Measure Information Form and Instructions

Project Title: Measuring Outcomes in Orthopedics Routinely (MOOR) – eCQM: Prolonged Opioid Prescribing Rate Following Elective Primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA).
Date: 11/25/2020

Information included is current on 12/21/20 .

Project Overview:

As part of a larger project, the Centers for Medicare & Medicaid Services (CMS) provided funding to the Brigham and Women's Hospital (BWH) to develop a set of electronic clinical quality measures (eCQMs) related to total joint arthroplasty (TJA). The cooperative agreement name is Measuring Outcomes in Orthopedics Routinely (MOOR) and the number is: 1V1CMS331637-01-00.

1. Measure Name/Title (NQF Submission Form De.2.)

Prolonged Opioid Prescribing Rate Following Elective Primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA).

2. Descriptive Information

2.1 Measure Type (NQF Submission Form De.1.)

Identify a measure type from the list. Patient-reported outcomes (PROs) include health-related quality of life, functional status, symptom burden, experience with care, and health-related behavior.

☐process
☐process: appropriate use
☒outcome
☐outcome: PRO
☐cost / resource use
☐efficiency
☐structure
☐intermediate outcome
☐composite

2.2 Brief Description of Measure (NQF Submission Form De.3.)

Informed by the Washington State Agency Medical Directors' Group Guideline on Opioid Prescribing for Postoperative Pain, this eCQM will measure the percentage of opioid-naïve patients who were prescribed opioids for > 42 days (6 weeks) following an elective primary THA/TKA. Because this is a Merit-based Incentivized Payment System (MIPS) measure, the target population is patients 18 years and older across all payers.

2.3 If Paired or Grouped (NQF Submission Form De.4.)

This measure is not paired or grouped with any other measures.

3. Measure Specifications

These items follow the NQF requirements for measure submission and provide information required for measure evaluation.

3.1 Measure-Specific Webpage (NQF Submission Form S.1.)

Not applicable; this measure is under development.

3.2 If this is an electronic clinical quality measure (eCQM) (NQF Submission Form S.2a.):

The measure is under development using the eMeasure Authoring Tool (MAT). The Human Readable file and data dictionary is attached

3.3 Data Dictionary, Code Table, or Value Sets (NQF Submission Form S.2b.)

***Table A*: Value set used to identify patients with a qualifying elective primary THA or TKA**

Value set name	OID number
Primary THA/TKA Procedure	2.16.840.1.113883.3.464.1003.198.12.1006

***Table B*: Value sets used to identify denominator exclusion criteria**

Value set name	OID number
Nonprimary Total Hip, Total Knee Replacement	2.16.840.1.113762.1.4.1206.5
Fracture Exclusions for Hip and Knee Procedures	2.16.840.1.113762.1.4.1206.2
Malignant Neoplasm Complications Related to Hip and Knee Procedures	2.16.840.1.113762.1.4.1206.7
Mechanical Complications Related to Hip and Knee Procedures	2.16.840.1.113762.1.4.1206.1
Procedures Resulted from Periprosthetic Joint Infection/Wound Infections	2.16.840.1.113762.1.4.1206.9
Procedures Resulted from Surgical Site Bleeding and Other Surgical Site Complications	2.16.840.1.113762.1.4.1206.11
Cancer	2.16.840.1.113883.3.526.3.1010
Sickle Cell Disease	2.16.840.1.113883.3.3157.1004.22
Palliative Care	2.16.840.1.113883.3.3157.1004.24
Hospice Care	2.16.840.1.113883.3.3157.1004.20
Opioids	2.16.840.1.113762.1.4.1142.38
Left Against Medical Advice	2.16.840.1.113883.3.117.1.7.1.308
General Surgery	2.16.840.1.113883.3.117.1.7.1.255

- See attached excel file for full data dictionary

3.4 For an instrument-based measure (NQF Submission Form S.2c and S2.d):

Not applicable; this measure is based on routinely collected electronic health record (EHR) data.

3.5 Updates since last submission (NQF Submission Form S.3.1 and S.3.2)

Not applicable; this measure is under development.

3.6 Numerator Statement (NQF Submission Form S.4.)

The subset of patients from the denominator who were prescribed post-operative opioids for > 42 days after surgical discharge from an elective primary THA or TKA.

