MEASURE INFORMATION FORM

Project Title:

Dialysis Facility Compare – Standardized Readmission Ratio

Project Overview:

The Centers for Medicare & Medicaid Services (CMS) has contracted with the University of Michigan Kidney Epidemiology and Cost Center (UM-KECC) to calculate and report quality measures for public reporting on Dialysis Facility Compare.. The contract name is ESRD Quality Measure Development, Maintenance, and Support. The contract number is HHSM-500-2013-13017I.

Date:

Information included is current beginning with the measures reported in the Quarterly Dialysis Facility Compare Preview Period for October 2016 Report.

Measure Name

Standardized Readmission Ratio (SRR) for dialysis facilities

Descriptive Information

Measure Name (Measure Title De.2.)
Standardized Readmission Ratio (SRR) for dialysis facilities

Measure Type De.1.
Outcome

Brief Description of Measure De.3.
The Standardized Readmission Ratio (SRR) is defined to be the ratio of the number of Medicare-covered index discharges from acute care hospitals that resulted in an unplanned Medicare-covered readmission to an acute care hospital within 4–30 days of discharge for dialysis patients treated at a particular dialysis facility to the number of readmissions that would be expected given the discharging hospitals, the characteristics of the dialysis facility's patients and the national norm for dialysis facilities. Note that, in this document, "hospital" refers to acute care hospital.

If Paired or Grouped De.4.
It is our view that the SRR should be considered in conjunction with the Standardized Hospitalization Ratio (SHR; NQF #1463). These two measures present two different aspects of dialysis facilities' hospitalization use, both of which are important. The SHR gives a measure of hospitalization rates with reference to the totality of patients being served by a given facility. The SRR on the other hand uses as a denominator the number of hospitalizations for the given facility. A facility that has a very low SHR, corresponding to low hospitalization rates, together with a high SRR suggests the facility is managing patients well overall, but there appear to be some potential problems with transitions of care, such as hospital discharges. Alternatively, a facility might have a high SHR and a low SRR, indicating that there is an overall high utilization of hospital resources, but that the process of care after a discharge seems effective at reducing readmissions.

Subject/Topic Areas De.5.
Prevention, Renal, Renal : End Stage Renal Disease (ESRD)

Crosscutting Areas De 6.
Care Coordination, Care Coordination : Readmissions, Safety : Readmissions

Measure Specifications

Measure-specific Web Page S.1.
N/A

If This Is an eMeasure S.2a.

No HQMF specs

Data Dictionary, Code Table, or Value Sets S.2b.
No data dictionary

For Endorsement Maintenance S.3.
N/A

Numerator Statement S.4.
Each facility's observed number of hospital discharges that are followed by an unplanned hospital readmission within 4–30 days of discharge

Time Period for Data S.5.
One calendar year

Numerator Details S.6.
Hospitalizations are counted as events in the numerator if they were followed by an unplanned readmission that (a) occurred within 4-30 days of a hospital discharge and (b) was not preceded by a "planned" readmission that also occurred within 430 days of discharge. In summary, a readmission is considered "planned" under two scenarios [1]:

1. The patient undergoes a procedure that is always considered planned (e.g., bone marrow transplant) or has a primary diagnosis that always indicates the hospitalization is planned (e.g., maintenance chemotherapy).

2. The patient undergoes a procedure that MAY be considered planned if it is not accompanied by an acute diagnosis. For example, a hospitalization involving a heart valve procedure accompanied by a primary diagnosis of diabetes would be considered planned, whereas a hospitalization involving a heart valve procedure accompanied by a primary diagnosis of acute myocardial infarction (AMI) would be considered unplanned.

1. Centers for Medicaid and Medicare Services. Hospital Quality Initiative: Measure Methodology website. "Planned Readmission Algorithm" [ZIP file]. Available at: http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Measure-Methodology.html. Accessed February 3, 2014.

Denominator Statement S.7.
The expected number hospitalizations followed by an unplanned readmission within 4-30 days in each facility, which is derived from a model that accounts for patient characteristics, the dialysis facility to which the patient is discharged and the discharging hospital.

Target Population Category S.8.
Populations at Risk

Denominator Details S.9.
We calculate each dialysis facility's expected number of hospitalizations followed by an unplanned readmission by fitting a model with random effects for discharging hospitals, fixed effects for facilities

and regression adjustments for a set of patient-level characteristics, including measures of patient comorbidities. We compute the expectation for the given facility assuming readmission rates corresponding to an "average" facility with the same patient characteristics and same discharging hospitals as this facility. Model details are provided in the Risk Standardization section below.

All live discharges of dialysis patients from a Medicare-paid hospitalization in a calendar year are considered eligible for this measure.

