American Association of Hip and Knee Surgeons

Total Knee Replacement
Performance Measurement Set

Final – PCPI Approved

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Physician Performance Measures (Measures) and related data specifications developed by the American Association of Hip and Knee Surgeons (AAHKS) are intended to facilitate quality improvement activities by physicians.

These Measures are intended to assist physicians in enhancing quality of care. Measures are designed for use by any physician who manages the care of a patient for a specific condition. These Measures are not clinical guidelines and do not establish a standard of medical care, and have not been tested for all potential applications. The AAHKS encourages testing and evaluation of its Measures.

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EXECUTIVE SUMMARY

The American Association of Hip and Knee Surgeons (AAHKS) formed a Total Knee Replacement Work Group to identify and define quality measures towards improving outcomes for patients undergoing a total knee replacement.

An earlier pilot project that utilized the RAND/UCLA modified Delphi methodology to develop a set of candidate quality indicators for total joint replacement was used to identify the potential topic areas for the quality measures for total knee replacement.[1]

Purpose of Measurement Set

AAHKS formed a Total Knee Replacement Work Group to identify and define quality measures to improve outcomes for patients undergoing a total knee replacement (TKR). This project utilized the expertise of practicing orthopaedic surgeons and other clinicians to create explicit, valid, and feasible quality measures that can be used to monitor and improve the quality of orthopaedic care. The quality of care measures evaluate appropriate preoperative, intraoperative and postoperative care which are critical to improving patient function and quality of life.

Importance of Topic

High Impact Topic Area

During 1991 – 2010, the rate of primary total knee replacement procedures among the Medicare population increased over 161 percent from 93,230 procedures in 1991 to 243,802 procedures in 2010. The rate of revision procedures increased over 105 percent from 9650 to 19,871 procedures. The majority of the primary total knee replacements were performed on women (approximately 65 percent).[2]

The Centers for Disease Control found that the overall total knee replacement rate increased 58% (from 5.5 to 8.7 per 1,000 population) between 2000 and 2006. Similar increases were observed by sex, age group, and black or white race. TKR rates were 37 percent lower among blacks than whites (3.6 versus 5.7 per 1,000 population) in 2000, and 39% lower in 2006 (5.6 versus 9.2). In both years, the black/white disparity was lower among women (23% and 28%) than among men (63% and 60%). In 2006, blacks had a lower TKR rate than whites in all 50 states and the District of Columbia.[3]

In 2004 there were over 450,000 total knee replacements performed in the United States.[4]

Between 2007 and 2009, over 22 percent of adults reported they had been diagnosed with arthritis.[5] As the population ages, there will be an increased growth in the number of procedures. It is estimated that the number of total knee replacements performed per year could be over 3 million by the year 2030.[6]

Costs

Medicare paid approximately $3.2 billion in 2000 for hip and knee joint replacements.[7]

The overall inpatient costs for replacement of the knee during 2007 was over $9.2 billion with hospital stays of more than 605,000.[8]

Opportunity for Improvement

Katz and colleagues evaluated Medicare patients who underwent a total knee replacement between 1995 and 1996 and found that hospitals with lower volume of total knee replacements had a higher volume of mortality and other complications.[9]

Katz and colleagues also studied functional status of Medicare patients 2 years after their total knee replacement and found that patients who had low-volume surgeons in low-volume hospitals were twice as likely to have poor functional status scores.[10]

A study in California by SooHoo and colleagues found that hospitals below the 40th percentile for volume have a higher rate of complications following total knee arthroplasty.[11]

SooHoo and colleagues also identified that age and the Charlson comorbidity index had significant associations with the rates of mortality and readmissions due to infection. Age was also associated with the rate of pulmonary embolism.[12]

In another study published in 2011, SooHoo and colleagues reviewed the total knee replacement care at three affiliated California hospitals. The study compared the care using 31 developed quality indicators addressing the preoperative, intraoperative, and postoperative periods. There was a statistically significant difference in the adherence to the quality indicators at the three hospitals and the average adherence for all quality indicators was 53 percent.[13]

Clinical Evidence Base

Clinical practice guidelines serve as the foundation for the development of performance measures. This measurement set is based on clinical guidelines from the following:

American Association of Orthopaedic Surgeons (AAOS)
American College of Rheumatology (ACR)
National Institutes of Health (NIH)
American College of Cardiology/American Heart Association (ACC/AHA)
National Surgical Infection Prevention Project

Performance measures are not to be used as a substitute for clinical guidelines and individual physician clinical judgment.

Total Knee Replacement Outcomes

The Work Group discussed the development of outcome measures. There are many knee outcome scoring systems available, but there is no national consensus as to which system should be routinely used. Several large health systems and geographic areas in the U.S. have established joint registries but currently there is not a system to collect outcome information on a nationwide basis. In 2010, the AAOS, AAHKS, Hip Society, Knee Society, payers and industry representatives came together to establish the American Joint Replacement Registry (AJRR).[14] Eleven pilot hospitals began collecting data in late 2010. Data on a total of 8300 procedures were collected. Currently, Level I data (patient age, diagnosis, surgeon, surgical procedure and implant) are being collected. Level II (patient risk factors, surgical approaches, ASA score) and Level III data (outcomes data) will be collected in the future. The goal of the AJRR is to increase the number of hospitals reporting information over the next 5 years. Since patient outcomes will be collected by the AJRR in the next few years, orthopedic surgeons will be identifying a system to be used for outcome measurement.