3.7 Numerator Details (NQF Submission Form S.5.)

The Numerator for this measure is the subset of patients from the denominator who were prescribed post-operative opioids for > 42 days after surgical discharge from an elective primary THA or TKA.

The measure will examine opioids included in the following value set:

- C2S Opioids
  - 2.16.840.1.113762.1.4.1142.38

3.8 Denominator Statement (NQF Submission Form S.6.)

The target population is all patients aged 18 years or older who received an elective primary THA or TKA procedure within the measurement year.

3.9 Denominator Details (NQF Submission Form S.7.)

To be included in the measure cohort used in public reporting, patients must meet the following inclusion criteria:

1. Aged 18 or older on the date of procedure

2. Having a qualifying elective primary THA/TKA procedure (inpatient or outpatient); elective primary THA/TKA procedures.

These producers are defined in the value set:

- Primary THA/TKA Procedure
  - 2.16.840.1.113883.3.464.1003.198.12.1006
- Payer (E)
  - 2.16.840.1.114222.4.11.3591

3.10 Denominator Exclusions (NQF Includes "Exception" in the "Exclusion" Field) (NQF Submission Form S.8.)

- The patient was prescribed opioids within the 90 days prior to the index admission
- The patient received a diagnosis of Opioid Use Disorder within the 365 days prior to the index admission
- The patient had a Cancer diagnosis within the 365 days prior to the index admission or 90 days following discharge
- The patient had a diagnosis of Sickle Cell Disease within the 365 days prior to the index admission or 90 days following discharge
- The patient received hospice or palliative care within the 365 days prior to the index admission or 90 days following discharge
- The patient was discharged against medical advice (AMA)

- The patient received a separate THA- or TKA-related procedure within the 90 days prior to the index admission or 90 days after hospital discharge
- More than two THA or TKA procedure codes were documented during the index hospitalization
- The patient had an additional surgery within 90 days following discharge from their THA/TKA

3.11 Denominator Exclusion Details (NQF Includes "Exception" in the "Exclusion" Field) (NQF Submission Form S.9.)

- Patient was prescribed opioids within the 90 days prior to the index admission or had a diagnosis for opioid use disorder
    - *Rationale: It has been proven that patients with prior opioid use are prescribed and consume opioids for longer durations and in greater magnitudes following surgery. Limiting this measure to opioid naïve patients (no opioid use in the 90 days leading up to surgery) provides the measure with a more standardized cohort [1].*
    - *Value Set: C2S Opioids*
        - *2.16.840.1.113762.1.4.1142.38*
    - *Value Set: Opioid Abuse, Dependence, and Other Use*
        - *2.16.840.1.113762.1.4.1146.1109*
- The patient had a Cancer diagnosis within the 365 days prior to the index admission or 90 days following discharge
    - *Rationale: Harmonized with NQF 2940. Patients with a cancer diagnosis are likely to experience greater levels of pain and therefore may require opioids for a greater duration following surgery.*
    - *Value Set: Cancer*
        - *2.16.840.1.113883.3.526.3.1010*
- The patient had a diagnosis of Sickle Cell Disease within the 365 days prior to the index admission or 90 days following discharge
    - *Rationale: Harmonized with NQF 2940. Patients with a sickle cell diagnosis are likely to experience greater levels of pain and therefore may require opioids for a greater duration following surgery.*
    - *Value set: Sickle Cell Disease*
        - *2.16.840.1.113883.3.3157.1004.22*
- The patient received hospice or palliative care within the 365 days prior to the index admission or 90 days following discharge
    - *Rationale: Harmonized with NQF 2940. Patients receiving hospice or palliative care will be receiving opioids for reasons other than their THA/TKA procedure.*
    - *Value Set: Palliative Care*
        - *2.16.840.1.113883.3.3157.1004.24*
    - *Value Set: Hospice Care*
        - *2.16.840.1.113883.3.3157.1004.20*
- The patient was discharged against medical advice (AMA)
    - *Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge*

    - *Value Set: Left Against Medical Advice*
        - *2.16.840.1.113883.3.117.1.7.1.308*
- The patient underwent an additional surgery within 90 days from surgical discharge
    - *Rationale: The additional procedure may result in further opioid prescriptions not related to the THA/TKA*
    - *Value set: General Surgery*
        - *2.16.840.1.113883.3.117.1.7.1.255*
- The Patient had more than two THA or TKA procedure codes were documented during the index hospitalization
    - *Rationale: Chart reviews demonstrated that this was frequently a coding error*