Denominator Exclusions (NQF Includes "Exceptions" in the "Exclusion" Field) S.10.
Hospital discharges that:

- Are not live discharges
- Result in a patient dying within 30 days with no readmission
- Are against medical advice
- Include a primary diagnosis for cancer, mental health or rehabilitation
- Occur after a patient's 12th admission in the calendar year
- Are from a PPS-exempt cancer hospital
- Result in a transfer to another hospital on the same day
- Result in a readmission (unplanned) within 3 days of discharge.

Denominator Exclusion Details (NQF Includes "Exceptions" in the "Exclusion" Field) S.11.

- Death in hospital/within 30 days of discharge: We determine a patient's death date from the CMS Medicare Enrollment Database, Death Notification Form (CMS Form 2746), CMS Medical Evidence Form (CMS Form 2728), Medicare claims, OPTN transplant follow-up form, CROWNWeb database, Medicare inpatient claims, and the Social Security Death Master File.
- Discharged against medical advice: We determine discharge status from the inpatient claim.
- Certain diagnoses: The primary diagnosis at discharge is available on the inpatient claim; we group these diagnoses into more general categories using AHRQ's Clinical Classification Software (CCS; see http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp for descriptions of each CCS).

  The excluded CCSs are shown below.
  - Cancer: 42, 19, 45, 44, 17, 38, 39, 14, 40, 35, 16, 13, 29, 15, 18, 12, 11, 27, 33, 32, 24, 43, 25, 36, 21, 41, 20, 23, 26, 28, 34, 37, 22, 31, 30
  - Psychiatric: 657, 659, 651, 670, 654, 650, 658, 652, 656, 655, 662
  - Rehab for prosthesis: 254

- Number of admissions: We remove any records for a patient after his/her 12th admission in the calendar year.
- PPS-exempt cancer hospitals: The following hospitals are listed as PPS-exempt cancer hospitals in the Federal Register (http://www.gpo.gov/fdsys/pkg/FR-2011-07-18/html/2011-16949.htm): 050146, 050660, 100079, 100271, 220162, 330154, 330354, 360242, 390196, 450076, 500138
- Same-day transfers: We determine same-day transfers using the hospital ID and date of discharge and date of next admission available in the inpatient claims data.
- 3-day exclusion: excludes any discharge followed by an unplanned admission that occurs within 3 days of the discharge.

Stratification Details/Variables S.12.
N/A

Risk Adjustment Type S.13.
Statistical risk model

Statistical Risk Model and Variables S.14.
We use a two-stage model, the first of which is a double random-effects logistic regression model. In this model, both dialysis facilities and hospitals are represented as random effects, and we make regression adjustments for a set of patient-level characteristics. From this model, we obtain the estimated standard deviation of the random effects of hospitals.

The second model is a mixed-effects logistic regression model, in which we include facilities are fixed effects and hospitals as random effects, with the standard deviation specified as equal to its estimates from the first model. The expected number of hospitalizations followed by an unplanned readmission for each facility is estimated as the summation of the probabilities of readmission of all patients in this facility and assuming the national norm for facility effect. This model accounts for a given facility's case mix using the same set of patient-level characteristics as those in the first model.

Detailed Risk Model Specifications S.15.
See Appendix

Type of Score S.16.
Ratio

Interpretation of Score S.17.
Better quality = Lower score

Calculation Algorithm/Measure Logic S.18.
1. Identify target hospitalizations (index discharges and readmissions):

a. Identify all Medicare-covered inpatient hospitalizations for patients discharged on dialysis that ended on or after January 1 of the measure year and began on or before January 31 of the following year. Note that the discharges occurring January 1-31 of the following year are kept temporarily only as potential readmissions, to be identified in the construction of the sample; no discharges in this period are considered index discharges.
b. Exclude any hospitalizations occurring at non-acute hospitals (e.g., those from long-term care or rehabilitation hospitals).
c. Classify each hospitalization as planned or unplanned, using the algorithm developed for CMS' Hospital-Wide Readmission (HWR) measure.