Until that time, the Work Group determined that developing process measures would be more appropriate. When these measures are reevaluated in 3 years, the Work Group will consider including outcomes measures at that time.

The Work Group set out to develop performance measures that will achieve desired outcomes and reflect high quality of care. The desired outcomes addressed by the process measures include:

1. Decreased morbidity and mortality following total knee replacement.
2. Improved functional status following total knee replacement.
3. Decrease variations in the care of total knee replacement.

Intended Audience, Care Setting, and Patient Population

These measures are designed for use by physicians and eligible health care professionals managing ongoing care for all patients undergoing a total knee replacement. Four measures address the preoperative period and they are appropriate for the ambulatory care setting. The other three measures address care provided in the hospital setting.

These measures are meant to be used for performance and/or reporting at the individual physician level.

Measure Harmonization

When existing hospital-level or plan-level measures are available for the same measurement topics, AAHKS attempts to harmonize the measures to the extent possible.

Technical Specifications

Technical Specifications

Because administrative claims are currently the only available sources of data, specifications to collect and report on the total knee replacement measures for administrative claims are included in this document. In light of recent national initiatives to encourage physicians and other health care professionals to adopt Electronic Health Records (EHRs) in their practices, the AAHKS advocates that performance measures be integrated into EHRs so that data for measurement and improvement can be captured at the time care is provided.

There are several data sources available for collecting performance measures, generally requiring different sets of measure specifications, due to the structure of the systems storing the data.

Electronic Administrative Data (Claims)

Electronic Administrative Data are typically used for reporting clinical services provided to the patient by the physician or physician group practice to third party payers, including diagnosis (ICD-9-CM) codes and service/procedure (CPT Category I) codes. In some cases, this information can be analyzed to provide quality of care information. Supplemental tracking codes (CPT Category II) are developed for performance measurement collection and reporting through a claims-based system. CPT Category II codes are optional tracking codes that can be included on the claim for quality measure reporting, but are not required in order to process the claim for reimbursement. The calculation of performance measure information is determined by the claim form composition. Some claims will solely include reimbursement codes and others will include a combination of reimbursement and supplemental tracking codes. Some performance measures may not require the supplemental tracking codes be present on the claim form in order for the measure to be calculated, but this is not the case for all measures. Until expanded and linked administrative databases or EHR systems are more widely available and utilized, various pay-for-performance and pay-for-reporting programs (including the Physician Quality Reporting System of the Centers for Medicare and Medicaid Services) continue to rely on this type of claims data.

Paper Medical Record Data/Data Collection Flowsheet

Information from the paper medical record may be manually abstracted by prospective or retrospective manual review of clinical encounter information. Medical record data, despite being more expensive to acquire, can provide much richer clinical information usually not available in

electronic transactional data, alongside typical administrative claims information from the patient encounter.

Electronic Health Record Data
Specifications for the EHR have not been developed at this time.

Measure Exceptions

AAHKS used the American Medical Association (AMA)-convened Physician Consortium for Performance Improvement® (PCPI™) exception policy[15] which provides three categories of reasons for which a patient may be excluded from the denominator of an individual measure:

- **Medical reasons**
  Includes:
  - not indicated (absence of organ/limb, already received/performed, other medical reasons)
  - contraindicated (patient allergic history, potential adverse drug interaction, other medical reasons)

- **Patient reasons**
  Includes:
  - patient declined
  - social or religious reasons
  - other patient reasons

- **System reasons**
  Includes:
  - resources to perform the services not available
  - insurance coverage/payer-related limitations
  - other reasons attributable to health care delivery system

These measure exception categories are not available uniformly across all measures; for each measure, there must be a clear rationale to permit an exception for a medical, patient, or system reason. Where possible, examples have been provided in the measure exception language of instances that would constitute an exception. Examples are intended to guide clinicians and are not all-inclusive lists of all possible reasons why a patient could be excluded from a measure. When using CPT Category II codes to report the measure, the exception of a patient should be reported by appending the appropriate modifier to the CPT Category II code designated for the measure:

- **Medical reasons**: modifier 1P
- **Patient reasons**: modifier 2P
- **System reasons**: modifier 3P

Although this methodology does not require the external reporting of more detailed exception data, AAHKS recommends that physicians document the *specific* reasons for exception in patients' medical records for purposes of optimal patient management and audit-readiness. AAHKS also advocates the systematic review and analysis of each physician's exceptions data to identify practice patterns and opportunities for quality improvement. For example, it is possible for implementers to calculate the percentage of patients that physicians have identified as meeting the criteria for exception.

Please refer to documentation for each individual measure for information on the acceptable exception categories and the codes and modifiers to be used for reporting.

