

NATIONAL QUALITY FORUM

Measure Submission and Evaluation Worksheet 5.0

This form contains the information submitted by measure developers/stewards, organized according to NQF's measure evaluation criteria and process. The evaluation criteria, evaluation guidance documents, and a blank online submission form are available on the [submitting standards web page](#).

NQF #: 1891 NQF Project: Pulmonary Project
(for Endorsement Maintenance Review) Original Endorsement Date: Most Recent Endorsement Date: Last Updated Date: Oct 26, 2012
BRIEF MEASURE INFORMATION
De.1 Measure Title: Hospital 30-Day, All-Cause, Risk-Standardized Readmission Rate (RSRR) following Chronic Obstructive Pulmonary Disease (COPD) Hospitalization
Co.1.1 Measure Steward: Centers for Medicare and Medicaid Services
De.2 Brief Description of Measure: The measure estimates a hospital-level risk-standardized readmission rate (RSRR), defined as unplanned readmissions for any cause within 30 days after the date of discharge of the index admission, for patients 40 and older discharged from the hospital with either a principal diagnosis of COPD or a principal diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD.
2a1.1 Numerator Statement: The outcome for this measure is 30-day all-cause readmission. We define all-cause readmission as an inpatient admissions for any cause, with the exception of planned readmissions, within 30 days after the date of discharge from the index admission for patients 40 and older discharged from the hospital with either a principal diagnosis of COPD or a principal diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD. If a patient has one or more admissions (for any reason) within 30 days after discharge from the index admission, only one is counted as a readmission. For the detailed definition of planned readmissions, please refer to the attached report, Respecifying the Hospital 30-Day Pneumonia and 30-Day Chronic Obstructive Pulmonary Disease Readmission Measures by adding a Planned Readmission Algorithm.
2a1.4 Denominator Statement: This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 40 years or older. We have explicitly tested the measure in both age groups. The cohort includes admissions for patients discharged from the hospital with either a principal diagnosis of COPD (see codes below) OR a principal diagnosis of respiratory failure (see codes below) WITH a secondary discharge diagnosis of acute exacerbation of COPD (see codes below) and with a complete claims history for the 12 months prior to admission.
2a1.8 Denominator Exclusions: An index admission is any eligible admission to an acute care hospital assessed in the measure for the outcome (readmitted within 30 days of the date of discharge from the initial admission). The measure excludes admissions for patients: <ul style="list-style-type: none"> • with an in hospital death (because they are not eligible for readmission). • transferred to another acute care facility (We assign the outcome for the acute episode of care to the hospital that discharges the patient to the non-acute care setting because the discharging hospital initiates the discharge and the transition to the outpatient setting. Therefore, the last admission in the acute care setting for the episode of care is eligible to be an index admission in the measure. The prior admissions in the same acute episode are excluded from the measure.) • who were discharged alive and against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge). • without at least 30 days post-discharge claims data (because the 30-day readmission outcome cannot be assessed in this group). Additionally, admissions that occur within 30 days of the discharge date of an earlier index admission are not themselves considered to be index admissions. Any COPD admission can only be an index admission or a readmission, but not both.
Of note, a patient may satisfy multiple exclusion criteria.

1.1 Measure Type: [Outcome](#)
 2a1. 25-26 Data Source: [Administrative claims](#)
 2a1.33 Level of Analysis: [Facility](#)

1.2-1.4 Is this measure paired with another measure? [No](#)

De.3 If included in a composite, please identify the composite measure (title and NQF number if endorsed):
[This measure is not formally paired with another measure, however this measure is harmonized with a measure of hospital-level, all-cause, 30-day, risk-standardized mortality following a COPD hospitalization.](#)

STAFF NOTES (issues or questions regarding any criteria)

Comments on Conditions for Consideration:

Is the measure untested? Yes No If untested, explain how it meets criteria for consideration for time-limited endorsement:

1a. Specific national health goal/priority identified by DHHS or NPP addressed by the measure (check De.5):
 5. Similar/related [endorsed](#) or submitted measures (check 5.1):
 Other Criteria:

Staff Reviewer Name(s):

1. IMPACT, OPPORTUNITY, EVIDENCE - IMPORTANCE TO MEASURE AND REPORT

Importance to Measure and Report is a threshold criterion that must be met in order to recommend a measure for endorsement. All three subcriteria must be met to pass this criterion. See [guidance on evidence](#).
Measures must be judged to be important to measure and report in order to be evaluated against the remaining criteria. (evaluation criteria)

1a. High Impact: H M L I
 (The measure directly addresses a specific national health goal/priority identified by DHHS or NPP, or some other high impact aspect of healthcare.)

De.4 Subject/Topic Areas (Check all the areas that apply): [Pulmonary/Critical Care, Pulmonary/Critical Care : Chronic Obstructive Pulmonary Disease \(COPD\), Pulmonary/Critical Care : Dyspnea](#)
 De.5 Cross Cutting Areas (Check all the areas that apply): [Care Coordination, Overuse, Population Health, Safety : Complications, Safety : Healthcare Associated Infections](#)

1a.1 Demonstrated High Impact Aspect of Healthcare: [Affects large numbers, A leading cause of morbidity/mortality, High resource use, Patient/societal consequences of poor quality, Severity of illness](#)

1a.2 If "Other," please describe:

1a.3 Summary of Evidence of High Impact (Provide epidemiologic or resource use data):
[COPD is a leading cause of readmissions to the hospital.1 The 30-day readmission rate among patients hospitalized for COPD is 22.6%, accounting for 4% of all 30-day readmissions.1 In 2007 the Medicare Payment Advisory Committee \(MedPAC\) published a report to Congress in which it identified the seven conditions associated with the most costly potentially preventable readmissions. Among these seven, COPD ranked fourth.2](#)

[The Agency for Health Research and Quality \(AHRQ\) has identified COPD as an ambulatory-care-sensitive condition \(ACSC\). ACSCs are conditions for which good outpatient care can potentially prevent the need for hospitalization or for which early intervention can prevent complications or more severe disease.3 COPD is an ACSC that is associated with high readmission rates and high costs to Medicare.2 These facts underscore the need for developing strategies to reduce readmissions and subsequent](#)

costs associated with COPD admissions. COPD patients require ongoing care and treatment after discharge and are therefore at increased risk for readmission. A hospital-level, 30-day all-cause readmission measure will inform healthcare providers about opportunities to improve care, and strengthen incentives for quality improvement, particularly for care at the time of transitions (e.g., discharge to home or a skilled nursing facility). Improvements in inpatient care and care transitions for this common, costly condition are likely to reduce costly readmissions.

1a.4 Citations for Evidence of High Impact cited in 1a.3: 1. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *N Engl J Med.* Apr 2 2009;360(14):1418-1428.
2. Medicare Payment Advisory Committee. Report to the Congress: Promoting Greater Efficiency in Medicare. Washington DC2007.
3. AHRQ Quality Indicators. Fact Sheet. Prevention Quality Indicators. 2006. <http://qualityindicators.ahrq.gov/downloads/pqi/2006-Feb-PreventionQualityIndicators.pdf> . Accessed December 21, 2010.

