the accuracy of total knee arthroplasty</td>
<td>would be very low quality due to differences in severity at baseline between groups that were not statistically adjusted for</td>
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<tr>
<td></td>
<td>2004</td>
<td>Distal femoral cut perpendicular to the mechanical axis may induce varus instability in flexion in medial osteoarthritic knees with varus deformity in total knee arthroplasty: a pitfall of the navigation system</td>
<td>narrative review</td>
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<td>2011</td>
<td>Radiographic analysis of a hand-held surgical navigation system for tibial resection in total knee arthroplasty</td>
<td>no patient oriented outcomes</td>
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<td>2014</td>
<td>Extramedullary guides versus portable, accelerometer-based navigation for tibial alignment in total knee arthroplasty: A randomized, controlled trial: Winner of the 2013 HAP PAUL award</td>
<td>no patient oriented outcomes</td>
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<td>2009</td>
<td>Comparison of total knee arthroplasty using computer-assisted navigation versus conventional guiding systems: a prospective study</td>
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<td>Seo,S.S.; Seo,J.H.; Sohn,M.W.; Kim,Y.J.</td>
<td>2012</td>
<td>Differences in measurement of lower limb alignment among different registration methods of navigation and radiographs in TKA using the OrthoPilot system</td>
<td>no patient oriented outcomes</td>
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<td>Shetty,G.M.; Mullaji,A.; Bhayde,S.</td>
<td>2012</td>
<td>Computer navigated TKA for the treatment of osteoarthritis associated with extra-articular femoral deformity</td>
<td>not relevant, does not compare uka to tka</td>
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<td>Smith, J.R.; Rowe, P.J.; Blyth, M.; Jones, B.</td>
<td>2013</td>
<td>The effect of electromagnetic navigation in total knee arthroplasty on knee kinematics during functional activities using flexible electrogoniometry</td>
<td>unclear if 90% of patients had knee OA</td>
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<td>Sparmann, M.; Wolke, B.; Czupalla, H.; Banzer, D.; Zink, A.</td>
<td>2003</td>
<td>Positioning of total knee arthroplasty with and without navigation support. A prospective, randomised study</td>
<td>less than 90% of patients had knee OA</td>
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<td>Computer navigation versus conventional total knee replacement: no difference in functional results at two years</td>
<td>unclear if all patients have osteoarthritis</td>
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<td>Lee, D.H.; Padhy, D.; Park, J.H.; Jeong, W.K.; Park, J.H.; Han, S.B.</td>
<td>2009</td>
<td>Axial deviation in total knee arthroplasty--is the navigation system necessary?</td>
<td>no patient oriented outcomes</td>
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<td>Lee, D.H.; Padhy, D.; Park, J.H.; Jeong, W.K.; Park, J.H.; Han, S.B.</td>
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<td>The impact of a rectangular or trapezoidal flexion gap on the femoral component rotation in TKA</td>
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<td>Sampath, S.A.C.; Voon, S.H.; Sangster, M.; Davies, H.</td>
<td>2009</td>
<td>The statistical relationship between varus deformity, surgeon's experience, BMI and tourniquet time for computer assisted total knee replacements</td>
<td>no patient oriented outcomes</td>
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</tbody>
</table>


November 24, 2015

Kevin Shea, MD
American Academy of Orthopaedic Surgeons
9400 West Higgins Road
Rosemont, Illinois 60018

Dear Dr. Shea:

The Arthroscopy Association of North America has voted to endorse the AAOS Clinical Practice Guideline on the Surgical Management of Osteoarthritis of the Knee. This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

Jeffrey S. Abrams
Jeffrey S. Abrams, MD
President
November 24, 2015

Kevin Shea, MD
Clinical Practice Guidelines Section Leader
Committee on Evidence-Based Quality and Value
American Academy of Orthopaedic Surgeons
1900 West Higgins Road
Rosemont, Illinois 60018-4976

Dear Dr. Shea:

The American College of Radiology is pleased to endorse the AAOS Clinical Practice Guideline on the Surgical Management of Osteoarthritis of the Knee. We appreciate having had the opportunity to participate in the review process of this document and look forward to future active involvement in the construction and review of AAOS Clinical Practice Guidelines that involve diagnostic imaging: image guided interventional procedures or radiation therapy.

This endorsement grants permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

William T. Thorwarth, Jr., MD, FACR
Chief Executive Officer
American College of Radiology

David C. Kushner, MD, FACR
President
American College of Radiology

cc: Bibb Allen, Jr., MD, FACR, Chair, ACR Board of Chancellors
    William T. Herrington, MD, FACR, Speaker, ACR Council
    Jacqueline A. Bello, MD, FACR, Chair, ACR Commission on Quality and Safety
    Pamela Wilcox, RN, MBA, ACR Executive Vice President, Quality and Safety
    David Kurfth, MPH, MA, ACR Director, Quality and Safety
    Jayson Murray, Manager, AAOS Evidence-Based Quality and Value Unit
20 November 2015

Kevin Shea, MD
AAOS Clinical Practice Guidelines Section Leader
9400 West Higgins Road
Rosemont, IL 60018

Dear Dr. Shea,

The Society of Military Orthopaedic Surgeons (SOMOS) Executive Committee has voted to endorse the AAOS Clinical Practice Guideline on the Surgical Management of Osteoarthritis of the Knee. This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

Anthony E. Johnson, MD
President
Promoting outstanding care to patients with knee disorders through innovative research and education.

December 1, 2015

Kevin Shea, MD  
AAOS Clinical Practice Guidelines Section Leader of the Committee on Evidence-Based Quality and Value  
9400 West Higgins Road, Suite 500  
Rosemont, IL 60018

Dear Dr. Shea,

With this letter, The Knee Society endorses the AAOS Clinical Practice Guideline on the Surgical Management of Osteoarthritis of the Knee (SMOAK). This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

We would like to thank AAOS CPG Section and the entire Committee on Evidence-Based Quality and Value for your diligent and thorough response to our comments on this CPG. While we endorse the SMOAK CPG, it is The Knee Society’s request that our comments are also published. We view the SMOAK guidelines as a work-in-progress that are subject to the limitations of the methodology and need to be used as one tool in concert with clinical judgment by orthopaedic surgeons in practice.

We thank you, your colleagues, and the AAOS staff for your work on this important project and for allowing The Knee Society to be a part of it.

Sincerely,

[Signature]

Thomas Parker Vail, MD  
President  
The Knee Society

cc: The Executive Board of The Knee Society
December 1, 2015

Kevin Shea, MD
AAOS Clinical Practice Guidelines Section Leader
Committee on Evidence-Based Quality and Value
9400 West Higgins Road
Rosemont, IL 60018-4576

Dear Dr. Shea:

The American Geriatrics Society has voted to endorse the AAOS Clinical Practice Guideline on the Surgical Management of Osteoarthritis of the Knee. This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

Steven R. Counsell, MD, AGSF
President, American Geriatrics Society