Measure Information Form

1. Measure Name/Title (CMS Consensus-Based Entity [CBE] Measure Submission Form, Measure Specifications sp.01)

Standardized Hospitalization Ratio for Dialysis Facilities (SHR)

2. Descriptive Information

2.1 Measure Type

- ☐ process
- ☒ outcome
- ☐ PRO-PM
- ☐ cost /resource use
- ☐ efficiency
- ☐ structure
- ☐ intermediate outcome
- ☐ population health
- ☐ composite
  - ☐ process
  - ☐ outcome
  - ☐ other
- ☐ other

2.2 Brief Description of Measure (CMS CBE Measure Submission Form, Measure Specifications sp.02 and sp.06)

Risk-adjusted standardized hospitalization ratio of the number of observed hospitalizations to the number of expected hospitalizations for dialysis facility patients (CBE ID 1463). This measure is calculated as a ratio but can also be expressed as a rate. SHR can be expressed as a risk-standardized rate, which is the product of the facility SHR and the national average hospitalization rate.

2.3 If Paired or Grouped (CMS CBE Measure Submission Form, Measure Specifications sp.03)

N/A

3. Measure Specifications

3.1 Measure-Specific Webpage (CMS CBE Measure Submission Form, Measure Specifications sp.09)

N/A

3.2 If this is an electronic clinical quality measure (eCQM) (CMS CBE Measure Submission Form, Measure Specifications sp.10)

N/A

3.3 Data Dictionary, Code Table, or Value Sets (CMS CBE Measure Submission Form, Measure Specifications sp.11)

See attachment

3.4 For an instrument-based measure (CMS CBE Measure Submission Form, Measure Specifications sp.23 and sp.24)

N/A

3.5 Updates since last submission (CMS CBE Measure Submission Form, Specifications: Maintenance Update spma.01 and spma.02)

Addition of COVID-19 adjustment in SHR model. New time periods for each patient begin at the start of a new COVID-19 diagnosis category and COVID-19 diagnosis is now included as a covariate in stage 1 of the SHR model.

3.6 Numerator Statement (CMS CBE Measure Submission Form, Measure Specifications sp.12)

Number of inpatient hospital admissions among eligible patients at the facility during the reporting period.

3.7 Numerator Details (CMS CBE Measure Submission Form, Measure Specifications sp.13)

The numerator is calculated through use of Medicare claims. When a claim is submitted for an inpatient hospitalization, the patient is attributed to a dialysis facility following the rules discussed above. The numerator is the count of all such hospitalizations over the reporting period. Index COVID-19 Hospitalizations (ICovH) are not counted as hospitalization events.

3.8 Denominator Statement (CMS CBE Measure Submission Form, Measure Specifications sp.14)

Number of hospital admissions that would be expected among eligible patients at the facility during the reporting period, given the patient mix at the facility.

3.9 Denominator Details (CMS CBE Measure Submission Form, Measure Specifications sp.15)

Mapping Patients to Facilities

EQRS is the primary basis for placing patients at dialysis facilities, and dialysis claims are used as an additional source. Information regarding first ESRD service date, death, and transplant is obtained from additional sources including the CMS Medical Evidence Form (CMS-2728), transplant data from the OPTN (Dialysis Facility Measures only), the Death Notification Form (CMS-2746) and the Social Security Death Master File (Dialysis Facility Measures only). Also see Section 3.1.6. Additionally, for Dialysis Facility Measures, a new treatment history record is created for each patient each time he/she changes facility or treatment modality. Each record represents a time period associated with a specific modality and dialysis facility.

As patients can receive dialysis treatment at more than one facility in a given year, each patient day is assigned to a facility (or no facility, in some cases) based on a set of conventions described below.

A patient's follow-up is included after that patient has received chronic dialysis for at least 90 days. Thus, hospitalizations, mortality and survival during the first 90 days of ESRD do not enter into the calculations. This minimum 90-day period also assures that most patients are eligible for Medicare, either as their primary or secondary insurer. It also excludes from analysis patients who die or recover during the first 90 days of ESRD.