1b. Opportunity for Improvement: H M L I

(There is a demonstrated performance gap - variability or overall less than optimal performance)

1b.1 Briefly explain the benefits (improvements in quality) envisioned by use of this measure:

A hospital-level, 30-day all-cause readmission measure will inform healthcare providers about opportunities to improve care, and strengthen incentives for quality improvement, particularly for care at the time of transitions (e.g., discharge to home or a skilled nursing facility). Improvements in inpatient care and care transitions for this common, costly condition are likely to reduce costly readmissions.

1b.2 Summary of Data Demonstrating Performance Gap (Variation or overall less than optimal performance across providers):

[For Maintenance – Descriptive statistics for performance results for this measure - distribution of scores for measured entities by quartile/decile, mean, median, SD, min, max, etc.]

There is substantial variation in COPD RSRRs among hospitals. Using Medicare FFS 2008 data and the updated measure (with the planned readmission algorithm), the median hospital RSRR for COPD was 21.2% with a range of 17.8% to 26.2%. The 5th percentile was 19.9% and the 95th percentile was 23.0%. The interquartile range was 20.8% to 21.7%.

There is a paucity of research on quality outcomes for COPD patients in the US. However, there are some studies which demonstrate variation in practice patterns for COPD patients.

A large study of nearly 70,000 patients in 360 US hospitals demonstrated widespread variation in practice patterns across institutions¹, including underuse of antibiotics and systemic corticosteroids, suggesting there are opportunities to improve quality of care.

A review of the medical records of 409 Medicare Beneficiaries in Oklahoma reported similar opportunities to improve adherence to recommendations contained in clinical guidelines, especially with regard to the use of systemic corticosteroids.²

A third study, of 169 patients in 12 US communities, documented substantial opportunities to improve the quality of both chronic and acute care to patients with COPD. COPD patients received 58.0% of recommended care including 60.4% of acute care and 46.1% of routine care.³

In our analysis of Medicare FFS patients, crude readmission rates of a national sample of 176,481 patients across 4,547 hospitals demonstrates that hospital readmission rates for COPD patients are generally high, at a mean of 21.8%, and that there is a large amount of variation in outcomes, with the rates ranging from 10.8-32.6% (5th and 95th percentiles respectively).

1b.3 Citations for Data on Performance Gap: **[For Maintenance –** Description of the data or sample for measure results reported in 1b.2 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included]

1. Lindenauer PK, Pekow P, Gao S, et al. Quality of care for patients hospitalized for acute exacerbations of chronic obstructive pulmonary disease. *Ann Intern Med.* Jun 20 2006;144(12):894-903.
2. Bratzler DW, Oehlert WH, McAdams LM, et al. Management of acute exacerbations of chronic obstructive pulmonary disease in the elderly: physician practices in the community hospital setting. *J Okla State Med Assoc.* 2004;97:227-32
3. Mularski RA, Asch SM, Shrank WH, et al. The quality of obstructive lung disease care for adults in the United States: Adherence to recommended processes. *Chest* 2006; 130:1844-1850.

1b.4 Summary of Data on Disparities by Population Group: [For Maintenance – Descriptive statistics for performance results for this measure by population group]

A study of nearly 70,000 patients hospitalized for acute exacerbation of COPD, in which 9% of patients were black and 3% were Hispanic, reported that black and Hispanic patients were less likely than white patients to receive recommended and ideal care.¹

A study by Mularski, et al., demonstrated modest variation in recommended care provided between racial groups, geographic areas, insurance types, and other characteristics.²

We conducted analyses to explore disparities in hospitals' performance on the measures by race and socioeconomic status (SES). We conducted these analyses prior to adding the planned readmission algorithm, but do not expect the change would substantively affect the results.

Race

We used the Medicare Provider Analysis and Review (MEDPAR) File for 2008 to calculate the percentage of African-American patients at each hospital, using all patients admitted to each hospital. We examined hospital-level RSRRs across hospitals which were grouped by decile of percentage of African-American patients they cared for. There were no differences in the RSRRs by decile. The distributions for the RSRRs overlapped, and some hospitals caring for the highest percentage of African-American patients performed well on the measure. The median RSRR was 22.0% for hospitals with the highest and lowest percentages of African-American patients. In comparison to the national average, hospitals with high proportions of African-American patients do not have worse 30-day RSRRs.

SES

We determined a SES level for each hospital, based on the median household income for the hospital zip code. We used 2000 census data (http://factfinder.census.gov/home/saff/main.html?_lang=en) to identify hospital five-digit zip codes and median household income. We categorized median household income into deciles and examined hospital-level RSRRs across deciles of median household income. There were no differences in RSRRs across income decile. The distributions for the RSRRs overlapped and hospitals in the lowest median income decile performed well on the measure. The median RSRR was 22.0% for hospitals in the lowest and highest deciles of median household income. In comparison to the national average, hospitals in low-income zip codes do not have worse 30-day RSRRs.

1b.5 Citations for Data on Disparities Cited in 1b.4: [For Maintenance – Description of the data or sample for measure results reported in 1b.4 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included]

1. Lindenauer PK, Pekow P, Gao S, et al. Quality of care for patients hospitalized for acute exacerbations of chronic obstructive pulmonary disease. *Ann Intern Med.* Jun 20 2006; 144 (12) 894-903.
2. Mularski RA, Asch SM, Shrank WH, et al. The quality of obstructive lung disease care for adults in the United States: Adherence to recommended process. *Chest* 2006; 130-1844-1850.

1c. Evidence (Measure focus is a health outcome OR meets the criteria for quantity, quality, consistency of the body of evidence.) Is the measure focus a health outcome? Yes No If not a health outcome, rate the body of evidence.

Quantity: H M L I Quality: H M L I Consistency: H M L I

Quantity	Quality	Consistency	Does the measure pass subcriterion1c?
M-H	M-H	M-H	Yes <input type="checkbox"/>
L	M-H	M	Yes <input type="checkbox"/> IF additional research unlikely to change conclusion that benefits to patients outweigh harms: otherwise No <input type="checkbox"/>
M-H	L	M-H	Yes <input type="checkbox"/> IF potential benefits to patients clearly outweigh potential harms: otherwise No <input type="checkbox"/>
L-M-H	L-M-H	L	No <input type="checkbox"/>
Health outcome – rationale supports relationship to at least			Does the measure pass subcriterion1c?

