

NQF-ENDORSED VOLUNTARY CONSENSUS STANDARD FOR HOSPITAL CARE

Measure Information Form Collected For: CMS Outcome Measures (Claims Based)

Measure Set: CMS Complication Measures

Set Measure ID #: COMP-THA/TKA

Performance Measure Name: Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA).

Description: This hospital-level risk-standardized complication measure for patients undergoing elective primary THA and/or TKA identifies “index” admissions for inclusion in the measure using Medicare Part A inpatient claims for FFS Medicare beneficiaries hospitalized. An “index” admission is any eligible admission to an acute care hospital for an elective primary THA and/or TKA included in the measure. The admission date of the index hospitalization is the starting point for all follow-up, and the hospital that performed the procedure is the one held accountable for the measure outcome (complication or no complication).

Rationale: THA and TKA are commonly performed procedures that improve quality of life. In 2003 there were 202,500 THAs and 402,100 TKAs performed¹ and the number of procedures performed has increased steadily over the past decade.^{2,3} Although these procedures dramatically improve quality of life, they are costly. In 2005 annual hospital charges totaled \$3.95 billion and \$7.42 billion for primary THA and TKA, respectively.² These costs are projected to increase by 340% to \$17.4 billion for THA and by 450% to \$40.8 billion for TKA by 2015.² Medicare is the single largest payer for these procedures, covering approximately two-thirds of all THAs and TKAs performed in the US.³ Combined, THA and TKA procedures account for the largest procedural cost in the Medicare budget.⁴

Because these are commonly performed and costly procedures, it is imperative to address quality of care. Complications increase costs associated with THA and TKA and affect the quality, and potentially quantity, of life for patients.

Although complications following elective THA and TKA are rare, the results can be devastating. Rates for periprosthetic joint infection following THA and TKA range from 1.6% to 2.3%, depending upon the population.^{5,6} Reported 90-day death rates following THA range from 0.7%⁷ to 2.7%.⁸ Rates for pulmonary embolism following TKA range from 0.5% to 0.9%.⁸⁻¹¹ Rates for wound infection in Medicare population-based studies vary between 0.3% and 1.0%.^{8,9,11} Rates for septicemia range from 0.1%, during the index admission¹² to 0.3%, 90 days following discharge for primary TKA.⁸ Rates for bleeding and hematoma following TKA range from 0.94%¹² to 1.7%.¹³

Furthermore, hospitals vary in their rate of complications. Analyses in Medicare fee-for-service (FFS) patients (2008-2010) demonstrate a median hospital-level RSCR of 3.5% (range 1.8% to 8.9%) after elective primary THA and/or TKA, suggesting room for improvement in clinical care.

The variation in complication rates across hospitals suggests there are considerable differences in the quality of care at the hospital level. Measuring and reporting risk-standardized complications rates will inform health care providers about opportunities to improve care, strengthen incentives for quality improvement, and promote improvements in the quality of care received by patients and the outcomes they experience. The measure will also provide patients with information that could guide their choices regarding where they seek care for these elective procedures. Furthermore, the measure will increase transparency for consumers and has the potential to lower health care costs due to costly readmissions associated with these complications.

Type of Measure: Outcome

Improvement Noted As: A decrease in the RSCR.

Numerator Statement: This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we are using this field to define our statistically-adjusted outcome measure.

The outcome for this measure is any one of the specified complications occurring during the index admission or during a readmission within the specified time period for that complication. Therefore, if a patient experiences one or more complications in the applicable time period, the outcome variable is coded as a "yes." The measure includes complications that are clinically significant, attributable to the THA/TKA procedure, and identifiable in claims data. The measure includes the following complications:

- identified during index admission or within 7 days of admission date:
 - acute myocardial infarction (AMI)
 - pneumonia
 - sepsis/septicemia/shock
- identified during index admission or within 30 days of admission date:
 - surgical site bleeding
 - pulmonary embolism
 - death
- identified during index admission or within 90 days of admission date:
 - mechanical complications
 - periprosthetic joint infection/wound infection

Denominator Statement: Patients eligible for inclusion in the measure are those aged 65 years and older electively admitted to non-federal acute care hospitals, as indicated by an ICD-9-CM procedure code for primary THA and/or TKA.