2. Identify index discharges as all discharges from Step 1, except those meeting one of the following criteria:

a. those ending in the next calendar year;
b. for patients who died during the hospitalization (because there was no opportunity for readmission);
c. for patients who were discharged against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge);
d. those ending in a transfer to another acute care facility (for patients who are transferred between one acute care hospital and another, the measure considers these multiple contiguous hospitalizations as a single acute episode of care, and any readmission for a transferred patient is attributed to the hospital that ultimately discharges the patient to the dialysis facility);
e. those taking place at Prospective Payment System (PPS)-exempt cancer hospitals;
f. those that occur after a patient's 12th hospital admission in the time period;
g. those for which the patient was admitted for medical treatment of cancer, primary psychiatric diagnoses or rehabilitation; and
h. those followed by an unplanned admission (from Step 1) that occurred within 3 days of discharge

3. Classify each index discharge in Step 2 according to whether it was followed within 4-30 days by an unplanned readmission:

a. For each index discharge in Step 2, find the first admission among the hospitalizations in Step 1 that occurred within 4-30 days of the index discharge date.
b. If no admission is identified AND the patient died within 30 days of the index discharge date then the index discharge is excluded.
c. If the admission identified was unplanned, then the index discharge is classified as having a readmission.

d. If no admission is identified (and not excluded in 3b) OR the admission identified was planned, then the index discharge is classified as not having a readmission.

4. Identify final set of index discharges for analysis as those from Step 3 with the following additional exclusions:

a. Exclude facilities with fewer than 11 index discharges in the time period.

5. Identify all ICD-9(before Oct 1st, 2015) and ICD-10(after Oct 1st, 2015) diagnoses for the patient in the full calendar year preceding the respective discharge; group each diagnosis into CMS' Hierarchical Condition Categories. These diagnoses are identified from Medicare-paid institutional claims (inpatient, outpatient, home health, hospice and skilled nursing facility).

6. Using a two-stage modeling process (see Appendix), calculate each facility's expected rate of readmission by regressing the probability of unplanned readmission within 4–30 days on a set of risk factors:

a. Fixed effect for dialysis facility receiving discharged patient
b. Random effect for hospital discharging the patient
c. Sex
d. Age at index discharge
e. Years on dialysis as of index discharge
f. Diabetes as cause of ESRD
g. BMI at incidence of ESRD
h. Length (days) of index hospitalization
i. Past-year comorbidities (grouped into CCs)
j. Discharged with high-risk condition (grouped into AHRQ CCSs)

Calculate the facility-level measure as the ratio of its actual readmission events to its expected number of readmission events. Standardize the measure in relation to the national median readmission rate.

Calculation Algorithm/Measure Logic Diagram URL or Attachment S.19.
Available in attached appendix at A.1

Sampling S.20.
N/A

Survey/Patient-Reported Data S.21.
N/A

Missing Data S.22.
N/A

Data Source S.23.
Administrative claims

Data Source or Collection Instrument S.24.
Data are derived from an extensive national ESRD patient database based on data from the CMS REMIS and CROWNWeb systems, Medicare dialysis and hospital payment records, the Organ Procurement and Transplant Network (OPTN), the CMS Nursing Home Minimum Dataset, and the Social Security Death Master File. Data from the CMS Annual Facility Survey (Form CMS-2744), the CMS Medical Evidence Form (Form CMS-2728) and the Death Notification Form (Form CMS-2746) come from CROWNWeb. The database is comprehensive for Medicare-covered ESRD patients. Information on hospitalizations is obtained from Medicare Inpatient Claims Standard Analysis Files (SAFs), and information on past-year comorbidities is obtained from multiple types (inpatient, outpatient institutional, physician/supplier, home health, hospice, skilled nursing facility claims) of Medicare Claims Standard Analysis Files (SAFs).

http://www.cms.gov/Manuals/IOM/itemdetail.asp?filterType=none&filterByDID=-99&sortByDID=1&sortOrder=ascending&itemID=CMS018912

Data Source or Collection Instrument (Reference) S.25.
N/A

Level of Analysis S.26.
Facility

Care Setting S.27.
Dialysis Facility

Composite Performance Measure S.28.
N/A

Appendix: Detailed Risk Model Specifications

To estimate the probability of 30-day unplanned readmission, we use a two-stage model, the first of which is a double random-effects logistic regression model. In this stage of the model, both dialysis facilities and hospitals are represented as random effects, and regression adjustments are made for a set of patient-level characteristics. From this model, we obtain the estimated standard deviation of the random effects of hospitals (Diggle, et. al., 2002).

The second stage of the model is a mixed-effects logistic regression model, in which dialysis facilities are modeled as fixed effects and hospitals are modeled as random effects, with the standard deviation specified as equal to its estimates from the first model. The expected number of readmissions for each facility is estimated as the summation of the probabilities of readmission of all patients in this facility and assuming the national norm (i.e., the median) for facility effect. This model accounts for a given facility's case mix using the same set of patient-level characteristics as those in the first model.

