

Computation and risk adjustment of the Functional Status Assessment and Improvement for Patients Who Received a Total Hip Replacement or Total Knee Replacement performance measures

Our measure development team has drafted two electronic clinical quality measures that focus on functional status assessments before and after a joint replacement. One of the draft measures assesses care surrounding a primary total hip replacement; the other assesses care surrounding a primary total knee replacement. Both draft measures are based on standardized, patient-reported outcome (PRO) tools and are calculated at the provider level by taking the mean change in PRO score before and after joint replacement among all the provider’s patients that underwent a total joint replacement. PRO tools included in the draft measures include the Hip disability and Osteoarthritis Outcome Score (HOOS), the Knee injury and Osteoarthritis and Outcome Score (KOOS), the Patient Reported Outcomes Measurement Information System Global Health short form (PROMIS-10) and the Veterans RAND 12-Item Health Survey (VR-12).

These measures have been drafted for potential inclusion in Stage 3 of CMS’s EHR Incentive program, also known as Meaningful Use. The Meaningful Use program provides incentives for reporting data but, importantly, is not currently publicly reported and does not currently award incentives based on the level of performance.

Provider-level outcomes are often influenced by patient-level factors outside the provider’s control. At this point in the measure’s development, the measure development team has not yet been able to develop and test a risk-adjustment model for these measures, due to a lack of relevant data in structured fields. We anticipate there will be opportunities to pursue the development of a risk-adjustment model in the future. Sites participating in national or regional registries continue to accrue patient data and may be able to provide access to the large quantities of data needed to develop and test a risk-adjustment model. In Table 1, we present a preliminary list of risk-adjustment variables for consideration; additional factors may be considered when sufficient data are available to test a risk-adjustment model. Note that these definitions are not finalized and will be discussed with experts before development and testing of a risk-adjustment model.

Table 1. Potential risk-adjustment variables

Variable	Example definition
Age	Patient’s age at the time of surgery
Gender	Male, female, or unknown sex
Race	Patient’s race
Socioeconomic status	Insurance (e.g., Medicaid or dual-eligible patients, uninsured patients), characteristics of a patient’s neighborhood (e.g., average education, income, employment, crime)
Social functioning	Social functioning scores based on pre-operative assessment (e.g., PROMIS-10 Global or VR-12 social function questions)

Variable	Example definition
Comorbidities	Including, but not limited to the following comorbidities: <ul style="list-style-type: none"> • Obesity (e.g., defined by patient's body mass index) • Anxiety • Depression • Deep vein thrombosis • Pulmonary embolism • Musculoskeletal system involvement • Diabetes • Peripheral vascular disease • Poor immune status (e.g., immunocompromised, HIV) • Cardiac disease • Poor nutritional status
Chronic pain	<ul style="list-style-type: none"> • Pre-operative opioid dose • Exceeding a pre-determined threshold for pain based on pre-operative pain assessment (e.g., HOOS/KOOS pain subscale)
Smoking status	<ul style="list-style-type: none"> • History of tobacco use • Pack-years
Preoperative function and symptoms	<ul style="list-style-type: none"> • Patient's preoperative pain or function score
American Society of Anesthesiologists (ASA) physical status classification	<ul style="list-style-type: none"> • Assessment of severity based on ASA grade (1, 2, 3, or 4)
Radiographic severity	<ul style="list-style-type: none"> • Assessment of severity based on Kellgren-Lawrence grade (0, 1, 2, 3, or 4)
Previous infection	<ul style="list-style-type: none"> • Arthropathy of the hip or knee associated with infections
Retained hardware	<ul style="list-style-type: none"> • Previously installed hardware at the hip or knee joint
Range of motion	<ul style="list-style-type: none"> • Quantified range of motion at the joint before replacement
Gait aides	<ul style="list-style-type: none"> • Use of gait aides before joint replacement
Post-traumatic arthritis	<ul style="list-style-type: none"> • Arthritis at the hip or knee joint due to physical trauma
Inflammatory arthritis	<ul style="list-style-type: none"> • Rheumatoid arthritis at the hip or knee joint
Previous open surgery	<ul style="list-style-type: none"> • Prior invasive surgical interventions at the hip or knee joint
Abductor muscle deficiency	<ul style="list-style-type: none"> • Abductor muscle deficiency for hip replacement patients
Congenital deformity	<ul style="list-style-type: none"> • Developmental Dysplasia of Hip and Childhood Developmental Abnormalities
Angular deformity	<ul style="list-style-type: none"> • Acquired deformity of the knee (e.g., $\geq 15^\circ$ deformity at the knee joint) • Angular, translational, or rotational deformities of the proximal femur
Extensor mechanism deficiency	<ul style="list-style-type: none"> • Extensor mechanism deficiency for knee replacement patients
Flexion contracture	<ul style="list-style-type: none"> • Flexion contracture at the hip before joint replacement

