## NQF-ENDORSED VOLUNTARY CONSENSUS STANDARDS FOR HOSPITAL CARE

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

**Measure Set:** CMS Mortality Measures

**Set Measure ID#:** MORT-30-COPD

**Performance Measure Name:** Hospital 30-day, all-cause, risk-standardized mortality rate following acute exacerbation of Chronic Obstructive Pulmonary Disease (COPD).

**Description:** The measure estimates a hospital-level, risk-standardized mortality rate for patients discharged from the hospital with a principal diagnosis of COPD, as well as those with a principal diagnosis of respiratory failure who had a secondary diagnosis of an acute exacerbation of COPD (AECOPD).

**Rationale:** Risk-standardized mortality rates (RSMRs) can provide important information about quality of care that is currently unavailable to hospitals. Variation in mortality, after adjusting for case-mix, may reflect differences in hospitals' general environments (such as coordination of care, patient safety policies, and staffing) or variation in care processes. Outcome measures can focus attention on a broad set of healthcare activities that affect patients' well-being. Moreover, improving outcomes is the ultimate goal of quality improvement, and so the inclusion of outcomes measures assists in attaining improvement goals.

COPD is a common condition with substantial mortality and morbidity. The condition imposes a substantial burden on patients and the health care system, and there is marked variation in outcomes by institution.

**Type of Measure:** Outcome

**Improvement Noted As:** A decrease in the RSMR.

**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 outcome. The calculation of the rate is defined below under Measure Calculation.

The outcome for this measure is 30-day all-cause mortality. We define mortality as death from any cause within 30 days after the index admission date.

**Denominator Statement:**
The target population for this measure includes admissions for Medicare Fee-for-Service (FFS) beneficiaries aged ≥65 years discharged from acute care non-federal hospitals, having a principal discharge diagnosis of COPD, as well as those with a principal diagnosis of respiratory failure who had a secondary diagnosis of AECOPD.

**Included Populations:** Admissions for Medicare FFS beneficiaries aged ≥65 years discharged from non-federal acute care hospitals, having a principal discharge diagnosis of COPD, as well as those with a principal diagnosis of respiratory failure who had a secondary diagnosis of AECOPD.

CMS FFS beneficiaries hospitalized within an acute care non-federal hospital are included if they have been enrolled in Part A and Part B Medicare for the 12 months prior to the date of admission to ensure a full year of administrative data for risk-adjustment. For patients with more than one admission in a given year for a given condition, only one admission is randomly selected to include in the cohort (others are excluded).

The measure includes patients who are admitted to an acute care hospital with a diagnosis of COPD and then transferred to another acute facility if the primary discharge diagnosis is COPD at the second hospital. The measure considers admission to the first hospital as the start of an acute episode of care and assigns the patient‘s outcome to the hospital that initially admitted them.

**ICD-9-CM codes that define the patient cohort**

| | |
|---|---|
| 491.21 | Obstructive chronic bronchitis; with (acute) exacerbation; acute exacerbation of COPD, decompensated COPD, decompensated COPD with exacerbation |
| 491.22 | Obstructive chronic bronchitis; with acute bronchitis |
| 491.8 | Other chronic bronchitis. Chronic: tracheitis, tracheobronchitis |
| 491.9 | Unspecified chronic bronchitis |
| 492.8 | Other emphysema; emphysema (lung or pulmonary): NOS, centriacinar, centrilobular, obstructive, panacinar, panlobular, unilateral, vesicular. MacLeod's syndrome; Swyer-James syndrome; unilateral hyperlucent lung |
| 493.20 | Chronic obstructive asthma; asthma with COPD, chronic asthmatic bronchitis, unspecified |
| 493.21 | Chronic obstructive asthma; asthma with COPD, Chronic asthmatic bronchitis, with status asthmaticus |
| 493.22 | Chronic obstructive asthma; asthma with COPD, chronic asthmatic bronchitis, with (acute) exacerbation |
| 496 | Chronic: nonspecific lung disease, obstructive lung disease, obstructive pulmonary disease (COPD) NOS. NOTE: This code is not to be used with any code from categories 491-493. |
| 518.81* | Other diseases of lung; acute respiratory failure; respiratory failure NOS |
| 518.82* | Other diseases of lung; acute respiratory failure; other pulmonary insufficiency, acute respiratory distress |
| 518.84* | Other diseases of lung; acute respiratory failure; acute and chronic respiratory failure |

799.1* Other ill-defined and unknown causes of morbidity and mortality; respiratory arrest, cardiorespiratory failure

*Patients with a principal diagnosis represented by these codes are included in the measure if the code is accompanied by a secondary diagnosis of AECOPD (491.21, 491.22, 493.21, or 493.22)

**Excluded Populations:**
The measure excludes admissions for patients:

- with inconsistent or unknown mortality status or other unreliable data (e.g. date of death precedes admission date)
- who were transferred from another acute care hospital (because the death is attributed to the hospital where the patient was initially admitted)
- enrolled in the Medicare Hospice program any time in the 12 months prior to the index hospitalization including the first day of the index admission (since it is likely these patients are continuing to seek comfort measures only)
- who were discharged against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge)

**Risk Adjustment:** For each patient, covariates are obtained from administrative data extending 12 months prior to, and including, the index admission. For all patients, information from Medicare inpatient claims, physician Part B claims and hospital outpatient claims are used for risk adjustment. Inpatient claim records have data on hospitalization for and include demographic information, principal and secondary diagnosis codes, and procedure codes. Diagnosis codes for comorbidities are also collected from physician and hospital outpatient files. These data are captured from the claim(s) for the index admission and from all inpatient and outpatient claims for the entire year before the patient's index COPD hospitalization to be utilized in the risk-adjustment model.