Testing and Implementation of the Measurement Set

The draft measures in this set are being made available for public comment without any prior testing. The AAHKS will welcome the opportunity to promote the initial testing of these measures and to ensure that any results available from testing are used to refine the measures before implementation.

Total Knee Replacement
Measure #1a: Assessment of Patient History
(Measures #1a, #1b, and #1c are a composite measure and must be used together)

Measure Description

Percentage of patients undergoing a total knee replacement who had a history completed within one year prior to the procedure that included all of the following: onset and duration of symptoms, location and severity of pain, activity limitations (e.g., walking distance, use of assistive devices, and difficulty with stairs)

Measure Components

Numerator Statement	Patients who had a history completed within one year prior to the procedure that included all of the following: onset and duration of symptoms, location and severity of pain, activity limitations (e.g., walking distance, use of assistive devices, and difficulty with stairs)
Denominator Statement	All patients undergoing a total knee replacement
Denominator Exceptions	None
Supporting Guideline & Other References	The following evidence statements are quoted verbatim from the referenced clinical guidelines: The initial contact (for patients presenting with acute knee pain) may not require obtaining radiographs but should rely on a comprehensive history and physical exam. (AAOS, 2003)[16]

Measure Importance

Relationship to desired outcome	A complete history of the patient will identify any medical problems that will need to be corrected prior to the procedure. In addition, the patient's preoperative activity level and symptoms are important to determine the severity of the patient's knee arthritis and baseline functionality.
Opportunity for Improvement	In a study conducted by SooHoo and colleagues at 3 hospitals, 54 percent of the patients had documentation of the history of the present illness with variation between the 3 hospitals. Pain evaluation was documented 60 percent of the time and the documentation ranged from 99 percent of the time at the best performing hospital down to 25 percent at the least performing hospital.[13]
IOM Domains of Health Care Quality Addressed	• Safe • Effective • Efficient
Exception Justification	This measure has no exceptions.
Harmonization with Existing Measures	Harmonization with existing measures was not applicable to this measure.

Measure Designation	
Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Ambulatory care
Data source	• Electronic health record (EHR) data • Administrative Data/Claims (inpatient or outpatient claims) • Administrative Data/Claims Expanded (multiple-source) • Paper medical record • Registry data

Technical Specifications: Administrative/Claims Data

Administrative claims data collection requires users to identify the eligible population (denominator) and numerator using codes recorded on claims or billing forms (electronic or paper). Users report a rate based on all patients in a given practice for whom data are available and who meet the eligible population/denominator criteria.

The specifications listed below are those needed for performance calculation. Additional CPT II codes may be required depending on how measures are implemented. (Reporting vs. Performance)

Denominator (Eligible Population)	All patients undergoing a total knee replacement CPT Service Code: 27446, 27447, 27438, or 27442
Numerator	Patients who had a history completed within one year prior to the procedure that included all of the following: onset and duration of symptoms, location and severity of pain, activity limitations (e.g., walking distance, use of assistive devices, and difficulty with stairs), Report the CPT Category II code: XXXXF: *Patients who had a history completed* in development for this numerator

Total Knee Replacement
Measure #1b: Physical Examination
(Measures #1a, #1b, and #1c are a composite measure and must be used together)

Measure Description

Percentage of patients undergoing a total knee replacement who had a physical examination completed within one year prior to the procedure that included all of the following: gait, knee range of motion, presence or absence of deformity of the knee, stability of the knee, neurologic status (sensory and motor function), vascular status (peripheral pulses), skin, height, and weight

Measure Components

Numerator Statement	Patients who had a physical examination completed within one year prior to the procedure that included all of the following: gait, knee range of motion, presence or absence of deformity of the knee, stability of the knee, neurologic status (sensory and motor function), vascular status (peripheral pulses), skin, height, and weight
Denominator Statement	All patients undergoing a total knee replacement
Denominator Exceptions	None
Supporting Guideline & Other References	The following evidence statements are quoted verbatim from the referenced clinical guidelines: The initial contact (for patients presenting with acute knee pain) may not require obtaining radiographs but should rely on a comprehensive history and physical exam. Significant Physical Examination: • Visual inspection for abnormalities • Presence and location of warmth • Tenderness (location) • Presence and location of swelling • Range of motion (active and passive) • Meniscal compression • Varus/valgus instability (0º and 30º of flexion) • Anterior Drawer with + or – Lachman • Foot pulse • Presence and location of erythema • Hip pain or abnormalities present • Patella apprehension • Crepitance (AAOS, 2003)[15] On physical examination, patients with OA often have tenderness on palpation, bony enlargement, crepitus on motion, and/or limitation of joint motion. (American College of Rheumatology, 2000)[17]

Measure Importance

Relationship to desired	A complete examination of the knee is necessary to plan for the surgical procedure. In addition, the patient's preoperative evaluation is important to

outcome	determine the severity of the patient's knee arthritis and baseline functionality.
Opportunity for Improvement	A study conducted by SooHoo and colleagues found that all components of the physical examination were documented only 5 percent of the time for the patients undergoing total knee replacement at the 3 hospitals.[13]
IOM Domains of Health Care Quality Addressed	• Safe • Effective • Efficient
Exception Justification	This measure has no exceptions.
Harmonization with Existing Measures	The American Medical Association (AMA)-convened Physician Consortium for Performance Improvement® (PCPI™) osteoarthritis measure addressing the physical examination of the involved joint includes visual inspection, palpation, and degree of range of motion of the joint. This measure addresses additional items that should be documented in the medical record prior to total knee replacement.