one healthcare structure, process, intervention, or service	Yes <input type="checkbox"/> IF rationale supports relationship
<p>1c.1 Structure-Process-Outcome Relationship (Briefly state the measure focus, e.g., health outcome, intermediate clinical outcome, process, structure; then identify the appropriate links, e.g., structure-process-health outcome; process- health outcome; intermediate clinical outcome-health outcome): N/A This is an outcomes measure, not a process measure.</p> <p>1c.2-3 Type of Evidence (Check all that apply):</p> <p>1c.4 Directness of Evidence to the Specified Measure (State the central topic, population, and outcomes addressed in the body of evidence and identify any differences from the measure focus and measure target population): N/A This is an outcomes measure, not a process measure.</p> <p>1c.5 Quantity of Studies in the Body of Evidence (Total number of studies, not articles): N/A This is an outcomes measure, not a process measure.</p> <p>1c.6 Quality of Body of Evidence (Summarize the certainty or confidence in the estimates of benefits and harms to patients across studies in the body of evidence resulting from study factors. Please address: a) study design/flaws; b) directness/indirectness of the evidence to this measure (e.g., interventions, comparisons, outcomes assessed, population included in the evidence); and c) imprecision/wide confidence intervals due to few patients or events): N/A This is an outcomes measure, not a process measure.</p> <p>1c.7 Consistency of Results across Studies (Summarize the consistency of the magnitude and direction of the effect): N/A This is an outcomes measure, not a process measure.</p> <p>1c.8 Net Benefit (Provide estimates of effect for benefit/outcome; identify harms addressed and estimates of effect; and net benefit - benefit over harms): N/A This is an outcomes measure, not a process measure.</p> <p>1c.9 Grading of Strength/Quality of the Body of Evidence. Has the body of evidence been graded? No</p> <p>1c.10 If body of evidence graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias: N/A This is an outcomes measure, not a process measure.</p> <p>1c.11 System Used for Grading the Body of Evidence: Other</p> <p>1c.12 If other, identify and describe the grading scale with definitions: N/A This is an outcomes measure, not a process measure.</p> <p>1c.13 Grade Assigned to the Body of Evidence: N/A This is an outcomes measure, not a process measure.</p> <p>1c.14 Summary of Controversy/Contradictory Evidence: N/A This is an outcomes measure, not a process measure.</p> <p>1c.15 Citations for Evidence other than Guidelines(Guidelines addressed below): N/A This is an outcomes measure, not a process measure.</p> <p>1c.16 Quote verbatim, the specific guideline recommendation (Including guideline # and/or page #): N/A This is an outcomes measure, not a process measure.</p> <p>1c.17 Clinical Practice Guideline Citation: N/A This is an outcomes measure, not a process measure.</p>	

1c.18 National Guideline Clearinghouse or other URL: [N/A This is an outcomes measure, not a process measure.](#)

1c.19 Grading of Strength of Guideline Recommendation. Has the recommendation been graded? [No](#)

1c.20 If guideline recommendation graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias:

1c.21 System Used for Grading the Strength of Guideline Recommendation: [Other](#)

1c.22 If other, identify and describe the grading scale with definitions: [N/A This is an outcomes measure, not a process measure.](#)

1c.23 Grade Assigned to the Recommendation: [N/A This is an outcomes measure, not a process measure.](#)

1c.24 Rationale for Using this Guideline Over Others: [N/A This is an outcomes measure, not a process measure.](#)

Based on the NQF descriptions for rating the evidence, what was the developer's assessment of the quantity, quality, and consistency of the body of evidence?

1c.25 Quantity: [High](#) 1c.26 Quality: [High](#) 1c.27 Consistency: [High](#)

1c.28 Attach evidence submission form:

1c.29 Attach appendix for supplemental materials:

Was the threshold criterion, *Importance to Measure and Report*, met?

(1a & 1b must be rated moderate or high and 1c yes) Yes No

Provide rationale based on specific subcriteria:

For a new measure if the Committee votes NO, then STOP.

For a measure undergoing endorsement maintenance, if the Committee votes NO because of 1b. (no opportunity for improvement), it may be considered for continued endorsement and all criteria need to be evaluated.

2. RELIABILITY & VALIDITY - SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. (**evaluation criteria**)

Measure testing must demonstrate adequate reliability and validity in order to be recommended for endorsement. Testing may be conducted for data elements and/or the computed measure score. Testing information and results should be entered in the appropriate field. Supplemental materials may be referenced or attached in item 2.1. See [guidance on measure testing](#).

S.1 **Measure Web Page** (*In the future, NQF will require measure stewards to provide a URL link to a web page where current detailed specifications can be obtained*). Do you have a web page where current detailed specifications for this measure can be obtained? [No](#)

S.2 If yes, provide web page URL:

2a. RELIABILITY. Precise Specifications and Reliability Testing: H M L I

2a1. Precise Measure Specifications. (*The measure specifications precise and unambiguous.*)

2a1.1 **Numerator Statement** (*Brief, narrative description of the measure focus or what is being measured about the target population, e.g., cases from the target population with the target process, condition, event, or outcome*):

[The outcome for this measure is 30-day all-cause readmission. We define all-cause readmission as an inpatient admissions for any cause, with the exception of planned readmissions, within 30 days after the date of discharge from the index admission for patients 40 and older discharged from the hospital with either a principal diagnosis of COPD or a principal diagnosis of respiratory failure with a secondary diagnosis of acute exacerbation of COPD. If a patient has one or more admissions \(for any reason\) within 30 days](#)

after discharge from the index admission, only one is counted as a readmission. For the detailed definition of planned readmissions, please refer to the attached report, Respecifying the Hospital 30-Day Pneumonia and 30-Day Chronic Obstructive Pulmonary Disease Readmission Measures by adding a Planned Readmission Algorithm.

2a1.2 Numerator Time Window *(The time period in which the target process, condition, event, or outcome is eligible for inclusion):* Patients who are readmitted for any cause within 30 days from the date of discharge of the index COPD admission.

2a1.3 Numerator Details *(All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, codes with descriptors, and/or specific data collection items/responses):* 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 the outcome.

Measure includes readmissions to any acute care hospital for any cause within 30 days from the date of discharge of the index admission.

Planned admissions not counted as readmissions

Unplanned readmissions are acute clinical events experienced by a patient that require urgent hospitalizations. Higher than expected unplanned readmission rates suggest lower quality of hospital and post-discharge care and are the focus of hospital quality measurement as part of quality improvement efforts. In contrast, planned readmissions are generally not a signal of quality of care. Furthermore, there is concern that including planned readmissions in a readmission measure could create a disincentive to provide appropriate care to patients who are scheduled for elective or necessary procedures, unrelated to the quality of the prior admission, within 30 days of discharge. We have, therefore, developed an algorithm for using claims data to identify "planned readmissions" that will not count as outcomes in the readmission measure.

In Medicare FFS data from the 2008 calendar year, 0.6% of index hospitalizations for COPD were followed by a planned readmission within 30 days of discharge. After accounting for planned readmissions, the crude 30-day measure readmission rate decreased from 21.9% to 21.3%.

The detailed algorithm for identifying planned readmissions is in the attached report, Respecifying the Hospital 30-Day Pneumonia and 30-Day Chronic Obstructive Pulmonary Disease Readmission Measures by adding a Planned Readmission Algorithm.

2a1.4 Denominator Statement *(Brief, narrative description of the target population being measured):*

This claims-based measure can be used in either of two patient cohorts: (1) patients aged 65 years or older or (2) patients aged 40 years or older. We have explicitly tested the measure in both age groups.

The cohort includes admissions for patients discharged from the hospital with either a principal diagnosis of COPD (see codes below) OR a principal diagnosis of respiratory failure (see codes below) WITH a secondary discharge diagnosis of acute exacerbation of COPD (see codes below) and with a complete claims history for the 12 months prior to admission.

2a1.5 Target Population Category *(Check all the populations for which the measure is specified and tested if any):* Adult/Elderly Care, Populations at Risk

2a1.6 Denominator Time Window *(The time period in which cases are eligible for inclusion):*

This measure was developed with 12 months of data.

2a1.7 Denominator Details *(All information required to identify and calculate the target population/denominator such as definitions, codes with descriptors, and/or specific data collection items/responses):*

Note: 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). We therefore use this field to define the measure cohort.

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The denominator includes patients 40 and over hospitalized for COPD. COPD is rare in the less than 40 age group (1.5% of patients in our 2006 California all payer dataset), and at younger ages is likely to represent patients with asthma or other pulmonary conditions.