References

1. Thiels C.A., Anderson S.S., Ubl D.S., Hanson K.T., Bergquist W.J., Gray R.J., et al: Wide variation and overprescription of opioids after elective surgery. *Ann Surg.* 2017; 266: pp. 564-573

3.12 Stratification Details/Variables (NQF Submission Form S.10.)

The proposed measure will be stratified based of total hip and total knee patients, following recommendation from the technical expert panel as well as initial alpha testing. Therefore, the following value sets will be used for stratification:

- Primary THA Procedure
    - 2.16.840.1.113883.3.464.1003.198.12.1006
- Primary TKA Procedure
    - 2.16.840.1.113883.3.464.1003.198.12.1006

All other inclusion/exclusion criteria will remain constant.

3.13 Risk Adjustment Type (NQF Submission Form S.11.)

Select the risk adjustment type. Provide specifications for risk stratification in 3.14 (NQF Submission Form S.12.) and for the statistical model in 3.16-3.17 (NQF Submission Form S.14.–15.).

☐no risk adjustment or risk stratification
☒stratification by risk category/subgroup
☒statistical risk model
☐other (S.13.a.)

We adapted Dawson's conceptual model for relationships between social determinants of health and systolic blood pressure to describe the relationship between antecedents, predisposing, enabling factors, need for healthcare factors and patient outcomes. For this eCQM the outcome we are measuring the duration of opioid prescriptions after THA/TKA. In terms of antecedents, regional variation will be important when looking at these rates nationally. Rosenberg and

colleagues found that the amount of variability in health outcomes in the U.S. is large even after accounting for differences in population, co-morbidities, and health system factors. African American/Black race is an important outcome antecedent in the total joint replacement population [5]. Pfefferle et al. noted poorer outcomes for African American patients (particularly African American women) after TKA [6]. They found that African American women under the age of 60 had the greatest incidence of manipulation after TKA due to stiffness and decreased range of motion. Stone et al. also found that African American patients had longer lengths of stay, more complications (e.g., sepsis, manipulation under anesthesia) and were less likely to be discharged home than Caucasian patients after total joint surgery [7].

Patient demographics including age, sex and household income may be important predisposing factors of post-surgical outcomes. Basilico and colleagues found that older age was an important risk factor for complications following total joint replacement surgery [8]. As noted above, younger African American women have the greatest incidence of manipulation post TKA. Dy et al. found that younger age and lower income (e.g., Medicaid) increased the risk of undergoing early revision THA [9]. Kremers et al. did not find associations between marital status and educational attainment and postoperative complications [4].

English proficiency may be an important enabling factor for patients undergoing THA/TKA. De Oliveira et al. found that THA/TKA patients had a high prevalence of inadequate health literacy (60%) that may be associated with poor comprehension of discharge instructions and could potentially impact post-surgical outcomes [1].

Comorbidity and smoking status are important factors that increase the need for healthcare and may contribute to poorer outcomes in patients undergoing total joint replacement. Kremers et al. explored social and behavioral factors in THA/TKA and found that a positive smoking status was associated with higher rates of post-surgical infections. In addition, literature has shown that obesity is associated with higher rates of peri-operative complications, joint and wound infections, mechanical complications, deep vein thrombosis, blood loss, operative time, and need for revision surgery following primary total joint arthroplasty [3]. Currently, more than one third of Americans are classified as obese (BMI $\geq 30 kg/m^2$) and morbidly obese patients have significantly higher risk of complications noted above and they undergo total knee arthroplasty at an average age of 13 years younger than non-obese patients due to rapid progression of osteoarthritis [2].

References:

1. De Oliveira GS., et al. (2015). “The impact of health literacy in the care of surgical patients: a qualitative systematic review”. *BMC Surgery.* 15 (86).
2. Changulani M, et al. (2008). “The relationship between obesity and the age at which hip and knee replacement is undertaken”. *J Bone Joint Sug.* 90: (B:360-363)
3. Haynes J, et al. (2017). “Obesity in total hip arthroplasty: Does it make a difference?” *Bone Joint J.* 99-B (1 Supple A): 31-6