In order to exclude patients who only received temporary dialysis therapy, we assigned patients to a facility only after they had been on dialysis there for at least 60 days. This 60-day period is used any time a patient begins therapy at a new facility whether the patient transferred from another facility, started ESRD for the first time, or returned to dialysis after a transplant. That is, hospitalizations during the first 60 days of dialysis at a facility do not affect the SHR of that facility.

For each patient, we identify the dialysis provider at each point in time. Starting with day 91 of ESRD, patients are attributed to facilities according to the following rules:

- A patient is attributed to a facility once the patient has been treated there for the past 60 days. When a patient transfers from one facility to another, the patient continues to be attributed to the original facility for 60 days and then is attributed to the destination facility.
- In particular, a patient is attributed to their current facility on day 91 of ESRD if that facility had treated them for the past 60 days. If on day 91, the facility had not treated a patient for the past 60 days, we wait until the patient reaches day 60 of continuous treatment at that facility before attributing the patient to that facility.
- When a patient is not treated in a single facility for a span of 60 days (for instance, if there were two switches within 60 days of each other), we do not attribute that patient to any facility.
- Patients are no longer attributed to facilities three days prior to transplant in order to exclude the transplant hospitalization.
- Patients who withdrew from dialysis or recovered renal function remain assigned to their treatment facility for 60 days after withdrawal or recovery.

If a period of one year passes with neither paid dialysis claims nor EQRS information to indicate that a patient was receiving dialysis treatment, the patient is designated lost to follow-up and is not included in the analysis. If dialysis claims or other evidence of dialysis reappears, the patient is re-entered into analysis after 60 days of continuous therapy at a single facility.

Days at Risk for Medicare Dialysis Patients

After patient treatment histories are defined as described above, periods of follow-up in time since ESRD onset are created for each patient. In order to adjust for duration of ESRD appropriately, we define six-time intervals with cut points at six months, one year, two years, three years and five years. A new time period begins each time the patient is determined to be at a different facility or crosses any of the above cut points, and at the start of a new COVID-19 diagnosis category (see 2.14.13 for description).

Because we can only identify hospitalizations if they appear in Medicare inpatient claims, we only include patients during time periods in which we are reasonably sure that all of the patient's hospitalizations would be included in Medicare billing records. Therefore, we require that patients reach a certain level of Medicare-paid dialysis bills, have Medicare inpatient claims, or are enrolled in MA during the period. Specifically, a patient-month within a given dialysis patient-period is included in the SHR calculation when at least one of the following is true:

(1) The patient had $1,200+ of Medicare-paid dialysis claims or at least one Medicare inpatient claim (hospital or SNF) during that month or one of the two prior months.
(2) The Medicare EDB indicates the patient was enrolled in MA during the month.

The intention of these criteria is to assure completeness of information on hospitalizations for all patients included in the analysis.

The number of days at risk in each of these patient-ESRD facility-year time periods is used to calculate the expected number of hospital admissions for the patient during that period. The SHR for a facility is the ratio of the total number of observed hospitalizations to the total number of expected hospitalizations during all time periods at the facility. Based on a risk adjustment model for the overall national hospitalization rates, we compute the expected number of hospitalizations that would occur for each month that each patient is attributed to a given facility. The sum of all such expectations for patients and months yields the overall number of hospital admissions that would be expected given the specific patient mix, and this forms the denominator of the measure.

The denominator of the SHR stems from a proportional rates model (Lawless and Nadeau, 1995; Lin et al., 2000; Kalbfleisch and Prentice, 2002). This is the recurrent event analog of the well-known proportional hazards or Cox model (Cox, 1972; Kalbfleisch and Prentice, 2002). To accommodate large-scale data, we adopt a model with piecewise constant baseline rates (e.g., Cook and Lawless, 2007) and the computational methodology developed in Liu, Schaubel and Kalbfleisch (2012).