The measure was developed in a cohort of patients 65 years and older who were enrolled in Medicare FFS and admitted to non-federal hospitals. To be included in the Medicare FFS cohort the inclusion criteria required that the patient be continuously enrolled in Medicare FFS Parts A and B for the 12 months prior to the index hospitalization.

Primary COPD and respiratory failure with a secondary diagnosis of acute exacerbation of COPD are defined by the following ICD-9-CM and ICD-10-CM codes:

ICD-9-CM codes used to define COPD:

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): Not otherwise specified, 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.

ICD-10-CM codes used to define COPD:

J441 Chronic obstructive pulmonary disease with (acute) exacerbation

J418 Mixed simple and mucopurulent chronic bronchitis

J42 Unspecified chronic bronchitis

J439 Emphysema, unspecified

J449 Chronic obstructive pulmonary disease, unspecified

J440 Chronic obstructive pulmonary disease with acute lower respiratory infection

ICD-9-CM codes used to define respiratory failure:

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

ICD-9-CM codes used to define acute exacerbation of COPD:

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

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

ICD-10-CM codes used to define respiratory failure:

J9600 Respiratory failure, unspecified, unspecified whether with hypoxia or hypercapnia

J9690 Respiratory failure, unspecified, unspecified whether with hypoxia or hypercapnia

J80 Acute Respiratory distress syndrome

J9620 Acute and chronic respiratory failure, unspecified whether with hypoxia or hypercapnia

R092 Respiratory arrest

ICD-10-CM codes used to define acute exacerbation of COPD:

J441 Chronic obstructive pulmonary disease with (acute) exacerbation

J440 Chronic obstructive pulmonary disease with acute low respiratory infection

2a1.8 Denominator Exclusions (Brief narrative description of exclusions from the target population):

An index admission is any eligible admission to an acute care hospital assessed in the measure for the outcome (readmitted within 30 days of the date of discharge from the initial admission).

The measure excludes admissions for patients:

- with an in hospital death (because they are not eligible for readmission).
 - transferred to another acute care facility (We assign the outcome for the acute episode of care to the hospital that discharges the patient to the non-acute care setting because the discharging hospital initiates the discharge and the transition to the outpatient setting. Therefore, the last admission in the acute care setting for the episode of care is eligible to be an index admission in the measure. The prior admissions in the same acute episode are excluded from the measure.)
 - who were discharged alive and against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge).
 - without at least 30 days post-discharge claims data (because the 30-day readmission outcome cannot be assessed in this group).
- Additionally, admissions that occur within 30 days of the discharge date of an earlier index admission are not themselves considered to be index admissions. Any COPD admission can only be an index admission or a readmission, but not both.

Of note, a patient may satisfy multiple exclusion criteria.

2a1.9 Denominator Exclusion Details (All information required to identify and calculate exclusions from the denominator such as definitions, codes with descriptors, and/or specific data collection items/responses):

We provide denominator exclusions details for the Medicare data. The specific fields used in "all-payer" data will vary.

In-hospital deaths are identified using the discharge disposition vital status indicator.

Transfers to other acute care facilities are defined when a patient with an inpatient hospital admission (with at least one qualifying COPD admission) is discharged from an acute care hospital and admitted to another acute care hospital on the same day or next day.

Discharges Against Medical Advice (AMA) are identified using the discharge disposition indicator.

Lack of claims data for 30 days post-discharge is identified by patient enrollment status in the CMS' Enrollment Database (EDB) (for Medicare FFS patients only).

2a1.10 Stratification Details/Variables (All information required to stratify the measure results including the stratification variables, codes with descriptors, definitions, and/or specific data collection items/responses):

Results of this measure will not be stratified.

2a1.11 Risk Adjustment Type (Select type. Provide specifications for risk stratification in 2a1.10 and for statistical model in 2a1.13): **Statistical risk model** **2a1.12 If "Other," please describe:**

2a1.13 Statistical Risk Model and Variables (Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development should be addressed in 2b4.):

Our approach to risk adjustment is tailored to and appropriate for a publicly reported outcome measure, as articulated in the American Heart Association (AHA) Scientific Statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes"¹.

The measure employs a hierarchical logistic regression model to create a hospital-level 30-day RSRR. This approach to modeling appropriately accounts for the structure of the data (patients clustered within hospitals), the underlying risk due to patients' comorbidities, and sample size at a given hospital when estimating hospital readmission rates. In brief, the approach

simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals.² At the patient level, the model adjusts the log-odds of readmission within 30 days of discharge for age and selected clinical covariates. The second level models hospital-specific intercepts as arising from a normal distribution. The hospital-specific intercepts represent the hospital contribution to the risk of readmission, after accounting for patient risk and sample size, and can be inferred as a measure of quality. 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 RSRR is calculated as the ratio of the number of “predicted” to the number of “expected” readmissions, multiplied by the national unadjusted readmission rate. For each hospital, the numerator of the ratio (“predicted”) is the number of readmissions within 30 days predicted on the basis of the hospital’s performance with its observed case mix, and the denominator (“expected”) is the number of readmissions 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 readmission or better quality and a higher ratio indicates higher-than-expected readmission or worse quality.

The predicted hospital outcome (the numerator) is the sum of predicted probabilities of readmission for all patients at a particular hospital. The predicted probability of each patient in that hospital is calculated using the hospital-specific intercept and patient risk factors. The expected number of readmissions (the denominator) is the sum of expected probabilities of readmission for all patients at a hospital. The expected probability of each patient in a hospital is calculated using a common intercept and patient risk factors. Candidate and Final Risk-adjustment Variables: The measure was developed using Medicare FFS claims data. Candidate variables were patient-level risk-adjustors that were expected to be predictive of readmission, based on empirical analysis, prior literature, and clinical judgment, including age and indicators of comorbidity and disease severity. For each patient, covariates are obtained from Medicare claims extending 12 months prior to and including the index admission. The model adjusts for case mix differences based on the clinical status of patients at the time of admission. We used condition categories (CCs), which are clinically meaningful groupings of more than 15,000 ICD-9-CM diagnosis codes, and combinations of CCs as candidate variables. A file which contains a list of the ICD-9-CM codes and their groupings into CCs is available on www.qualitynet.org (<http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1182785083979>). We did not risk-adjust for CCs that were possible adverse events of care and that were only recorded in the index admission. Only comorbidities that conveyed information about the patient at that time or in the 12 months prior, and not complications that arose during the course of the hospitalization were included in the risk-adjustment.

References:

1. Krumholz HM, Brindis RG, Brush JE, et al. 2006. Standards for Statistical Models Used for Public Reporting of Health Outcomes: An American Heart Association Scientific Statement From the Quality of Care and Outcomes Research Interdisciplinary Writing Group: Cosponsored by the Council on Epidemiology and Prevention and the Stroke Council Endorsed by the American College of Cardiology Foundation. *Circulation* 113: 456-462.
2. Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. *Stat Sci* 22 (2): 206-226.

Frequencies and odds ratios for the model development sample (2008 Medicare FFS patients aged 65 and older; n=170,480 admissions) are presented below.

