

Memo

To: HSCRC
From: Eric Schone
Date: 6/17/2021
Subject: **Options for implementing a Hip/knee hospital outcomes measure**

Hip and knee replacements are among the most common surgeries. Quality measurement is important. Because mortality is fortunately low, outcomes-based measures must be based on alternative outcomes. Several measures have been developed using two different outcomes. One is complications following surgery, which includes adverse outcomes such as mechanical complications and infection, as well as mortality. The second is a patient reported outcome measure (PROM), which is based on the patient's responses to a survey describing the outcome of the surgery and its impact on functional status.

CMS has moved to implement measures of both types. The complications measure is part of the inpatient quality reporting (IQR) program, and a clinician group version of this inpatient measure has been added to the MIPS program in performance year 2021. A PROM measure has been tested, endorsed by NQF, and included by CMS in the proposed rule for that program. Both of these measures concern quality of surgeries performed on hospital inpatients. However, an increasing share of hip and knee replacements are performed in an outpatient setting. Covid-19 has accelerated this trend. Some of that increased outpatient volume will persist.

CMS has contracted with Brigham and Women's hospital to develop an electronic clinical quality measure (eCQM) based on complications extracted from electronic medical records that will include both inpatient and outpatient settings. This effort is part of the Measuring Outcomes in Orthopedics Routinely (MOOR) project, which also includes a PROM and two post-discharge drug measures. These measures are calculated at the clinical practice level rather than the hospital level.

CMS's Comprehensive Care for Joint Replacement (CJR) model¹ includes data collection for a PROM using instruments and protocols similar to the measures we reviewed. The Joint Commission has also developed measures for inpatient and outpatient surgeries that include PROMs. Information about the measures is available through Joint Commission Resources (JCR). However, the JCR PROM comprises two (pre-op and post-op) process measures and captures only the proportion of patients for which PROM data are collected. This measure will be required for accreditation of advanced hip and knee programs as of 7/1/2021.

HSCRC is considering measures that will address the outcomes of hip and knee surgeries and that will include procedures performed in both inpatient and outpatient settings. This memo describes options

¹ This model tests bundled payment and quality measurement for an episode of care associated with hip and knee replacements to encourage hospitals, physicians, and post-acute care providers to work together to improve the quality and coordination of care from the initial hospitalization through recovery; the model began on April 1, 2016 and will run through September 30, 2021, and as of January 1, 2021 approximately 432 IPPS hospitals in 67 different MSAs are participating in this CJR model. For additional information, see: <https://innovation.cms.gov/innovation-models/cjr>

based on measures currently in use or in development. First it describes the measures we have reviewed and their components. Then it presents options for testing measures and implementation.

Review of measures

Complication and PROM measures include:

- 1) CMS’s Inpatient risk standardized complications measure based on Medicare claims data
- 2) CMS’s Inpatient PROM measure based on claims and surveys
- 3) CMS’s inpatient and outpatient complications measure based on electronic health records
- 4) CMS’s inpatient and outpatient PROM measure based on electronic health records and survey²
- 5) JCR’s Outpatient/ambulatory PROM, a process measure based on chart abstraction and survey²

CMS’s CJR program includes data collection for CMS’s inpatient PROM described above (4). The MOOR project also includes development of two drugs measures:

- CMS inpatient and outpatient high dosage opioids measure based on drugs claims
- CMS inpatient and outpatient adverse drug events measure based on electronic health records

Components of the measures include selection criteria for index encounters, outcomes, risk factors and data sources. Table 1 below presents the components of the measures we reviewed.

Table 1. Measure components

Measure	Index encounters	Outcome	Risk Factors
1) CMS’s Inpatient risk standardized complications measure based on Medicare claims data	Identified by ICD-10 procedure codes from the initial encounter, exclusions are ICD-10 procedure and diagnosis codes. One encounter per calendar year is randomly selected for patients with multiple encounters. Specifications for inclusion and exclusion criteria are included in the methods report. ³	See Table 2. Outcomes are taken from ICD-10 diagnosis codes from the index encounter or from encounters occurring within the specified length of time from the index start date. Includes inpatient and outpatient claims for complications and mortality from CMS’s vital statistics. Outcome definitions are provided in the methods report for the measure.	The source is diagnosis codes from claims records for the previous 12 months. Diagnosis codes are grouped into CCs and chosen by backward selection using split sample validation. Risk factors are specified in the methods report.