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Ambulatory care
Data source	• Electronic health record (EHR) data • Administrative Data/Claims (inpatient or outpatient claims) • Administrative Data/Claims Expanded (multiple-source) • Paper medical record • Registry data

Technical Specifications: Administrative/Claims Data

Administrative claims data collection requires users to identify the eligible population (denominator) and numerator using codes recorded on claims or billing forms (electronic or paper). Users report a rate based on all patients in a given practice for whom data are available and who meet the eligible population/denominator criteria.

The specifications listed below are those needed for performance calculation. Additional CPT II codes may be required depending on how measures are implemented. (Reporting vs. Performance)

Denominator (Eligible Population)	All patients undergoing a total knee replacement CPT Service Code: 27446, 27447, 27438, or 27442
Numerator	Patients who had a physical examination completed within one year prior to the procedure that included all of the following: gait, knee range of motion, presence or absence of deformity of the knee, stability of the knee, neurologic status (sensory and motor function), vascular status (peripheral pulses), skin, height, and weight Report the CPT Category II code: XXXXF: *Patients who had a physical examination completed* in development for this numerator

Total Knee Replacement
Measure #1c: Radiographic Evidence of Arthritis
(Measures #1a, #1b, and #1c are a composite measure and must be used together)

Measure Description

Percentage of patients undergoing a total knee replacement with radiographic evidence of arthritis within one year prior to the procedure

Measure Components

Numerator Statement	Patients with radiographic evidence of arthritis within one year prior to the procedure
Denominator Statement	All patients undergoing a total knee replacement
Denominator Exceptions	Documentation of medical reason for no radiographic evidence of arthritis (e.g., patients with osteonecrosis or bone tumor, MRI studies showing full thickness cartilage loss)
Supporting Guideline & Other References	The following evidence statements are quoted verbatim from the referenced clinical guidelines: Candidates for elective TKR should have radiographic evidence of joint damage, moderate to severe persistent pain that is not adequately relieved by an extended course of nonsurgical management, and clinically significant functional limitation resulting in diminished quality of life. (NIH Consensus Statement 2003)[18]

Measure Importance

Relationship to desired outcome	Prior to total knee replacement, there should be radiographic evidence of arthritis including joint space narrowing and deformity.
Opportunity for Improvement	Radiographic evidence of arthritis was identified 80 percent of the time on the patients undergoing total knee replacement at the 3 California hospitals studied by SooHoo and colleagues. Adherence ranged from 71 to 85 percent.[13]
IOM Domains of Health Care Quality Addressed	• Safe • Effective • Efficient
Exception Justification	A denominator exception has been added to capture those patients who require total knee replacement due to osteonecrosis or a bone tumor.
Harmonization with Existing Measures	Harmonization with existing measures was not applicable to this measure.

Measure Designation

Measure purpose	• Quality improvement • Accountability

Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Ambulatory care
Data source	• Electronic health record (EHR) data • Administrative Data/Claims (inpatient or outpatient claims) • Administrative Data/Claims Expanded (multiple-source) • Paper medical record • Registry data

Technical Specifications: Administrative/Claims Data

Administrative claims data collection requires users to identify the eligible population (denominator) and numerator using codes recorded on claims or billing forms (electronic or paper). Users report a rate based on all patients in a given practice for whom data are available and who meet the eligible population/denominator criteria.

The specifications listed below are those needed for performance calculation. Additional CPT II codes may be required depending on how measures are implemented. (Reporting vs. Performance)

Denominator (Eligible Population)	All patients undergoing a total knee replacement CPT Service Code: 27446, 27447, 27438, or 27442
Numerator	Patients with documented radiographic evidence of arthritis within one year prior to the total knee replacement Report the CPT Category II code: XXXXF: *Patients with radiographic evidence of arthritis* in development for this numerator
Denominator Exceptions	Documentation of medical reason for no radiographic evidence of arthritis (e.g., patients with osteonecrosis or bone tumor, MRI studies showing full thickness cartilage loss)) • Append modifier to CPT Category II code: XXXXF-1P

Total Knee Replacement
Measure #2: Shared Decision-Making: Trial of Conservative (Non-surgical) Therapy

Measure Description

Percentage of patients undergoing a total knee replacement with documented shared decision-making including discussion of conservative (non-surgical) therapy (e.g. NSAIDs, analgesics, exercise, injections) prior to the procedure