Only variables that convey information about patients' clinical status at the time of admission are used for the risk-adjustment, while complications that arise during the course of patients' index hospitalization are not included in the model.

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

The final set of risk-adjustment variables included:

| | |
|---|---|
| Demographics | Age |
| Cardiovascular/ Respiratory | Sleep Apnea<br>History of Mechanical Ventilation<br>Respirator Dependence/Respiratory Failure<br>Cardio-Respiratory Failure and Shock<br>Congestive Heart Failure<br>Chronic Atherosclerosis<br>Arrhythmias<br>Vascular or Circulatory Disease<br>Fibrosis of Lung and Other Chronic Lung Disorder<br>Asthma<br>Pneumonia<br>Pleural Effusion/Pneumothorax<br>Other Lung Disorders |
| Comorbidity | Metastatic Cancer and Acute Leukemia<br>Lung, Upper Digestive Tract, and Other Severe Cancers<br>Lymphatic, Head and Neck, Brain, and Other Major Cancers;<br>Breast, Prostate, Colorectal and Other Cancers and Tumors; Other<br>Respiratory and Heart Neoplasms<br>Other Digestive and Urinary Neoplasms<br>Diabetes and DM Complications<br>Protein-calorie Malnutrition<br>Disorders of Fluid/Electrolyte/Acid-Base<br>Other Endocrine/Metabolic/Nutritional Disorders<br>Other Gastrointestinal Disorders<br>Osteoarthritis of Hip or Knee<br>Other Musculoskeletal and Connective Tissue Disorders<br>Iron Deficiency and Other/Unspecified Anemias and Blood Disease<br>Dementia and Senility<br>Drug/Alcohol Abuse, Without Dependence<br>Other Psychiatric Disorders<br>Quadriplegia, Paraplegia, Functional Disability<br>Mononeuropathy, Other Neurological Conditions/Injuries<br>Hypertension and Hypertensive Disease<br>Stroke<br>Retinal Disorders, Except Detachment and Vascular Retinopathies<br>Other Eye Disorders<br>Other Ear, Nose, Throat, and Mouth Disorders<br>Renal Failure<br>Decubitus Ulcer or Chronic Skin Ulcer<br>Other Dermatological Disorders<br>Trauma<br>Vertebral Fractures<br>Major Complications of Medical Care and Trauma |

**Model Validation:** We computed several summary statistics for assessing logistic regression (patient-level) model performance, which included over-fitting indices, predictive ability, area under the receiver operating characteristic (ROC) curve, distribution of residuals, and model chi-square. Model performance is similar in the development and validation samples, with strong model discrimination and fit. Predictive ability is also similar in both samples. The C statistic (area under the receiver operator curve) is 0.72 when the model is applied to either the development or validation sample.

**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.

**Measure Analysis Suggestions:** None

**Sampling:** No.

**Data Reported As:** Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute exacerbation of Chronic Obstructive Pulmonary Disease (COPD).

**Measure Calculation:**
The measure estimates hospital-level 30-day all-cause RSMR for COPD using hierarchical logistic regression modeling. In brief, the approach simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals. At the patient level, the model adjusts the log-odds of mortality within 30 days of admission for age, sex, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution in order to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of “predicted” deaths to the number of “expected” deaths, multiplied by the national unadjusted mortality rate. For each hospital, the “numerator” of the ratio is the number of deaths within 30 days predicted on the basis of the hospital’s performance with its observed case-mix, and the “denominator” is the number of deaths 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 mortality or better quality, and a higher ratio indicates higher-than-expected mortality or worse quality.

The predicted number of deaths (the numerator) is calculated by regressing the risk factors and the hospital-specific intercept on the risk of mortality, multiplying the estimated regression coefficients by the patient characteristics in the hospital,

transforming, and then summing over all patients attributed to the hospital to get a value. The expected number of deaths (the denominator) is obtained by regressing the risk factors and a common intercept on the mortality outcome using all hospitals in our sample, multiplying the subsequent estimated regression coefficients by the patient characteristics observed in the hospital, transforming, and then summing over all patients in the hospital to get a value. To assess hospital performance in any reporting period, we re-estimate the model coefficients using the years of data in that period.

The statistical modeling approach is described fully in the original methodology report.

**Selected References:**


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