² The Joint Commission also promotes a similar inpatient measure based on ICD10 procedure and diagnosis codes.

³ <https://qualitynet.cms.gov/inpatient/measures/complication/methodology>

Measure	Index encounters	Outcome	Risk Factors
2) CMS's Inpatient PROM measure based on claims and surveys	ICD-10 procedure codes, exclusions are ICD10 procedure and diagnosis codes from the initial encounter. One encounter is randomly selected for patients with multiple encounters. Specifications for inclusion and exclusion criteria are included in the methods report.	Pre-admission and post-discharge Knee dysfunction and Osteoarthritis Outcomes Survey (KOOS) or KOOS Jr, Hip dysfunction and Osteoarthritis Outcomes Survey (HOOS) or HOOS Jr, Promis or VR-12 survey instruments are sources of outcomes.	The source is claims records from the previous 12 months, previous survey elements and census data. Diagnosis codes are grouped into CCs and risk factors are chosen by backwards selection. Risk factors are specified in the methods report.
3) CMS's inpatient and outpatient complications measure based on electronic health records	Procedures indicated on electronic medical record. Exclusions are procedures and diagnoses from the index encounter and encounters from the preceding 3 months. Value sets are identified in the measure information sheet.	See Table 2. Outcomes are taken from electronic health records for the index encounter or from encounters occurring within the specified length of time from the index start date, including only post discharge complications for outpatient surgeries, but index complications for inpatient surgeries. Value sets are identified in the measure information sheet.	Risk adjustment is based on an electronic health record model still under development.
4) CMS's inpatient and outpatient PROM measure based on electronic health records and survey	Procedures indicated on electronic medical record. Exclusions are procedures and diagnoses from the index encounter and encounters from the preceding 3 months. Value sets are identified in the measure information sheet.	Pre-admission and post-discharge Knee dysfunction and Osteoarthritis Outcomes Survey (KOOS) or KOOS Jr, Hip dysfunction and Osteoarthritis Outcomes Survey (HOOS) or HOOS Jr, Promis or VR-12 survey instruments are sources of outcomes.	Risk adjustment is based on an electronic health record model still under development.
5) JCR's Outpatient/ambulatory PROM, a process measure based on chart abstraction and survey	CPT codes from the medical record	Pre-admission and post-discharge Knee dysfunction and Osteoarthritis Outcomes Survey (KOOS) or KOOS Jr, Hip dysfunction and Osteoarthritis Outcomes Survey (HOOS) or HOOS Jr, Promis or VR-12 survey instruments are sources of outcomes. Outcome is data collection.	No risk adjustment is performed

Identifying Index encounters

A comparison of the different measures indicates the different options for selecting the cases that will make up the measure denominator. Index encounters for CMS's claims-based inpatient measures are

ICD-10 procedure cases from the index inpatient claim, with exclusions based on ICD codes from the same encounters. ECQMs use value sets based on standard electronic health record formats. Index stays for the outpatient JCR measure are identified using CPT codes from the index encounter.

If functional outcomes are to be compared to preadmission status, cases for PROMs must be identified prior to the index encounter. Data used to develop CMS's inpatient PROM were taken from the CJR cohort, which instituted a protocol for PROM data collection including pre-admission surveys.

Outcomes

Clinical Outcomes

All measures except for the JCR measure are outcome measures. The JCR measure is a process measure (or measures, since pre-admission and post-admission surveys are separate measures). Table 2 presents outcomes from the post-discharge complications measures, both the inpatient claims-based measure and the eCQM. The outcomes are taken from the index encounter or from encounters occurring within the specified length of time from the index start date, and CMS's vital statistics data.