Table 1: Final set of risk-adjustment variables:

Variable//Frequency (%)//Odds Ratio (95% confidence interval)

Demographic

NQF #1891 Hospital 30-Day, All-Cause, Risk-Standardized Readmission Rate (RSRR) following Chronic Obstructive Pulmonary Disease (COPD) Hospitalization, Last Updated Date: Oct 26, 2012

- Age-65 (years above 65, continuous) for 65 and over cohorts/Frequency = -/OR (95% CI)=1.00 (1.00-1.00); (this variable is Age (years, continuous) for 40 and over cohorts)

Cardiovascular/Respiratory

- Sleep Apnea (ICD-9 CM diagnosis codes: 327.20, 327.21, 327.23, 327.27, 327.29, 780.51, 780.53, 780.57) / Frequency=10.46% / OR (95% CI)=1.00 (0.96-1.03)
- History of mechanical ventilation (ICD-9 procedure codes: 93.90, 96.70, 96.71, 96.72)/ Frequency=7.33/ OR (95% CI)=1.13 (1.08-1.18)
- Respirator dependence/respiratory failure (CC 77-78)/ Frequency=1.38/ OR (95% CI)=1.12 (1.03-1.23)
- Cardio-respiratory failure and shock (CC 79)/ Frequency=29.84/ OR (95% CI)=1.21 (1.18-1.24)
- Congestive heart failure (CC 80)/ Frequency=43.86/ OR (95% CI)=1.21 (1.18-1.24)
- Chronic atherosclerosis (CC 83-84)/ Frequency=51.57/ OR (95% CI)=1.11 (1.08-1.13)
- Arrhythmias (CC 92-93)/ Frequency=37.2/ OR (95% CI)=1.17 (1.12-1.22)
- Vascular or circulatory disease (CC 104-106)/ Frequency=38.2/ OR (95% CI)=1.09 (1.05-1.14)
- Arrhythmias (CC 92-93)/ Frequency=38.48/ OR (95% CI)=1.14 (1.11-1.17)
- Other and Unspecified Heart Disease (CC 94)/ Frequency=19.45/ OR (95% CI)=1.08 (1.05-1.11)
- Vascular or Circulatory Disease (CC 104-106)/ Frequency=39.42/ OR (95% CI)=1.09 (1.06-1.11)
- Fibrosis of lung and other chronic lung disorder (CC 109)/ Frequency=18.12/ OR (95% CI)=1.09 (1.06-1.12)
- Pneumonia (CC 111-113)/ Frequency=51.51/ OR (95% CI)=1.10 (1.07-1.13)

Other Comorbid Conditions

- History of Infection (CC 1, 3-6)/ Frequency=32.16/ OR (95% CI)=1.08 (1.05-1.11)
- Metastatic cancer and acute leukemia (CC 7)/ Frequency=2.64/ OR (95% CI)=1.24 (1.15-1.33)
- Lung, upper digestive tract, and other severe cancers (CC 8)/ Frequency=5.91/ OR (95% CI)=1.19 (1.13-1.25)
- Lymphatic, head and neck, brain, and other major cancers; breast, prostate, colorectal and other cancers and tumors; other respiratory and heart neoplasms (CC 9-11)/ Frequency=13.88/ OR (95% CI)=1.04 (1.01-1.08)
- Other digestive and urinary neoplasms (CC 12)/ Frequency=7.06/ OR (95% CI)=0.96 (0.92-1.01)
- Diabetes and DM complications (CC 15-20, 119-120)/ Frequency=39.15/ OR (95% CI)=1.08 (1.05-1.11)
- Protein-calorie malnutrition (CC 21)/ Frequency=7.57/ OR (95% CI)=1.14 (1.09-1.19)
- Disorders of Fluid/Electrolyte/Acid-Base (CC 22-23)/ Frequency=34.57/ OR (95% CI)=1.17 (1.14-1.20)
- Other Endocrine/Metabolic/Nutritional Disorders (CC 24)/ Frequency=68.61/ OR (95% CI)=0.91 (0.89-0.94)
- Pancreatic Disease (CC 32)/ Frequency=4.85/ OR (95% CI)=1.12 (1.06-1.17)
- Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders (CC 34)/ Frequency=12.58/ OR (95% CI)=1.07 (1.03-1.11)
- Other Gastrointestinal Disorders (CC 36)/ Frequency=58.29/ OR (95% CI)=1.04 (1.02-1.07)
- Severe Hematological Disorders (CC44)/ Frequency=2.07 /OR (95% CI)=1.12 (1.04-1.20)
- Iron Deficiency and Other/Unspecified Anemias and Blood Disease (CC 47)/ Frequency=42.09/ OR (95% CI)=1.13 (1.10-1.16)
- Dementia and senility (CC 49-50)/ Frequency=17.07 /OR (95% CI)=1.00 (0.97-1.04)
- Drug/Alcohol Induced Dependence/Psychosis (CC 51-52)/ Frequency=3.67/ OR (95% CI)=1.15 (1.09-1.22)
- Major Psych Disorders (CC 54-56)/ Frequency=10.79/ OR (95% CI)=1.08 (1.04-1.12)
- Depression (CC 58)/ Frequency=19.63/ OR (95% CI)=1.06 (1.03-1.09)
- Anxiety Disorders (CC 59)/ Frequency=3.27/ OR (95% CI)=1.15 (1.08-1.22)
- Other Psychiatric Disorders (CC 60)/ Frequency=18.37/ OR (95% CI)=1.11 (1.08-1.15)
- Quadriplegia, paraplegia, functional disability (CC 67-69, 100-102, 177-178)/ Frequency=5.02/ OR (95% CI)=1.08 (1.02-1.13)
- Polyneuropathy (CC 71)/ Frequency=7.91/ OR (95% CI)=1.11 (1.06-1.16)
- Acute Coronary Syndrome (CC 81-82)/ Frequency=9.54/ OR (95% CI)=1.08 (1.04-1.12)
- Hypertensive Heart and Renal Disease or Encephalopathy (CC 89)/ Frequency=13.20/ OR (95% CI)=1.13 (1.09-1.17)
- Stroke (CC 95-96)/ Frequency=6.84/ OR (95% CI)=1.04 (1.00-1.09)
- Renal Failure (CC 131)/ Frequency=18.61/ OR (95% CI)=1.10 (1.06-1.14)
- Decubitus ulcer or chronic skin ulcer (CC 148-149)/ Frequency=7.43/ OR (95% CI)=1.03 (0.99-1.08)
- Cellulitis, Local Skin Infection (CC 152)/ Frequency=12.50/ OR (95% CI)=1.07 (1.03-1.11)
- Vertebral Fractures (CC 157)/ Frequency=5.24/ OR (95% CI)=1.14 (1.08 -1.19)

ICD-10-CM codes for model variables (for those variables defined by ICD-9 CM codes rather than CCs)

Mechanical Ventilation

- 5A09357 Assistance with Respiratory Ventilation, Less than 24 Consecutive Hours, Continuous Positive Airway Pressure
- 5A09457 Assistance with Respiratory Ventilation, 24-96 Consecutive Hours, Continuous Positive Airway Pressure
- 5A09557 Assistance with Respiratory Ventilation, Greater than 96 Consecutive Hours, Continuous Positive Airway Pressure
- 5A1935Z Respiratory Ventilation, Less than 24 Consecutive Hours
- 5A1945Z Respiratory Ventilation, 24-96 Consecutive Hours
- 5A1955Z Respiratory Ventilation, Greater than 96 Consecutive Hours