3.10 Denominator Exclusions (CMS CBE Includes “Exception” in the “Exclusion” Field) (CMS CBE Measure Submission Form, Measure Specifications sp.16)

Patient Time at Risk Exclusions:

- First 90 days of ESRD treatment.
- Time during which patients were treated at the facility for fewer than 60 days.
- Time during which patient has a functioning kidney transplant (exclusion begins three days prior to the date of transplant).
- Time at risk once a patient has not been treated by any facility for a year or longer.
- Months which do not fulfill at least one of these criteria:
  - Month is within or in the two months following a month in which the patient has $1,200 of Medicare-paid dialysis claims.
  - Month is within or in the two months following a month in which the patient has at least one Medicare inpatient (hospital or SNF) claim submitted during the month.
  - Patient is enrolled in MA during the month according to the Medicare Enrollment Database.

3.11 Denominator Exclusion Details (CMS CBE Includes “Exception” in the “Exclusion” Field) (CMS CBE Measure Submission Form, Measure Specifications sp.17)

N/A

3.12 Stratification Details/Variables (CMS CBE Measure Submission Form, Measure Specifications sp.18)

N/A

3.13 Risk Adjustment Type (CMS CBE Measure Submission Form, Measure Specifications sp.19)

☐ no risk adjustment or risk stratification
☐ stratification by risk category/subgroup
☒ statistical risk model
☐ other

The patient characteristics included in the stage 1 model as covariates are:

- Age: Determine each patient’s age as of the period start date for the birth date provided by multiple data sources.* Age, centered at 65 years, is included both as a linear (continuous) and a quadratic term.

- Sex: Determine each patient's sex from multiple sources.*
- Diabetes as cause of ESRD: Determine each patient's primary cause of ESRD from Medical Evidence Form (CMS-2728), and EQRS.
- Duration of ESRD: Determine each patient's length of time on dialysis using the first service date from multiple data sources* and categorize as 90 days- < 6 months, 6 months- < 1 year, 1- < 2 years, 2- < 3 years, 3- < 5 years, or 5+ years as of the period start date.
- Nursing home status: Uses multiple sources* including the Nursing Home MDS. Determine each patient's nursing home status in previous 365 days and categorize as none (0 days), short-term nursing home (0-89 days), or long-term nursing home (>=90 days) as of the period start date.
- BMI at incidence: Calculate each patient's BMI based on the height and weight provided on his/her CMS 2728 and group patients into the following categories: BMI < 18.5, 18.5 ≤ BMI < 25, 25 ≤ BMI < 30, or BMI ≥ 30. BMI is imputed when either missing, or outside the range of 10 to 70 for adults or 5 to 70 for children. Missing and out-of-range BMIs are categorized into the mode group (i.e. >=30).
- Comorbidities at incidence are determined using a selection of comorbidities reported on the Medical Evidence Form (CMS-2728) namely, alcohol dependence, atherosclerotic heart disease, cerebrovascular disease, chronic obstructive pulmonary disease, congestive heart failure, diabetes (includes currently on insulin, on oral medications, without medications, and diabetic retinopathy), drug dependence, inability to ambulate, inability to transfer, malignant neoplasm, cancer, other cardiac disease, peripheral vascular disease, and tobacco use (current smoker). Each comorbidity is included as a separate covariate in the model.
- MA coverage: Calculate the proportion of time during the treatment period that the patient is enrolled in MA from Medicare EDB.
- Prevalent comorbidities: Identify a patient's prevalent comorbidities based on inpatient claims from the previous calendar year. The specific list of ICD codes used for adjustment related to this edition of the *Manual* can be found on the Measuring Quality page on the ESRD QIP section of CMS.gov. These ICD codes are then grouped using comorbidity groups defined by the 2019.1 version of the AHRQ CCS. See https://dialysisdata.org/content/dfccmethodology for a full list of the AHRQ categories used in the model adjustment.
- COVID-19 diagnosis: Determines each patient's COVID-19 status based on inpatient Medicare claims and physician supplier Medicare claims that contain an inpatient HCPCS code (HCPCS: 99221, 99222, 99223, 99231, 99232, 99233, 99238, 99239, 99251, 99252, 99253, 99254, 99255). A claim record confirms a COVID-19 diagnosis if any COVID-19 diagnosis codes (ICD-10-CM: U071, B9729, J1282) are included as primary or secondary diagnoses. Secondary diagnoses include 2nd through 25th ordered diagnoses. Patients with an inpatient COVID-19 event on February 20, 2020 or later (including during the ECE period of March-June 2020) are identified as COVID-19 patients. The COVID-19 clock starts at the discharge date of the first COVID-19 inpatient Medicare claim, which is the ICovH, and is then tracked for the following six months. The clock is not reset in the case of multiple COVID-19 hospitalizations. The period following the first ICovH is categorized into three mutually exclusive stages: the first month (days 1-30) after the ICovH discharge date is defined as "COVID1"; the second month (days 31-60) is defined as "COVID2"; the