eMeasure title	Measure description	Initial patient population	Measure population	Measure observations	Exclusions and exceptions	Definitions
Functional Status Assessment and Improvement for Patients Who Received a Total Hip Replacement	Average change in functional status assessment score for patients 19 years or older who received a primary total hip arthroplasty (THA) and completed a functional status assessment within the 90 days prior to their surgery and in the 270–365 days after their surgery.	Adults who meet the following criteria: – Age 19 years or older by the start of the measurement period – Had a primary total hip arthroplasty (THA) in the year prior to the measurement period – Had an encounter during the measurement period	Adults in the initial patient population who meet the following criteria: – Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, HOOS) in the 90 days prior to or including the day of surgery, with the score recorded in the electronic health record (EHR) – Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, HOOS) administered during the 270-365 days after surgery, with the score recorded in the EHR	Average change in functional status assessment score (before and after surgery) for all patients in the measure population	Exclusions: – An acute fracture of hip or lower limb at the time of THA, or – Severe cognitive impairment in the interval 90 days prior to and 365 days after surgery Exceptions: None	Lower limb fracture: A fracture caused by an acute accident. This may result in the need for a complete replacement of the hip joint. Since such a case would not be an elective surgery, patients with acute fractures are excluded from the denominator. To identify patients with an acute lower leg fracture, identify codes within the "Fracture – Lower Body Grouping Value Set" near the time of the hip replacement. Cognitive impairment: A state of mind (whether caused by medical, psychological, or developmental reasons) that interferes with a patient's ability to provide his or her own unique responses to questions that are validated for self-report on current state of health or illness. This state of mind would also preclude response by interview.

eMeasure title	Measure description	Initial patient population	Measure population	Measure observations	Exclusions and exceptions	Definitions
Functional Status Assessment and Improvement for Patients Who Received a Total Knee Replacement	Average change in functional status assessment score for patients age 19 years or older who received a primary total knee arthroplasty (TKA) and completed a functional status assessment within 90 days prior to their surgery and in the 270–365 days after their surgery.	Adults who meet the following criteria: – Age 19 years or older by the start of the measurement period – Had a primary total knee arthroplasty (TKA) in the year prior to the measurement period – Had an encounter during the measurement period	Adults in the initial patient population who meet the following criteria: – Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, KOOS) in the 90 days prior to or including the day of surgery, with the score recorded in the EHR – Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, KOOS) during the 270-365 days after surgery, with the score recorded in the EHR	Average change in functional status assessment score (before and after surgery) for all patients in the measure population	Exclusions: – An acute fracture of hip or lower limb at the time of TKA, or – Severe cognitive impairment in the interval 90 days prior to and 365 days after surgery Exceptions: None	Lower limb fracture: A fracture caused by an acute accident. This may result in the need for a complete replacement of the knee joint. Since such a case would not be an elective surgery, patients with acute fractures are excluded from the denominator. To identify patients with an acute lower leg fracture, identify codes within the "Fracture – Lower Body Grouping Value Set" near the time of the knee replacement. Cognitive impairment: A state of mind (whether caused by medical, psychological, or developmental reasons) that interferes with a patient's ability to provide his or her own unique responses to questions that are validated for self-report on current state of health or illness. This state of mind would also preclude response by interview.