Sleep Apnea

- G4730 Sleep apnea, unspecified
- G4731 Primary central sleep apnea
- G4733 Obstructive sleep apnea (adult) (pediatric)
- G4737 Central sleep apnea in conditions classified elsewhere
- G4739 Other sleep apnea

2a1.14-16 Detailed Risk Model Available at Web page URL (or attachment). Include coefficients, equations, codes with descriptors, definitions, and/or specific data collection items/responses. Attach documents only if they are not available on a webpage and keep attached file to 5 MB or less. NQF strongly prefers you make documents available at a Web page URL. Please supply login/password if needed:

Attachment

[Delv49b_COPD_ReadmissionMethodologyReport-9-29-11.pdf](#)

2a1.17-18. Type of Score: [Rate/proportion](#)

2a1.19 Interpretation of Score (*Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score*): [Better quality = Lower score](#)

2a1.20 Calculation Algorithm/Measure Logic (*Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.*):

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

The predicted hospital outcome (the numerator) is the sum of predicted probabilities of readmission for all patients at a particular hospital. The predicted probability of each patient in that hospital is calculated using the hospital-specific intercept and patient risk factors. The expected number of readmissions (the denominator) is the sum of expected probabilities of readmission for all patients at a hospital. The expected probability of each patient in a hospital is calculated using a common intercept and patient risk factors.

Please see attachment for more details on the calculation algorithm.

2a1.21-23 Calculation Algorithm/Measure Logic Diagram URL or attachment:

Attachment

[COPD Readmission Calculation Algorithm.pdf](#)

2a1.24 Sampling (Survey) Methodology. If measure is based on a sample (or survey), provide instructions for obtaining the sample, conducting the survey and guidance on minimum sample size (response rate):

N/A - This measure is not based on a sample or survey.

2a1.25 Data Source (Check all the sources for which the measure is specified and tested). If other, please describe:

Administrative claims

2a1.26 Data Source/Data Collection Instrument (Identify the specific data source/data collection instrument, e.g. name of database, clinical registry, collection instrument, etc.): Administrative Claims

To apply the measure to Medicare FFS patients, Medicare Part A inpatient and outpatient and Part B outpatient claims are used. To apply the measure to a non-Medicare population, inpatient claims data are used.

The Medicare data sources used to create the measure were:

1. Medicare Part A Inpatient and Outpatient and Part B outpatient claims from the Standard Analytic File, including inpatient and outpatient claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This dataset was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission.

The measure was subsequently tested in 2006 California Patient Discharge Data, a large, linked all-payer database of patient hospital admissions. Records are linked by a unique patient identification number allowing us to determine patient history from previous hospitalizations as well as whether the patient was readmitted to any hospital within 30 days.

2a1.27-29 Data Source/data Collection Instrument Reference Web Page URL or Attachment:

2a1.30-32 Data Dictionary/Code Table Web Page URL or Attachment:

Attachment

COPD ICD 9 to ICD10_Diag + Proc.pdf

2a1.33 Level of Analysis (Check the levels of analysis for which the measure is specified and tested): Facility

2a1.34-35 Care Setting (Check all the settings for which the measure is specified and tested): Hospital/Acute Care Facility

2a2. Reliability Testing. (Reliability testing was conducted with appropriate method, scope, and adequate demonstration of reliability.)

2a2.1 Data/Sample (Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

In measure development and testing, we used Medicare Part A and Part B claims data for calendar years 2007, 2008, and 2009 to test model reliability among Medicare FFS patients (original model specification without the planned readmission algorithm). The 2007 cohort included 302,562 admissions from 4,638 hospitals; the 2008 cohort included 352,633 admissions from 4,637 hospitals; and the 2009 cohort included 332,186 admissions from 4,574 hospitals.

2a2.2 Analytic Method (Describe method of reliability testing & rationale):

Data Element Reliability

In constructing the measure in Medicare FFS patients, we aim to utilize only those data elements from the claims that have both face validity and reliability. We avoid the use of fields that are thought to be coded inconsistently across hospitals or providers.

Specifically, we use fields that are consequential for payment and which are audited. We identify such variables through empiric analyses and our understanding of CMS auditing and billing policies and seek to avoid variables which do not meet this standard. For example, "discharge disposition" is a variable in Medicare claims data that is not thought to be a reliable variable for identifying a transfer between two acute care facilities. Thus, we derive a variable using admission and discharge dates as a surrogate for "discharge disposition" to identify hospital admissions involving transfers. This allows us to identify these admissions using variables in the claims data which have greater reliability than the "discharge disposition" variable.

In addition, CMS has in place several hospital auditing programs used to assess overall claims code accuracy, to ensure appropriate billing, and for overpayment recoupment. CMS routinely conducts data analysis to identify potential problem areas and detect fraud, and audits important data fields used in our measures, including diagnosis and procedure codes and other elements that are consequential to payment.

Finally, we assess the reliability of the data elements by comparing model variable frequencies and odds ratios in three years of data.

Measure Result Reliability

The reliability of a measurement is the degree to which repeated measurements of the same entity agree with each other. For measures of hospital performance, the measured entity is naturally the hospital, and reliability is the extent to which repeated measurements of the same hospital give similar results. Accordingly, our approach to assessing reliability is to consider the extent to which assessments of a hospital using different but randomly selected subsets of patients produce similar measures of hospital performance. That is, we take a "test-retest" approach in which hospital performance is measured once using a random subset of patients, then measured again using a second random subset exclusive of the first, and the agreement of the two resulting performance measures compared across hospitals.¹

For test-retest reliability of the measure in Medicare FFS patients aged 65 and older, we combined index admissions from successive measurement periods into one dataset, randomly sampled half of patients within each hospital, calculated the measure for each hospital, and repeated the calculation using the second half. Thus, each hospital is measured twice, but each measurement is made using an entirely distinct set of patients. To the extent that the calculated measures of these two subsets agree, we have evidence that the measure is assessing an attribute of the hospital, not of the patients. As a metric of agreement we calculated the intra-class correlation coefficient², and assessed the values according to conventional standards³. Specifically, we used a combined 2007-2009 sample, randomly split it into two approximately equal subsets of patients, and calculated the RSRR for each hospital for each sample. The agreement of the two RSRRs was quantified for hospitals in each sample using the intra-class correlation as defined by ICC (2,1) by Shrout and Fleiss.²

Using two independent samples provides an honest estimate of the measure's reliability, compared with using two random but potentially overlapping samples which would exaggerate the agreement. Moreover, because our final measure is derived using hierarchical logistic regression, and a known property of hierarchical logistic regression models is that smaller volume hospitals contribute less 'signal', a split sample using a single measurement period would introduce extra noise, potentially underestimating the actual test-retest reliability that would be achieved if the measure were reported using three years of data.

References:

1. Rousson V, Gasser T, Seifert B. "Assessing intrarater, interrater and test-retest reliability of continuous measurements," *Statistics in Medicine*, 2002, 21:3431-3446.
2. Shrout P, Fleiss J. Intraclass correlations: uses in assessing rater reliability. *Psychological Bulletin*, 1979, 86, 420-3428.
3. Landis J, Koch G, The measurement of observer agreement for categorical data, *Biometrics*, 1977;33:159-174.

2a2.3 Testing Results (*Reliability statistics, assessment of adequacy in the context of norms for the test conducted*):

Data Element Reliability

Overall, risk factor frequencies changed very little across the three-year period, and there were no notable differences in the odds ratios across years of data.