Measure Components

Numerator Statement	Patients with documented shared decision-making including discussion of conservative (non-surgical) therapy (e.g. NSAIDs, analgesics, exercise, injections) prior to the procedure
Denominator Statement	All patients undergoing a total knee replacement
Denominator Exceptions	None
Supporting Guideline & Other References	The following evidence statements are quoted <u>verbatim</u> from the referenced clinical guidelines: AAOS suggests that patients with symptomatic OA of the knee be encouraged to participate in self-management educational programs. (AAOS 2009) (Level of Evidence II Grade B.)[19] AAOS recommends that patients with symptomatic OA of the knee who are overweight (BMI >25) should be encouraged to lose weight (a minimum of 5% of body weight) and maintain their weight at a lower level with an appropriate program for dietary modification and exercise. (AAOS 2009) (Level of Evidence I Grade A.) AAOS recommends that patients with symptomatic OA of the knee be encouraged to participate in low-impact aerobic fitness exercises. (AAOS 2009) (Level of Evidence I Grade A.) AAOS suggests that patients with symptomatic OA of the knee use patellar taping for short-term relief of pain and improvement in function. (AAOS 2009) (Level of Evidence II Grade B.) AAOS suggests that patients with symptomatic OA of the knee receive one of the following analgesics for pain unless there are contradictions to this treatment: acetaminophen (<4g/day) or nonsteroidal anti-inflammatory drugs (NSAIDs). (AAOS 2009) (Level of Evidence II Grade B.) AAOS suggests that intra-articular corticosteroids be used for short-term pain relief for patients with symptomatic OA of the knee. (AAOS 2009) (Level of Evidence II Grade B.) Patients with knee OA who are not obtaining adequate pain relief and functional improvement from a combination of non-pharmacological and pharmacological treatment should be considered for joint replacement therapy. (ORSAI 2008)[20]

Measure Importance	
Relationship to desired outcome	A trial of non-surgical therapy should be used prior to surgery, when possible. Non-surgical therapy may include the use of NSAIDs, other analgesics, exercise, or injections. For patients with severe disability, the patient and surgeon may decide after a thorough review of conservative options that the optimal treatment is to proceed with the operative intervention.
Opportunity for Improvement	In a study conducted by SooHoo and colleagues at 3 hospitals, 54 percent of the patients had documentation of the history of the present illness which included the evaluation of the prior treatments and medications. Variation between the 3 hospitals ranged from 27 percent to 75 percent.[13]
IOM Domains of Health Care Quality Addressed	• Safe • Effective • Efficient
Exception Justification	This measure has no exceptions.
Harmonization with Existing Measures	Harmonization with existing measures was not applicable to this measure.

Measure Designation	
Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Ambulatory care
Data source	• Electronic health record (EHR) data • Administrative Data/Claims (inpatient or outpatient claims) • Administrative Data/Claims Expanded (multiple-source) • Paper medical record • Registry data

Technical Specifications: Administrative/Claims Data

Administrative claims data collection requires users to identify the eligible population (denominator) and numerator using codes recorded on claims or billing forms (electronic or paper). Users report a rate based on all patients in a given practice for whom data are available and who meet the eligible population/denominator criteria.

The specifications listed below are those needed for performance calculation. Additional CPT II codes may be required depending on how measures are implemented. (Reporting vs. Performance)

Denominator (Eligible Population)	All patients undergoing a total knee replacement CPT Service Code: 27446, 27447, 27438, or 27442
Numerator	Patients with documented shared decision-making including discussion of conservative (non-surgical) therapy (e.g. NSAIDs, analgesics, exercise, injections)

prior to the procedure

Report the CPT Category II code:
XXXXF: *Patients with documented shared decision-making including discussion of conservative (non-surgical) therapy prior to the procedure* in development for this numerator

Total Knee Replacement
Measure #3: Venous Thromboembolic and Cardiovascular Risk Evaluation

Measure Description

Percentage of patients undergoing a total knee replacement who are evaluated for the presence or absence of cardiovascular risk factors within 30 days prior to the procedure including history of deep venous thrombosis (DVT), pulmonary embolism (PE), myocardial infarction (MI), arrhythmia, and stroke

Measure Components

Numerator Statement	Patients who were evaluated for the presence or absence of cardiovascular risk factors within 30 days prior to the procedure including history of DVT, PE, MI, arrhythmia, and stroke
Denominator Statement	All patients undergoing a total knee replacement
Denominator Exceptions	None
Supporting Guideline & Other References	The following evidence statements are quoted verbatim from the referenced clinical guidelines. In patients with known coronary artery disease (CAD) or the new onset of signs or symptoms suggestive of CAD, baseline cardiac assessment should be performed. In the asymptomatic patient, a more extensive assessment of history and physical is warranted in those individuals 50 years of age or older, because the evidence related to the determination of cardiac risk factors and derivation of a Revised Cardiac Risk Index occurred in this population. Preoperative cardiac evaluation must therefore be carefully tailored to the circumstances that have prompted the evaluation and to the nature of the surgical illness. (ACC/AHA 2007)[21]

Measure Importance

Relationship to desired outcome	Prior to a total knee replacement the patient's venous thromboembolic and cardiovascular risk should be evaluated. A population-based study of all Olmstead County, Minnesota, patients undergoing a total hip or knee arthroplasty from 1994 - 2008, reported that patients undergoing a total knee arthroplasty with a previous history of a cardiac event or a thromboembolic event were associated with an increased risk of a 90-day cardiac or thromboembolic event following surgery.[22] A study using the Danish national resident registries compared all patients undergoing a primary THR and TKR from 1998 – 2007 to control groups not undergoing one of the procedures and found that the AMI rate 2 weeks after TKR was increased 31-fold compared to the control group.[23] Any preoperative disease state should be identified and managed prior to surgery to minimize the risk of the surgical procedure.
Opportunity for Improvement	SooHoo and colleagues found that the cardiovascular evaluation was performed 40 percent of the time at the 3 California hospitals with the rates ranging from 15 to 59 percent.[13]

IOM Domains of Health Care Quality Addressed	• Safe • Effective • Efficient
Exception Justification	This measure has no exceptions.
Harmonization with Existing Measures	Harmonization with existing measures was not applicable to this measure.