The equations used in the measure calculation are as follows:

- To estimate the probability of 30-day unplanned readmission, we use a two-stage approach. The main model, which produces the estimates used to calculate SRR, takes the form:

$$\log \frac{p_{ijk}}{1- p_{ijk}} = \gamma_i + \alpha_j + \beta^T Z_{ijk}\,, \tag{1}$$

  where p_{ijk} represents the probability of an unplanned readmission for the k^{th} discharge among patients from the i^{th} facility who are discharged from j^{th} hospital, and Z_{ijk} represents the set of patient-level characteristics. Here, $\gamma_i$is the fixed effect for facility and α_j is the random effect for hospital j. It is assumed that the α_js arise as independent normal variables (i.e., $\alpha_j \sim N(0, \sigma^2)$).

- We then use the estimates from this model to calculate each facility's SRR:

$$SRR_i = \frac{O_i}{E_i} = \frac{O_i}{\sum_{j\in H(i)} \sum_{k=1}^{n_{ij}} \tilde{p}_{ijk}}\,, \tag{2}$$

  where, for the i^{th} facility, O_i is the number of observed unplanned readmissions, E_i is the expected number of unplanned readmissions for discharges, $H(i)$ is the collection of indices of hospitals from which patients are discharged, and $\tilde{p}_{ijk}$ is the predicted probability of unplanned readmission under the national norm for each discharge. Specifically, $\tilde{p}_{ijk}$ takes the form

$$\tilde{p}_{ijk} = \frac{\exp\left(\widehat{\gamma_M} + \widehat{\alpha_j} + \widehat{\beta}^T Z_{ijk}\right)}{1+\exp\left(\widehat{\gamma_M} + \widehat{\alpha_j} + \widehat{\beta}^T Z_{ijk}\right)}\,, \tag{3}$$

which estimates the probability that a discharge from hospital *j* of an individual in facility *i* with characteristics Z_{ijk} would result in an unplanned readmission if the facility effect corresponded to the median of national facility effects, denoted by $\widehat{\gamma_M}$. Here, $\widehat{\alpha_j}$ and $\hat{\beta}$ are estimates from model (1). The sum of these probabilities is the expected number of unplanned readmissions E_i at facility *i*; e.g., the number of readmissions that would have been expected in facility i had they progressed to the readmissions at the same rate as the national population of dialysis patients.

Patient-Level Risk Adjustors

As mentioned previously, the model accounts for a set of patient-level characteristics:

- Sex
- Age
- Years on dialysis
- Diabetes as cause of ESRD
- BMI at incidence of ESRD
- Length (days) of index hospitalization
- Past-year comorbidities: We identify all unique ICD-9 diagnosis codes from each patient's prior year of Medicare claims. We group these diagnosis codes by diagnosis area using HHS' Hierarchical Condition Categories (CCs). The CCs used in calculation of the SRR are:
    - CCs 177, 178: Amputation status
    - CC 108: COPD
    - CC 79: Cardiorespiratory failure/shock
    - CC 46: Coagulation defects & other specified hematological disorders
    - CCs 51, 52: Drug and alcohol disorders
    - CCs 25, 26: End-Stage Liver Disease
    - CC 109: Fibrosis of lung or other chronic lung disorders
    - CCs 67–69, 100, 101: Hemiplegia, paraplegia, paralysis
    - CC 158: Hip fracture/dislocation
    - CC 174: Major organ transplants (excl. kidney)
    - CC 7: Metastatic cancer/acute leukemia
    - CC 44: Other hematological disorders
    - CCs 6, 111–113: Other infectious disease & pneumonias
    - CCs 10–12: Other major cancers
    - CC 32: Pancreatic disease
    - CCs 54–56, 58, 60: Psychiatric comorbidity
    - CC 77: Respirator dependence/tracheostomy status
    - CC 38: Rheumatoid arthritis & inflammatory connective tissue disease
    - CC 74: Seizure disorders & convulsions
    - CC 2: Septicemia/shock
    - CCs 8,9: Severe cancer
    - CCs 1, 3–5: Severe infection

    - CCs 148, 149: Ulcers
- Discharged with high-risk condition: We define a *high-risk* diagnosis as any diagnosis area that was rare in our population but had a 30-day readmission rate of at least 40%. We did not include high-risk diagnosis groups related to cancer or mental health. We group these conditions using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications Software (CCS). The CCS areas identified as high-risk are:
    - CCS 5: HIV infection
    - CCS 6: Hepatitis
    - CCS 56: Cystic fibrosis
    - CCS 57: Immunity disorders
    - CCS 61: Sickle cell anemia
    - CCS 190: Fetal distress and abnormal forces of labor
    - CCS 151: Other liver diseases
    - CCS 182: Hemorrhage during pregnancy; abruptio placenta; placenta previa
    - CCS 186: Diabetes or abnormal glucose tolerance complicating pregnancy; childbirth; or the puerperium
    - CCS 210: Systemic lupus erythematosus and connective tissue disorders
    - CCS 243: Poisoning by nonmedicinal substances