Measure Result Reliability

There were 987,373 admissions in the combined three-year sample, with 493,906 in one randomly selected sample and 493,469 in the remaining sample. The agreement between the two RSRRs for each hospital was 0.394, which according to the conventional interpretation is "Fair."¹ The intra-class correlation coefficient is based on a split sample of 3 years of data, resulting in a volume of patients in each sample equivalent to only 1.5 years of data, whereas the measure is likely to be reported with a full three years of

data. Based on our experiences with similar measures using split sample, with 4 years (and volume equivalent to 2 years), the intra-class correlation coefficient would be higher and in the moderate range.

References:

1. Landis J, Koch G, The measurement of observer agreement for categorical data, *Biometrics*, 1977;33:159-174.

2b. VALIDITY. Validity, Testing, including all Threats to Validity: H M L I

2b1.1 Describe how the measure specifications (measure focus, target population, and exclusions) are consistent with the evidence cited in support of the measure focus (criterion 1c) and identify any differences from the evidence:

N/A

2b2. Validity Testing. (Validity testing was conducted with appropriate method, scope, and adequate demonstration of validity.)

2b2.1 Data/Sample (Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

During measure development, we assessed face validity of the final measure via the Technical Expert Panel (TEP). The TEP was comprised of 12 members with diverse perspectives and backgrounds, including clinicians, consumers, hospitals, purchasers, and experts in quality improvement.

TEP members:

Darlene Bainbridge, RN, MS, NHA, CPHQ, CPHRM
President/CEO, Darlene D. Bainbridge & Associates, Inc.

Robert A. Balk, MD
Director of Pulmonary and Critical Care Medicine, Rush University Medical Center

Dale Bratzler, DO, MPH
President and CEO, Oklahoma Foundation for Medical Quality

Scott Cerreta, RRT
Director of Education, COPD Foundation

Gerard J. Criner, MD
Director of Temple Lung Center and Divisions of Pulmonary and Critical Care Medicine, Temple University
Guy D'Andrea, MBA
President, Discern Consulting

Jonathan Fine, MD
Director of Pulmonary Fellowship, Research and Medical Education, Norwalk Hospital

David Hopkins, MS, PhD
Senior Advisor, Pacific Business Group on Health

Fred Martin Jacobs, MD, JD, FACP, FCCP, FCLM
Executive Vice President and Director, Saint Barnabas Quality Institute

Natalie Napolitano, MPH, RRT-NPS
Respiratory Therapist, Inova Fairfax Hospital

Russell Robbins, MD, MBA
Principal and Senior Clinical Consultant, Mercer

2b2.2 Analytic Method (*Describe method of validity testing and rationale; if face validity, describe systematic assessment*):

Measure validity is demonstrated through prior validity testing done on our other claims-based measures, through use of established measure development guidelines, and by systematic assessment of measure face validity by a TEP of national experts and stakeholder organizations (original model specification without the planned readmission algorithm).

Validity of Claims-Based Measures

Our team has demonstrated for a number of prior measures the validity of claims-based measures for profiling hospitals by comparing either the measure results or individual data elements against medical records. CMS validated the six NQF-endorsed measures currently in public reporting (AMI, heart failure, and pneumonia mortality and readmission) with models that used chart-abstracted data for risk adjustment. Specifically, claims model validation was conducted by building comparable models using abstracted medical chart data for risk adjustment for heart failure patients (National Heart Failure data), AMI patients (Cooperative Cardiovascular Project data) and pneumonia patients (National Pneumonia Project dataset). When both models were applied to the same patient population, the hospital risk-standardized rates estimated using the claims-based risk adjustment models had a high level of agreement with the results based on the medical record model, thus supporting the use of the claims-based models for public reporting. Our group has reported these findings in the peer-reviewed literature.¹⁻⁶

We have also completed two national, multi-site validation efforts for two procedure-based complications measures (for primary elective hip/knee arthroplasty and implantable cardioverter defibrillator). Both projects demonstrated strong agreement between complications coded in claims and abstracted medical chart data.

Validity Indicated by Established Measure Development Guidelines

We developed this measure in consultation with national guidelines for publicly reported outcomes measures, with outside experts, and with the public. The measure is consistent with the technical approach to outcomes measurement set forth in NQF guidance for outcomes measures⁷ (National Quality Forum, 2010), CMS Measure Management System (MMS) guidance, and the guidance articulated in the American Heart Association scientific statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes".⁸

Validity as Assessed by External Groups

Throughout measure development, we obtained expert and stakeholder input via three mechanisms: regular discussions with an advisory working group, a national Technical Expert Panel (TEP), and a 30-day public comment period in order to increase transparency and to gain broader input into the measure.

The working group was comprised of three physicians who are board-certified in pulmonary and critical care medicine and a pharmacoepidemiologist with expertise in COPD. All members have expertise in quality measure development. The working group meetings addressed key issues surrounding measure development, including detailed discussions regarding the appropriate cohort for inclusion in the measure. The working group provided a forum for focused expert review and discussion of technical issues during measure development prior to consideration by the broader TEP.

In addition to the working group, and in alignment with the CMS Measure Management System, we convened a TEP to provide input and feedback during measure development from a group of recognized experts in relevant fields. To convene the TEP, we released a public call for nominations and selected individuals to represent a range of perspectives including physicians, consumers, and purchasers, as well as individuals with experience in quality improvement, performance measurement, and health care disparities. We held three structured TEP conference calls consisting of presentation of key issues, our proposed approach, and relevant data, followed by open discussion among TEP members. We made a minor modification to the measure cohort based on TEP feedback on the measures.

Following completion of the model, we solicited public comment on the measure through the CMS site link https://www.CMS.gov/MMS/17_CallforPublicComment.asp. The public comments were then posted publicly for 30 days.

Face Validity as Determined by TEP

To systematically assess face validity, we surveyed the Technical Expert Panel and asked each member to rate the following statement using a six-point scale (1=Strongly Disagree, 2=Moderately Disagree, 3=Somewhat Disagree, 4=Somewhat Agree, 5=Moderately Agree, and 6=Strongly Agree): "The readmission rates obtained from the readmission measure as specified will provide an accurate reflection of quality."

ICD-10-CM/PCS

The goal of the selection of the ICD-10-CM/PCS coding for the COPD readmission measure was to convert this measure to the new code set while keeping the measure fully consistent with the intent of the original development with the ICD-9-CM coding.

Elizabeth Drye, MD, SM, and Peter Lindenauer, MD, MSc, assisted with reviewing and confirming the crosswalk for the measure. Jacqueline Grady, MS, created the map for the ICD-9-CM and ICD-10-CM/PCS measure cohort codes using the General Equivalence Mapping crosswalk for the ICD-9-CM and ICD-10-CM/PCS that is located on the Centers for Medicare and Medicaid Services (CMS) website. The ICD-10-CM map for the CC's used for risk adjustment is still under development.