4. Kremers HM., et al. (2015). "Social and behavioral factors in total knee and hip arthroplasty". *The Journal of Arthroplasty*. 30:1852-1854.
5. Rosenberg BL., et al. (2016). "Quantifying Geographic Variation in Health Care Outcomes in the United States before and after Risk-Adjustment". *PLoS ONE*. 11(12):e0166762.
6. Pfefferle KJ, et al. (2014). "Risk factors for manipulation after total knee arthroplasty: a pooled electronc health record database study". *Journal of Arthroplasty*. 29(10): 2036-8.
7. Stone AH, et al. (2019). "Differences in perioperative outcomes and complications between African American and white patients after total joint arthroplasty". *Journal of Arthroplasty*. 34(4):656-662.
8. Basilico FC, et al. (2008). "Risk factors for cardiovascular complications following total joint replacement surgery". *American College of Rheumatology*. 58(7): 1915-1920.
9. Dy CJ, et al. (2013). "Risk factors for early revision after total hip arthroplasty". *American College of Rheumatology*. 66(6):907-915.

3.14 Type of Score (NQF Submission Form S.12.):

- ☐count
- ☒rate/proportion
- ☐ratio
- ☐categorical (e.g., yes or no)
- ☐continuous variable (CV) (e.g., an average)
- ☐other (specify)

3.15 Interpretation of Score (NQF Submission Form S.13.)

A lower score indicates better quality of care.

3.16 Calculation Algorithm/Measure Logic (NQF Submission Form S.14.)

- Step one: Define the denominator
    - Identify all patients aged 18 years or older, covered by any healthcare payer, who received an elective primary THA or TKA within the measurement year. Identify the first index admission for an elective primary THA or TKA for each patient. Define the denominator by applying the exclusion criteria.
- Step two: Define the numerator
    - Define the duration of each patient's post-operative opioid prescription(s):
        a. Identify the start date, defined as the date of the first opioid prescription written for the patient to use after hospital discharge.
        b. Identify the end date, defined as the day of the last prescribed dose after hospital discharge.
        c. Duration of the patient's post-operative opioid prescriptions = end date – discharge date +1.
- Step three: Calculate the percentage of patients that exceed 42 days (6 weeks): Divide the number of patients who exceeded 42 days in step two by the number of eligible patients

in the denominators (step one) and multiply by 100. The measure is reported as a percentage: XX out of 100 patients.

Hierarchical Logistic Regression Model

The measure estimates clinician group-level postoperative opioid prescribing practices following elective primary THA/TKA using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and clinician group levels to account for variance in patient outcomes within and between clinician groups [1,2,3,4]. At the patient level, it models the log-odds of a postoperative opioid prescription duration greater than 42 days (6 weeks) following surgery using age, sex, selected clinical covariates and a clinician group-specific random intercept. At the clinician group level, it models the clinician group-specific intercepts as arising from a normal distribution. The clinician group intercept represents the underlying risk of the patient receiving an opioid for a prolonged period at the clinician group level, after accounting for patient risk. The clinician group-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same clinician group. If there were no differences among clinician groups, then after adjusting for patient risk, the clinician group intercepts should be identical across all clinician groups.

The prolonged opioid prescribing rate is calculated as the ratio of the number of "predicted" to the number of "expected" cases exceeding 42 days, multiplied by the national rate of exceeding 42 days for a postoperative opioid duration. For each clinician group, the numerator of the ratio is the number of patients receiving prescriptions for greater than 42 days predicted based on the clinician group's performance with its observed case mix, and the denominator is the number of patients with postoperative opioid prescriptions expected based on the nation's performance with that clinician group'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 clinician group's performance given its case mix to an average clinician group's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected prolonged opioid prescribing rate or better quality, and a higher ratio indicates higher-than-expected prolonged opioid prescribing rate or worse quality.

In summary, the hierarchical logistic regression model is on the patient level and contains the patient characteristics as covariates (with fixed regression coefficients for these covariates that are common over all clinician groups) as well as a random effect for clinician group into which the patient's clinician belongs. The fixed regression coefficients of the risk factors are estimated using maximum likelihood with numerical quadrature to form the marginal likelihood integrated over the random clinician group-specific intercepts [5]. The random clinician group-specific intercepts are then estimated using an empirical Bayes approach [6].