Table 2. Outcomes

Complication	Time Frame (days)
Acute Myocardial Infarction	7
Pneumonia	7
Sepsis	7
Pulmonary embolism	30
Surgical site bleeding	30
Death	30
Wound infection/Periprosthetic joint infection	90
Mechanical Complication	90

Patient Reported Outcomes

The three PROMs all use instruments taken from the same set of options. Knee outcomes may be from pre-admission and post-discharge Knee dysfunction and Osteoarthritis Outcomes Survey (KOOS) or KOOS Jr, hip outcomes from the Hip dysfunction and Osteoarthritis Outcomes Survey (HOOS) or HOOS Jr. Promis or VR-12 survey instruments are sources of general health status outcomes, though the JCR measure is a process measure.

Risk factors

CMS's inpatient measures use risk factors taken from pre-admission claims in all settings. Thus, to perform risk adjustment using these or similar models, CMS data (for a Medicare measure) or MCDB (for an all-payer model) data would be needed. Otherwise, risk adjustment based on information from the index encounter must be developed. ECQM risk adjustment models are still under development, but would likely include history preceding the index encounter and social determinants of health. For the JCR measure, no risk adjustment is performed.

Options

This section presents three options for implementing a hip/knee measure. They are 1) developing a risk standardized complication measure similar to CMS's inpatient measure; 2) introducing a PROM and 3) testing the feasibility of extracting necessary information from electronic health records.

All proposed measures include both inpatient and outpatient procedures. However, outpatient procedures and outpatients differ from inpatient procedures and inpatients in ways that may not be captured by clinical risk factors. Outpatient surgeries are performed on patients able and willing to return home and recover there on the same day they receive surgery. In addition, information on inpatient and outpatient index records differs. For these reasons, all the risk-adjusted measures would include separate inpatient and outpatient risk models.

Option 1: Risk standardized complication rates

Complication rates could be developed and tested immediately using administrative data based on extant measure specifications. All-payer or a Medicare only measures can be constructed drawing on the specifications we reviewed.

1a. All payer claims-based measure

Selection criteria for inpatient index stays in an all-payer or Medicare measure are ICD10 inclusion and exclusions from CMS's inpatient measure specifications. Outpatient selection criteria are CPT codes and diagnosis codes from the JCR measure. Outcomes are from index (if inpatient) and post-discharge claims based on specifications for CMS's inpatient measure. Risk factors are from the index encounter. APR-DRGs (or ADM-DRGs) could be used as clinical risk factors for inpatient stays, while demographics and comorbidity mappings could be based on diagnoses from the initial encounter.

1b. Medicare only claims-based measure

The Medicare-only measure follows the CMS methodology most closely but must therefore be restricted to Medicare cases. Inpatient selection criteria are ICD10 inclusion and exclusions from CMS inpatient measures. Outpatient selection criteria are CPT codes and diagnosis codes from JCR specifications. Outcomes are from index (if inpatient) and post-discharge claims based on specifications for CMS inpatient measure. Risk factors are from prior Medicare claims. The risk factors could be those specified in the methodology report, or a chosen by a selection process using candidate risk factors similar to those used to develop the CMS measure.

Option 2. PROM strategy

A PROM uses the same inpatient and outpatient criteria as claims based measures above, and outcomes from the surveys used in the PROMs above. This measure could be developed using Medicare claims data with risk factors similar to the CMS PROM model or as an all-payer measure using risk factors from surveys and initial encounters. A PROM could be implemented with separate models for inpatient and outpatient procedures. Implementation could begin by discussion with stakeholders, including review of instruments and methods. An initial measure, for which the outcome is PROM data collection similar to the JCR measure could be instituted.

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Mathematica

Option 3. eCQM testing

The feasibility of measures based on electronic health records could be tested based on the criteria specified for the CMS eCQMs. Depending on the current state and availability of electronic health records in Maryland, rates for a complications measure could be calculated and analyzed. A PROM using electronic health records would require stakeholder engagement as in option 2 above.