eMeasure Title	Functional Status Assessment and Improvement for Patients Who Received a Total Hip Replacement		
eMeasure Identifier (Measure Authoring Tool)	379	eMeasure Version number	0.0.006
NQF Number	Not applicable	GUID	48c042d0-9455-4eae-b720-27f61ea8fbda
Measurement Period	January 1, 20xx, through December 31, 20xx		
Measure Steward	Centers for Medicare & Medicaid Services		
Measure Developer	National Committee for Quality Assurance		
Endorsed By	None		
Description	Average change in functional status assessment score for patients 19 years or older who received a primary total hip arthroplasty (THA) and completed a functional status assessment (FSA) within the 90 days prior to their surgery and in the 270–365 days after their surgery.		
Copyright	<p>Limited proprietary coding is contained in the measure specifications for user convenience. Users of proprietary code sets should obtain all necessary licenses from the owners of the code sets.</p> <p>CPT(R) contained in the measure specifications is copyright 2004-2015 American Medical Association. LOINC(R) copyright 2004-2012 Regenstrief Institute, Inc. This material contains SNOMED Clinical Terms(R) (SNOMED CT[R]) copyright 2004-2015 International Health Terminology Standards Development Organisation. ICD-10 copyright 2015 World Health Organization. All Rights Reserved.</p>		
Disclaimer	<p>These performance measures are not clinical guidelines and do not establish a standard of medical care, and have not been tested for all potential applications.</p> <p>THE MEASURES AND SPECIFICATIONS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND.</p> <p>Due to technical limitations, registered trademarks are indicated by (R) or [R] and unregistered trademarks are indicated by (TM) or [TM].</p>		
Measure Scoring	Continuous variable		
Measure Type	Outcome		
Stratification	None		
Risk Adjustment	<i>Please see the accompanying memo for a discussion on risk adjustment for this measure and variables under consideration.</i>		
Rate Aggregation	None		
Rationale	<p>Measuring functional status for patients undergoing total hip replacement permits longitudinal assessment from the patient's perspective of the impact of surgical intervention on pain, physical function, and health-related quality of life. These patient-reported outcomes can be measured using validated assessment instruments (Rothrock et al. 2010).</p> <p>Patients with acute hip or lower limb fractures at the time of surgery are excluded from this measure. The intent of this measure is to capture patients who undergo elective total joint replacement; patients who are</p>		

	<p>receiving a joint replacement as the result of acute trauma have not likely had the opportunity to complete preoperative health assessments.</p> <p>Preoperative and postoperative assessments are based on patient-reported data. Patients who are unable to report this information due to severe cognitive impairment are excluded from this measure.</p>
Clinical Recommendation Statement	NA
Improvement Notation	Depending on the FSA scales or subscale, a higher score or a lower score may indicate higher quality care. A patient's baseline FSA score will predict the amount of improvement he or she may expect to achieve (due to ceiling effects), emphasizing the importance of adjusting or stratifying by baseline score.
Reference	Rothrock, N.E., R.D. Hays, K. Spritzer, S.E. Yount, W. Riley, and D. Cella. "Relative to the General US population, Chronic Diseases Are Associated with Poorer Health-Related Quality of Life as Measured by the Patient-Reported Outcomes Measurement Information System (PROMIS)." <i>Journal of Clinical Epidemiology</i> , vol. 63, no. 11, 2010, pp. 1195–1204.
Definitions	<p>Lower limb fracture: A fracture caused by an acute accident. This may result in the need for a complete replacement of the hip joint. Since such a case would not be an elective surgery, patients with acute fractures are excluded from the measure population. To identify patients with an acute lower leg fracture, identify codes within the "Fracture—Lower Body Grouping Value Set" near the time of the hip replacement.</p> <p>Cognitive impairment: A state of mind (whether caused by medical, psychological, or developmental reasons) that interferes with a patient's ability to provide his or her own unique responses to questions that are validated for self-report on current state of health or illness. This state of mind would also preclude response by interview.</p>
Guidance	<p>The same assessment instrument must be used before and after surgery in order to calculate a change in score.</p> <p>Each of the assessment instruments or instrument subscales has its own performance rate in this measure. Since these instruments use different scoring methods and cover different aspects of patient-reported health, one instrument's performance rate in this measure can be compared only to other performance rates based on the same assessment instrument.</p> <p>Occurrence A of functional status result: If there are multiple patient-reported functional status assessments within the 90 days prior to surgery, use the completed FSA score closest to the surgery date. This will provide the most accurate assessment of the patient's status before surgery.</p> <p>Occurrence B of functional status result: If there are multiple patient-reported functional status assessments within the 270–365 days after surgery, use the completed FSA score furthest from the surgery date. This will provide the most accurate assessment of the patient's recovery after surgery.</p> <p>The intent of this measure is for a patient to have all applicable subscale scores for a particular tool (e.g., the VR-12 physical health score and the mental health score if the patient received the VR-12). At this time, we cannot specify this requirement in the measure logic.</p>
Transmission Format	TBD