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Ambulatory care • Hospital care
Data source	• Electronic health record (EHR) data • Administrative Data/Claims (inpatient or outpatient claims) • Administrative Data/Claims Expanded (multiple-source) • Paper medical record • Registry data

Technical Specifications: Administrative/Claims Data

Administrative claims data collection requires users to identify the eligible population (denominator) and numerator using codes recorded on claims or billing forms (electronic or paper). Users report a rate based on all patients in a given practice for whom data are available and who meet the eligible population/denominator criteria.
The specifications listed below are those needed for performance calculation. Additional CPT II codes may be required depending on how measures are implemented. (Reporting vs. Performance)

Denominator (Eligible Population)	All patients undergoing a total knee replacement CPT Service Code: 27446, 27447, 27438, or 27442
Numerator	Patients who were evaluated for the presence or absence of cardiovascular risk factors within 30 days prior to the procedure including history of DVT, PE, MI, arrhythmia, and stroke Report the CPT Category II code: XXXXF: *Patients who are evaluated for venous thromboembolic and cardiovascular risk factors* in development for this numerator

Total Knee Replacement
Measure #4: Preoperative Antibiotic Infusion with Proximal Tourniquet

Measure Description

Percentage of patients undergoing a total knee replacement who had the prophylactic antibiotic completely infused prior to the inflation of the proximal tourniquet

Measure Components

Numerator Statement	Patients who had the prophylactic antibiotic completely infused prior to the inflation of the proximal tourniquet
Denominator Statement	All patients undergoing a total knee replacement
Denominator Exceptions	Documentation of medical reason for not completely infusing the prophylactic antibiotic prior to the inflation of the proximal tourniquet (e.g., a tourniquet was not used)
Supporting Guideline & Other References	The following evidence statements are quoted verbatim from the referenced clinical guidelines: If a proximal tourniquet is used, the antimicrobial should be completely infused before inflation. (National Surgical Infection Prevention Project Advisory Statement 2004)[24]

Measure Importance

Relationship to desired outcome	The Surgical Care Improvement Project (SCIP) evaluates the timing and appropriateness of the prophylactic antibiotic. This measure evaluates that the prophylactic antibiotic is completely infused prior to the inflation of the tourniquet.
Opportunity for Improvement	Antibiotic prophylaxis was evaluated by SooHoo et al. They evaluated the timing, the discontinuation, the appropriateness of the antibiotic and the proximal tourniquet inflation after infusion. Adherence to this indicator ranged from 24 to 27 percent at the 3 hospitals.[13]
IOM Domains of Health Care Quality Addressed	• Safe • Effective • Efficient
Exception Justification	A denominator exception has been added to capture those patients for whom a tourniquet was not used.
Harmonization with Existing Measures	This measure addresses the infusion of the prophylactic antibiotic prior to the inflation of the proximal tourniquet. The current SCIP measure does not address the antibiotic infusion prior to the tourniquet inflation.

Measure Designation	
Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Hospital care
Data source	• Electronic health record (EHR) data • Administrative Data/Claims (inpatient or outpatient claims) • Administrative Data/Claims Expanded (multiple-source) • Paper medical record • Registry data

Technical Specifications: Administrative/Claims Data

Administrative claims data collection requires users to identify the eligible population (denominator) and numerator using codes recorded on claims or billing forms (electronic or paper). Users report a rate based on all patients in a given practice for whom data are available and who meet the eligible population/denominator criteria.

The specifications listed below are those needed for performance calculation. Additional CPT II codes may be required depending on how measures are implemented. (Reporting vs. Performance)

Denominator (Eligible Population)	All patients undergoing a total knee replacement CPT Service Code: 27446, 27447, 27438, or 27442
Numerator	Patients who had the prophylactic antibiotic completely infused prior to the inflation of the proximal tourniquet Report the CPT Category II code: XXXXF: *Patients who had the prophylactic antibiotic completely infused prior to inflation of the proximal tourniquet* in development for this numerator
Denominator Exceptions	Documentation of medical reason for not completely infusing the prophylactic antibiotic prior to the inflation of the proximal tourniquet (e.g., a tourniquet was not used) • Append modifier to CPT Category II code: XXXXF-1P

Total Knee Replacement
Measure #5: Identification of Implanted Prosthesis in Operative Report

Measure Description

Percentage of patients undergoing total knee replacement whose operative report identifies the prosthetic implant specifications including the prosthetic implant manufacturer, the brand name of the prosthetic implant, and the size of the prosthetic implant