The "predicted" number of patients with extended postoperative opioid prescriptions (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the

clinician group-specific random intercept on the risk that the patient may exceed the 42-day threshold. The estimated clinician group-specific intercept is added to the sum of the estimated regression coefficients multiplied by the patient characteristics. The results are transformed from the logit scale back to the probability scale (using the anti-logit transformation) and summed over all patients attributed to a clinician group to get a predicted value. The "expected" number of encounters, or the denominator is obtained in the same manner, but a common intercept using all clinician groups in our sample is added. The results are log transformed and summed over all patients in the clinician group to get an expected value. Thus, the risk factors for the patients and their common fixed regression coefficients are used in both the 'predicted' and the 'expected', but the expected is based solely on the patient characteristics, whereas the predicted includes the clinician group effect. Note, though, the clinician group random effect can be considered the residual clinician group effect after controlling for the patient risk factors. If there are strong clinician group effects after controlling for patient risk factors, then the risk-standardized prolonged opioid prescribing rates can be much different across clinician groups; if the clinician group effects are weak after controlling for the patient risk factors, then the prolonged opioid prescribing rates will be close to one. To assess clinician group performance for each reporting period, we re-estimate the model coefficients using the years of data in that period. This approach has been used in clinical papers by the statistician on our team [7,8].

References:

1. Normand S-LT., et al. (2007). "Statistical and Clinical Aspects of Hospital Outcomes Profiling." *Stat Sci.* 22(2): 206-226.
2. Dimick JB., et al. (2010). "Ranking hospitals on surgical mortality: the importance of reliability adjustment." *Health Services Research.* 45(6p1):1614-29.
3. Krell RW., et al. (2014). "Reliability of risk-adjusted outcomes for profiling hospital surgical quality." *JAMA surgery.* 149(5):467-74.
4. MacKenzie TA., et al. (2015). "A primer on using shrinkage to compare in-hospital mortality between centers." *Ann Thorac Surg.* 99(3):757-761.
5. Lange K. (1999). Numerical Analysis for Statisticians. New York: Springer – Verlag
6. Schall R. (1991). "Estimation in generalized linear models with random effects." *Biometrika.* 78(4): 719-727.
7. Wakeam E., et al. (2017). "Variation in the cost of 5 common operations in the United States." *Surgery.* 162(3):592-604.
8. Krimphove MJ., et al. (2019). "The current landscape of low-value care in men diagnosed with prostate cancer: what is the role of individual hospitals?" *Urol Oncol.* pii: S1078-1439(19)30134-6.

3.17 Sampling (NQF Submission Form S.15.)

Not applicable; this measure is not based on a sample.

3.18 Survey/Patient-Reported Data (NQF Submission Form S.16.)

Not applicable; this measure is not based on survey or patient-reported data.

3.19 Data Source (NQF Submission Form S.17.)

Indicate all sources for which the measure is specified and tested.

- ☐ administrative data
- ☐ claims data
- ☒ patient medical records (i.e., paper-based or electronic)
- ☒ electronic clinical data
- ☐ registries
- ☐ standardized patient assessments
- ☐ patient-reported data and surveys
- ☐ non-medical data
- ☐ other—describe in 3.20 (NQF Submission Form S.18.)

3.20 Data Source or Collection Instrument (NQF Submission Form S.18.)

Routinely collected information documented in EHRs.

3.21 Data Source or Collection Instrument (Reference) (NQF Submission Form S.19.)

Not applicable.

3.22 Level of Analysis (NQF Submission Form S.20.)

Indicate only the levels for which the measure is specified and tested.

- ☐ clinician: individual
- ☒ clinician: group/practice
- ☐ facility
- ☐ health plan
- ☐ integrated delivery system
- ☐ population: community, county, or city
- ☐ population: regional and state
- ☐ other

3.23 Care Setting (NQF Submission Form S.21.)

Indicate only the settings for which the measure is specified and tested.

- ☐ ambulatory surgery center
- ☒ clinician office/clinic
- ☐ outpatient rehabilitation
- ☐ urgent care – Ambulatory
- ☐ behavioral health: Inpatient
- ☐ behavioral health: Outpatient
- ☐ dialysis facility
- ☐ emergency medical services/ambulance
- ☐ emergency department
- ☐ home health

☐hospice
☐hospital
☐hospital: critical care
☐hospital: acute care facility
☐imaging facility
☐laboratory
☐pharmacy
☐nursing home / skilled nursing facility (SNF)
☐inpatient rehabilitation facility (IRF)
☐long-term acute care
☐birthing center
☐no applicable care setting
☐other

3.24 Composite Performance Measure (NQF Submission Form S.22.)

Not applicable; this measure is not a composite performance measure.