Initial Population	Adults who meet the following criteria: <ul style="list-style-type: none"> - Age 19 years or older by the start of the measurement period - Had a primary total hip arthroplasty (THA) in the year prior to the measurement period - Had an encounter during the measurement period
Denominator	Not applicable
Denominator Exclusions	Not applicable
Numerator	Not applicable
Numerator Exclusions	Not applicable
Denominator Exceptions	Not applicable
Measure Population	Patients must meet the following criteria to be counted in the measure population: <ul style="list-style-type: none"> - Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, HOOS) in the 90 days prior to or including the day of surgery, with the score recorded in the electronic health record (EHR) - Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, HOOS) during the 270–365 days after surgery, with the score recorded in the EHR
Measure Population Exclusions	The following criteria exclude patients from this measure: <ul style="list-style-type: none"> - An acute fracture of hip or lower limb at the time of THA, or - Severe cognitive impairment in the interval 90 days prior to and 365 days after THA
Measure Observations	Average change in functional status assessment score (before and after surgery) for all patients in the measure population
Supplemental Data Elements	For every patient evaluated by this measure also identify payer, race, ethnicity, and sex.

eMeasure Title	Functional Status Assessment and Improvement for Patients Who Received a Total Knee Replacement		
eMeasure Identifier (Measure Authoring Tool)	378	eMeasure Version number	0.0.016
NQF Number	Not applicable	GUID	29706bcb-cc88-4e41-99d1-ecf450386363
Measurement Period	January 1, 20xx, through December 31, 20xx		
Measure Steward	Centers for Medicare & Medicaid Services		
Measure Developer	National Committee for Quality Assurance		
Endorsed By	None		
Description	Average change in functional status assessment score for patients age 19 years or older who received a primary total knee arthroplasty (TKA) and completed a functional status assessment (FSA) within the 90 days prior to their surgery and in the 270–365 days after their surgery.		
Copyright	<p>Limited proprietary coding is contained in the measure specifications for user convenience. Users of proprietary code sets should obtain all necessary licenses from the owners of the code sets.</p> <p>CPT(R) contained in the measure specifications is copyright 2004-2015 American Medical Association. LOINC(R) copyright 2004-2013 Regenstrief Institute, Inc. This material contains SNOMED Clinical Terms(R) (SNOMED CT[R]) copyright 2004-2015 International Health Terminology Standards Development Organisation. ICD-10 copyright 2015 World Health Organization. All Rights Reserved.</p>		
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Measure Scoring	Continuous variable		
Measure Type	Outcome		
Stratification	None		
Risk Adjustment	<i>Please see the accompanying memo for a discussion on risk adjustment for this measure and variables under consideration.</i>		
Rate Aggregation	None		
Rationale	<p>Measuring functional status for patients undergoing total knee replacement permits longitudinal assessment from the patient's perspective of the impact of surgical intervention on pain, physical function, and health-related quality of life. These patient-reported outcomes can be measured using validated assessment instruments (Rothrock et al. 2010).</p> <p>Patients with acute lower limb fractures at the time of surgery are excluded from this measure. The intent of this measure is to capture patients who undergo elective total joint replacement; patients who are receiving a joint replacement as the result of acute trauma have not likely had the opportunity to complete preoperative health assessments.</p>		