Measure Components

Numerator Statement	Patients whose operative report identifies the prosthetic implant specifications including the prosthetic implant manufacturer, the brand name of the prosthetic implant, and the size of the prosthetic implant
Denominator Statement	All patients undergoing a total knee replacement
Denominator Exceptions	None
Supporting Guideline & Other References	The following evidence statements are quoted verbatim from the referenced clinical guidelines: Effective tracking of devices from the manufacturing facility, through the distributor network (including distributors, retailers, rental firms and other commercial enterprises, device user facilities, and licensed practitioners) and ultimately, to the patient is necessary for the effectiveness of remedies prescribed by the act, such as patient notification (section 518 (a) of the act) or device recall (section 518 (e) of the act). 21 CFR 821.1 (b)[25]

Measure Importance

Relationship to desired outcome	It is important to capture the type of prosthesis used. The rates of prosthesis failure which will require a revision increases from 10 percent at 10 years to approximately 20 percent at 20 years following surgery.[18] The FDA requires appropriate tracking of the device but this information may not be readily available to the surgeon performing the revision. The surgeon performing the revision needs to be able to identify the prosthesis and size of the prosthesis that were used in the initial surgery, to determine if a complete revision is required or if a partial revision could be performed. The initial operative report should contain the necessary information which will ultimately help the future treating physician who performs the revision surgery.
Opportunity for Improvement	The SooHoo et al study used a quality indicator that included 4 elements that should be documented in an operative note. The elements included knee stability, range of motion, patellar tracking, and the implants used in the procedure. The variation between the 3 hospitals where the total knee replacement operative notes included the 4 important elements, ranged from 26 to 59 percent.[13]
IOM Domains of Health Care Quality Addressed	• Safe • Effective • Efficient
Exception Justification	This measure has no exceptions.

Harmonization with Existing Measures	Harmonization with existing measures was not applicable to this measure.

Measure Designation

Measure purpose	• Quality improvement • Accountability
Type of measure	• Process
Level of Measurement	• Individual practitioner
Care setting	• Hospital care
Data source	• Electronic health record (EHR) data • Administrative Data/Claims (inpatient or outpatient claims) • Administrative Data/Claims Expanded (multiple-source) • Paper medical record • Registry data

Technical Specifications: Administrative/Claims Data

Administrative claims data collection requires users to identify the eligible population (denominator) and numerator using codes recorded on claims or billing forms (electronic or paper). Users report a rate based on all patients in a given practice for whom data are available and who meet the eligible population/denominator criteria.

The specifications listed below are those needed for performance calculation. Additional CPT II codes may be required depending on how measures are implemented. (Reporting vs. Performance)

Denominator (Eligible Population)	All patients undergoing a total knee replacement CPT Service Code: 27446, 27447, 27438, or 27442
Numerator	Patients whose operative report identifies the prosthetic implant specifications including the prosthetic implant manufacturer, the brand name of the prosthetic implant, and the size of the prosthetic implant Report the CPT Category II code: XXXXF: *Patients whose operative report identifies the prosthetic implant specifications* in development for this numerator

Summary of Non-Material Interest Disclosures

Total Knee Replacement

None of the members of the Total Knee Replacement Work Group had any disqualifying material interests under the PCPI Conflict of Interest Policy. The following is a summary of non-disqualifying interests disclosed on Work Group members' Material Interest Disclosure Statements. Completed Material Interest Disclosure Statements are available upon request.

Work Group Members	Disclosures
David Mauerhan, MD (Co-Chair)	Payment for Consulting Services – Biomet, Inc.
Jay Lieberman, MD (Co-Chair)	Payment for Consulting Services – De Puy, Inc.
Nelson SooHoo, MD	None
James Keeney, MD	Officer - Society of Military Orthopedic Surgeons and Mid-America Orthopaedic Association
Michael Parks, MD	Stock Ownership – Zimmer, Johnson and Johnson, Merck, Pfizer, P&G, United Health Payment for Consulting Services – Zimmer Holdings, Inc. Research Support – Zimmer Holdings, Inc. Director – American Academy of Orthopaedic Surgery, American Association of Hip and Knee Surgeons and New York State Society of Orthopaedic Surgeons
Jess Lonner, MD	Stock Ownership – Mako Surgical Research Support – Zimmer, Mako Surgical Speaking Honoraria – Zimmer, Mako Surgical Royalties – Zimmer Service on Speaker's Bureau – Zimmer, Mako Surgical Payment for Consulting Services – Zimmer Scientific Advisory Board – Healthpoint Capital, C D Diagnostics

	Service on Editorial Board for Several Peer Reviewed Journals
Michael Mont, MD	Research – NIH, Stryker, Tissue Gene, Wright Medical Royalties – Stryker Payment for Consulting Services – Stryker, Tissue Gene, Joint Active Systems, Johnson and Johnson, Salient Surgical
Scott Endsley, MD	None
Sara Piva, PT, PhD.	None
Kate Chenok, MBA	None