Eligible index admissions are identified using the following ICD-9 procedure codes in Medicare Part A inpatient claims data:

- 81.51 Total Hip Arthroplasty
- 81.54 Total Knee Arthroplasty

Included Populations: Admissions for Medicare FFS beneficiaries greater than or equal to 65 years of age discharged from non-federal acute care hospitals, having a principal procedure code for an elective primary THA and/or TKA.

Excluded Populations: In order to identify a cohort of elective THA and/or TKA procedures, the measure excludes admissions for patients:

- With a femur, hip or pelvic fracture coded in the principal discharge diagnosis field for the index admission
- Undergoing partial hip arthroplasty (PHA) procedures (with a concurrent THA/TKA)
- Undergoing revision procedures (with a concurrent THA/TKA)
- Undergoing resurfacing procedures (with a concurrent THA/TKA)
- With a mechanical complication coded in the principal discharge diagnosis field for the index admission
- With a malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field for the index admission
- With a procedure code for removal of implanted devices / prostheses

After excluding the above admissions to select elective primary THA/TKA procedures, the measure also excludes admissions for patients:

- Without at least 12 months pre-index admission enrollment in Medicare FFS
- Who were transferred in to the index hospital
- Who leave the hospital against medical advice (AMA)
- With more than two THA/TKA procedures codes during the index hospitalization

Risk Adjustment:

The measure follows an approach to risk adjustment that is tailored to and appropriate for a publicly reported outcome measure, as articulated in the American Heart Association (AHA) Scientific Statement, “Standards for Statistical Models Used for Public Reporting of Health Outcomes.”¹⁴

The goal of risk adjustment is to account for patient age, whether the patient had one or two procedures, and comorbid conditions that are clinically relevant and have strong relationships with the outcome while illuminating important quality differences between hospitals. The measure adjusts for case-mix differences based on the clinical status of the patient at the time of admission. Conditions that may represent adverse outcomes due to care received during the index admission are not considered for inclusion in the risk adjustment. Although they may increase the risk of mortality and complications, including them as covariates in risk adjustment could attenuate the measure’s ability to characterize the quality of care delivered by hospitals.

Full details of the development of the risk-standardization model for this measure are available at: <http://www.qualitynet.org>.

Data Collection Approach: Medicare claims data

Data Accuracy: The administrative claims data used to calculate the measure are maintained by CMS' Office of Information Services. These data undergo additional quality assurance checks during measure development and maintenance. A validation study to determine whether administrative data can reliably identify complications showed a final overall agreement of 99% between claims and medical records in identifying complications after minor changes to the complication definition.

Measure Analysis Suggestions: None

Sampling: No

Data Reported As: The measure estimates hospital-level RSCRs using a hierarchical logistic regression model. In brief, the approach simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals. The patient level models the log-odds of a complication adjusting for age, sex, selected clinical covariates, and a hospital-specific intercept. The second level models the hospital-specific intercepts as arising from a normal distribution. The hospital specific-intercept represents the underlying risk of a complication at that hospital, after accounting for patient risk. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSCR is calculated as the ratio of the number of “predicted” to the number of “expected” admissions with a complication, multiplied by the national unadjusted complication rate. For each hospital, the numerator of the ratio is the number of admissions with a complication predicted on the basis of the hospital’s performance with its observed case-mix, and the denominator is the number of admissions with a complication expected on the basis of the nation’s performance with that hospital’s case-mix. This approach is analogous to a ratio of “observed” to “expected” used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital’s performance given its case-mix to an average hospital’s performance with the same case-mix. Thus a lower ratio indicates lower-than-expected complication rate or better quality and a higher ratio indicates higher-than-expected complication rate or worse quality.

After regressing the risk factors and the hospital specific intercept on the risk of a complication, the predicted number of admissions with a complication (the numerator) is calculated by summing the estimated regression coefficients multiplied by the patient characteristics, adding the estimated hospital specific intercept, transforming this value to the probability scale, and then summing over all patients attributed to the hospital to get the predicted value. The expected number of admissions with a complication (the denominator) is obtained by summing the estimated regression coefficients multiplied by the patient characteristics observed in the hospital, adding the estimated average hospital intercept, transforming to the probability scale and then summing over all patients in the hospital to get the expected value.

Selected References:

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