	Preoperative and postoperative assessments are based on patient-reported data. Patients who are unable to report this information due to severe cognitive impairment are excluded from this measure.
Clinical Recommendation Statement	NA
Improvement Notation	Depending on the FSA scales or subscale, a higher score or a lower score may indicate higher quality care. A patient's baseline FSA score will predict the amount of improvement he or she may expect to achieve (due to ceiling effects), emphasizing the importance of adjusting or stratifying by baseline score.
Reference	Rothrock, N.E., R.D. Hays, K. Spritzer, S.E. Yount, W. Riley, and D. Cella. "Relative to the General US Population, Chronic Diseases Are Associated with Poorer Health-Related Quality of Life as Measured by the Patient-Reported Outcomes Measurement Information System (PROMIS)." <i>Journal of Clinical Epidemiology</i> , vol. 63, no. 11, 2010, pp. 1195–1204.
Definitions	<p>Lower limb fracture: A fracture caused by an acute accident. This may result in the need for a complete replacement of the knee joint. Since such a case would not be an elective surgery, patients with acute fractures are excluded from the measure population. To identify patients with an acute lower leg fracture, identify codes within the "Fracture—Lower Body Grouping Value Set" near the time of the knee replacement.</p> <p>Cognitive impairment: A state of mind (whether caused by medical, psychological, or developmental reasons) that interferes with a patient's ability to provide his or her own unique responses to questions that are validated for self-report on current state of health or illness. This state of mind would also preclude response by interview.</p>
Guidance	<p>The same assessment instrument must be used before and after surgery in order to calculate a change in score.</p> <p>Each of the assessment instruments or instrument subscales has its own performance rate in this measure. Since these instruments use different scoring methods and cover different aspects of patient-reported health, one instrument's performance rate in this measure can be compared only to other performance rates based on the same assessment instrument.</p> <p>Occurrence A of functional status result: If there are multiple patient-reported functional status assessments within the 90 days prior to surgery, use the completed FSA score closest to the surgery date. This will provide the most accurate assessment of the patient's status before surgery.</p> <p>Occurrence B of functional status result: If there are multiple patient-reported functional status assessments within the 270–365 days after surgery, use the completed FSA score furthest from the surgery date. This will provide the most accurate assessment of the patient's recovery after surgery.</p> <p>The intent of this measure is for a patient to have all applicable subscale scores for a particular tool (e.g., the VR-12 physical health score and the mental health score if the patient received the VR-12). At this time, we cannot specify this requirement in the measure logic.</p>
Transmission Format	TBD
Initial Population	Adults who meet the following criteria: – Age 19 years or older by the start of the measurement period

	<ul style="list-style-type: none"> - Had a primary total knee arthroplasty (TKA) in the year prior to the measurement period - Had an encounter during the measurement period
Denominator	Not applicable
Denominator Exclusions	Not applicable
Numerator	Not applicable
Numerator Exclusions	Not applicable
Denominator Exceptions	Not applicable
Measure Population	<p>Patients must meet the following criteria to be counted in the measure population:</p> <ul style="list-style-type: none"> - Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, KOOS) in the 90 days prior to or including the day of surgery, with the score recorded in the electronic health record (EHR) - Completed a patient-reported functional status assessment score (i.e., VR-12, PROMIS-10-Global Health, KOOS) during the 270–365 days after surgery, with the score recorded in the EHR
Measure Population Exclusions	<p>The following criteria exclude patients from this measure:</p> <ul style="list-style-type: none"> - An acute fracture of knee or lower limb at the time of TKA, or - Severe cognitive impairment in the interval 90 days prior to and 365 days after TKA
Measure Observations	Average change in functional status assessment score (before and after surgery) for all patients in the measure population
Supplemental Data Elements	For every patient evaluated by this measure also identify payer, race, ethnicity, and sex.