3rd – 6th month (days 61-180) after the ICovH discharge is defined as “COVID3”. Once it has been six months since the ICovH discharge, a patient is assigned to the “No COVID” group. COVID1, COVID2, and COVID3 are all included as covariates in the model, while No COVID is the reference group.

* This may include information from: EQRS, Medicare Claims, and the Medical Evidence Form (CMS 2728).

Categorical indicator variables are included as covariates in the stage 1 model to account for records with missing values for cause of ESRD, and comorbidities at incidence (missing CMS-2728). These variables have a value of 1 if the patient is missing the corresponding variable and a value of 0 otherwise. If a patient has less than six months of Medicare covered months in prior calendar year, prevalent comorbidities are set to a value of 0 and an indicator for missing prevalent comorbidities is included. This variable has a value of 1 if the patient is missing the corresponding comorbidities and a value of 0 otherwise. Another categorical indicator variable is included as a covariate in the stage 1 model to flag records where the patient has at least one of the incident comorbidities listed earlier. This variable has a value of 1 if the patient has at least one of the comorbidities and a value of 0 otherwise.

Beside main effects, two-way interaction terms between the following pairs of variables are included:

- Diabetes as cause of ESRD and Sex.
- Diabetes as cause of ESRD and Age.
- Age and Sex.

3.14 Type of Score (CMS CBE Measure Submission Form, Measure Specifications sp.20)

☐ count
☐ rate/proportion
☒ ratio
☐ categorical (e.g., yes or no)
☐ continuous variable (CV) (e.g., an average)
☐ composite/scale
☐ other (specify) Click or tap here to enter text.

3.15 Interpretation of Score (CMS CBE Measure Submission Form, Measure Specifications sp.21)

Better quality = Lower score

3.16 Calculation Algorithm/Measure Logic (CMS CBE Measure Submission Form, Measure Specifications sp.22)

See flowchart in appendix.

3.17 Sampling (CMS CBE Measure Submission Form, Measure Specifications sp.25 and sp.26)

N/A

3.18 Survey/Patient-Reported Data (CMS CBE Measure Submission Form, Measure Specifications sp.27)

N/A

3.19 Data Source (CMS CBE Measure Submission Form, Measure Specifications sp.28)

☐ administrative data
☒ claims data
☐ paper patient medical records
☐ electronic patient medical records
☐ electronic clinical data
☒ registries
☐ standardized patient assessments
☐ patient-reported data and surveys
☐ non-medical data
☐ other—describe in 3.20 (CMS CBE Measure Submission Form, Measure Specifications sp.29)

3.20 Data Source or Collection Instrument (CMS CBE Measure Submission Form, Measure Specifications sp.29)

Data from multiple sources are used in the calculation of this measure, including EQRS and Medicare Claims. See attached data dictionary.

3.21 Data Source or Collection Instrument (Reference) (CMS CBE Measure Submission Form, Measure Specifications sp.30)

No data collection instrument provided

3.22 Level of Analysis (CMS CBE Measure Submission Form, Measure Specifications sp.07)

☐ individual clinician
☐ group/practice
☒ hospital/facility/agency
☐ health plan
☐ accountable care organization
☐ geographic population
☐ other (specify) Click or tap here to enter text.

3.23 Care Setting (CMS CBE Measure Submission Form, Measure Specifications sp.08)

☐ 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 (specify) Click or tap here to enter text.

3.24 Composite Measure (CMS CBE Composite Measure Submission Form, Measure Specifications sp.30)

N/A