AAOS Evidence Rating System

Rating	Recommendation	Evidence
A	Recommends	Good evidence (consistent level I studies)
B	Suggested	Fair evidence (consistent level II and III studies
C	Option	Poor quality evidence (level IV or V)
I	Neither recommended nor not recommended	When there is insufficient or conflicting evidence

References

[1] SooHoo NF, Lieberman, JR, Farng E, Park S, et al. Development of quality of care indicators for patients undergoing total hip or total knee replacement. BMJ Qual Saf. 20(2):153-157, 2011.
[2] Cram P, Lu X, Kates SL, Singh JA. Total knee arthroplasty volume, utilization, and outcomes among Medicare beneficiaries, 1991 -2010. JAMA 308(12):1227-1236, 2012.
[3] Centers for Disease Control and Prevention. Racial disparities in total knee replacement among Medicare enrollees—United States, 2000-2006. MMWR 58(06); 133-138, 2009. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5806a1.htm. (Accessed June 14, 2011)
[4] American Academy of Orthopedic Surgeons. United States Bone and Joint Decade: The burden of musculoskeletal diseases in the United States, 2008.
[5] Centers for Disease Control and Prevention. Prevalence of doctor-diagnosed arthritis and arthritis attributable activity limitation – United States, 2007-2009. MMWR 59(39); Available at: http://www.cdc.gov/mmwr/pdf/wk/mm5939.pdf (Accessed June 22, 2011)
[6] Kurtz S, Ong K, Lau E, et al. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. J Bone Joint Surg Am 89(4):780-785, 2007.
[7] Agency for Healthcare Research and Quality. Evidence Report/Technology Assessment: Total knee replacement, 2003.
[8] Agency for Healthcare Research and Quality. Procedures with the most rapidly increasing hospital costs, 2004-2007. H-CUP Statistical Brief 82; Available at: http://www.hcup-us.ahrq.gov/reports/statbriefs/sb82.pdf (Accessed June 22, 2011)
[9] Katz JN, Losina E, Barrett J et al. Association between hospital and surgeon procedure volume and outcomes of total hip replacement in the United States Medicare population. J Bone Joint Surg Am. 83A:1622-1629, 2001.
[10] Katz JN, Mahomed NN, et al. 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. Arthritis & Rheumatism 56 (2):568-574, 2007.
[11] SooHoo N, Zingmond D, Lieberman J, et al. Primary total knee arthroplasty in California 1991-2001:Does hospital volume affect outcomes? J Arthoplasty 21:199-205, 2006.
[12] SooHoo N, Lieberman J, Ko C, et al. Factors predicting complication rates following total knee replacement. J Bone Joint Surg Am 88:480-485, 2006.
[13] SooHoo N, Tang E, Krenek L, et al. Variations in the quality of care delivered to patients undergoing total knee replacement at 3 affiliated hospitals. Orthopedics 34(5):356, 2011.
[14] American Joint Replacement Registry. The American Joint Replacement Registry Annual Report 2011. Available at: http://orthodoc.aaos.org/ajrr/AJRR%20Annual%20Report%202011-%20FINAL.pdf. Accessed August 2012.
[15] AMA-convened Physician Consortium for Performance Improvement. "Specification and Categorization of Measure Exclusions: Recommendations to PCPI Work Groups" Available at: http://www.ama-assn.org/ama/pub/physician-resources/physician-consortium-performance-improvement/knowledge-center/position-papers-resources.page?
[16] American Academy of Orthopaedic Surgeons. AAOS clinical practice guideline on osteoarthritis of the knee. 2003.
[17] American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. Recommendations for the medical management of osteoarthritis of the hip and knee. 2000 Update. Arthritis Rheum 43:1905-1915, 2000.
[18] National Institutes of Health. NIH consensus statement on total knee replacement. NIH Consensus and State-of-the-Science Statements 20:1. 2003.
[19] American Academy of Orthopaedic Surgeons. AAOS treatment guideline of osteoarthritis of the knee full guideline. 2008.
[20] Zhang W, Moskowitz RW, Nuki G, Abramson S, et al. OARSI recommendations for the management of hip and knee osteoarthritis, part II: OARSI evidence-based, expert consensus guidelines. Osteoarth and Cartil 16:137-162, 2008.
[21] Fleischer LA, Beckman JA, Brown KA, et al. ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for the noncardiac surgery: a report of the American College of

Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 50:1707-1732, 2007.
[22] Singh JA, Jensen MR, Harmsen WS, Gabriel SE, Lewallen DG. Cardiac and thromboembolic complications and mortality in patients undergoing total hip and total knee arthroplasty. Ann Rheum Dis 70:2082-2088, 2011.
[23] Lalmohamed A, Vestergaard P, Klop C, Grove EL. Timing of acute myocardial infarction in patients undergoing total hip or knee replacement a nationwide cohort study. Arch Intern Med 172(16):1229-1235, 2012.
[24] Bratzler DW, Houck PM. Antimicrobial prophylaxis for surgery: an advisory statement from the National Surgical Infection Prevention Project. Am J Surg 189:395-404, 2005.
[25] Medical Device Tracking Requirements. Federal Register 21:821, 2008.