References:

1. Krumholz HM, Wang Y, Mattera JA, Wang Y-F, Han LF, Ingber MJ, Roman S, Normand SL. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with an acute myocardial infarction. *Circulation*. 2006 Apr 4;113(13):1683-92.
2. Krumholz HM, Lin Z, Drye EE, Desai MM, Han LF, Rapp MT, Mattera JA, Normand SL. An administrative claims measure suitable for profiling hospital performance based on 30-day all-cause readmission rates among patients with acute myocardial infarction. *Circulation: Cardiovascular Quality and Outcomes*. 2011 Mar 1;4(2):243-52.
3. Krumholz HM, Wang Y, Mattera JA, Wang Y-F, Han LF, Ingber MJ, Roman S, Normand SL. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with heart failure. *Circulation*. 2006 Apr 4;113(13):1693-701.
4. Keenan PS, Normand SL, Lin Z, Drye EE, Bhat KR, Ross JS, Schuur JD, Stauffer BD, Bernheim SM, Epstein AJ, Wang Y-F, Herrin J, Chen J, Federer JJ, Mattera JA, Wang Y, Krumholz HM. An administrative claims measure suitable for profiling hospital performance on the basis of 30-day all-cause readmission rates among patients with heart failure. *Circulation: Cardiovascular Quality and Outcomes*. 2008 Sep;1(1):29-37.
5. Bratzler DW, Normand SL, Wang Y, O'Donnell WJ, Metersky M, Han LF, Rapp MT, Krumholz HM. An administrative claims model for profiling hospital 30-day mortality rates for pneumonia patients. *Public Library of Science One*. 2011 Apr 12;6(4):e17401.
6. Lindenauer PK, Normand SL, Drye EE, Lin Z, Goodrich K, Desai MM, Bratzler DW, O'Donnell WJ, Metersky ML, Krumholz HM. Development, validation, and results of a measure of 30-day readmission following hospitalization for pneumonia. *Journal of Hospital Medicine*. 2011 Mar;6(3):142-50.
7. National Quality Forum. National voluntary consensus standards for patient outcomes, first report for phases 1 and 2: A consensus report http://www.nysna.org/images/pdfs/practice/nqf_ana_outcomes_draft10.pdf. Accessed August 19, 2010.
8. Krumholz HM, Brindis RG, Brush JE, et al. Standards for Statistical Models Used for Public Reporting of Health Outcomes: An American Heart Association Scientific Statement From the Quality of Care and Outcomes Research Interdisciplinary Writing Group: Cosponsored by the Council on Epidemiology and Prevention and the Stroke Council Endorsed by the American College of Cardiology Foundation. *Circulation*. 2006;113(3):456-462.

2b2.3 Testing Results (*Statistical results, assessment of adequacy in the context of norms for the test conducted; if face validity, describe results of systematic assessment*):

Ten of the 12 TEP members responded to the survey question as follows: Strongly Disagreed (1), Somewhat Agreed (2),

Moderately Agreed (4), and Strongly Agreed (3). Of the TEP members who responded, 90% agreed (70% moderately or strongly agreed) that the measure will provide an accurate reflection of quality. We therefore gave the measure a moderate rating for face validity.

These results demonstrate TEP agreement with overall face validity of the measure as specified. Measure validity is also ensured through the processes employed during development, including regular expert and clinical input, and modeling methodologies with demonstrated validity in claims-based measures.

POTENTIAL THREATS TO VALIDITY. (*All potential threats to validity were appropriately tested with adequate results.*)

2b3. Measure Exclusions. (*Exclusions were supported by the clinical evidence in 1c or appropriately tested with results demonstrating the need to specify them.*)

2b3.1 Data/Sample for analysis of exclusions (*Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

In measure development, we used all COPD admissions in 2008 Medicare fee-for service data (initial cohort included 436,700 admissions) for the 65 and over model. We initially included 54,612 COPD admissions in the 2006 all-payer California data 18 years of age and over. We conducted this testing prior to specifying the measure for patients age 40 and over. Restricting the patient cohort to age 40 and over, however, is not likely to affect the results given that only 1.5% of patients were between the ages of 18 and 39.

2b3.2 Analytic Method (*Describe type of analysis and rationale for examining exclusions, including exclusion related to patient preference*):

All exclusions (detailed in section 2a1.8. "Denominator Exclusions") were determined by careful clinical review and have been used based on clinically relevant decisions. These exclusions are consistent with similar NQF-endorsed readmission measures.

2b3.3 Results (*Provide statistical results for analysis of exclusions, e.g., frequency, variability, sensitivity analyses*):

We examined overall frequencies and proportions of the admissions excluded for each exclusion criterion in all COPD admissions in 2008 Medicare fee-for-service data. The initial cohort included 436,700 admissions; the final cohort, after exclusions, included 352,631 admissions. Categories are not mutually exclusive.

- 1) Patients without a complete claims history for the 12 months prior to the date of index admission (n=32,149, 7.36%)
- 2) In-hospital deaths (n=14,089, 3.23%)
- 3) Transfer-out patients (n=6,205, 1.42%)
- 4) Without at least 30 days post-discharge or claim end date information (n=23,282, 5.33%)
- 5) Patients who leave hospital against medical advice (AMA) (n=2,350, 0.54%)
- 6) Additional admission for acute exacerbation of COPD within 30 days of prior index admission (n=28,867, 6.61%)

For the 18 years old and over model, we examined overall frequencies and proportions of admissions excluded for each exclusion criterion in all COPD admissions in 2006 California Patient Discharge Data. The initial cohort included 54,612 admissions. The final cohort, after exclusion, included 45,480 admissions. The exclusion categories are not mutually exclusive.

California Patient Discharge Data for All-Payer

- 1) In-hospital death (n=2,226, 4.08%)
- 2) Transferred out (n=2,291, 4.20%)
- 3) Discharges against medical advice (AMA) (n=1,057, 1.94%)
- 4) Hospitalization not selected (n=3,668, 7.46%)

2b4. Risk Adjustment Strategy. (*For outcome measures, adjustment for differences in case mix (severity) across measured entities was appropriately tested with adequate results.*)

2b4.1 Data/Sample (*Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

Measure Development and Validation in Medicare FFS:

For development, we used the original model specification without the planned readmission algorithm and randomly divided the 2008 Medicare cohort derived above into measure development cohort (N=176,480 admissions from 4,546 hospitals) and measure validation cohort (N=176,151 admissions from 4,553 hospitals).

Assessment of Temporal Trends in Risk Factors and Model Performance (2007-2009)

To assess temporal trends, we used Medicare cohorts from 2007 through 2009. The 2007 Medicare FFS cohort included 302,560 admissions from 4,638 hospitals; the 2008 cohort included 352,631 admissions from 4,638 hospitals; and the 2009 cohort included 332,184 admissions from 4,574 hospitals.

Limiting Risk-adjustment Data to Inpatient Claims:

To assess the adequacy of risk-adjusting with inpatient data only, we used the original model specification without the planned readmission algorithm in CMS data for Medicare FFS 65+ patients in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. Specifically, we created a 2007 measure cohort with complete one-year history data and 30-day follow-up data (N=15,531).

Applying the Measure to Patients Aged 18 and Older:

To test the model (original model specification without the planned readmission algorithm) in all-payer data, we used 45,480 cases aged 18 and older in the 2006 California Patient Discharge Data. We conducted this testing prior to specifying the measure for patients age 40 and over. Restricting the patient cohort to age 40 and over, however, is not likely to affect the results given that only 1.5% of patients were between the ages of 18 and 39.

2b4.2 Analytic Method (Describe methods and rationale for development and testing of risk model or risk stratification including selection of factors/variables):

Measure Development and Validation in Medicare FFS:

This measure is fully risk-adjusted using a hierarchical logistic regression model to calculate hospital RSRRs accounting for differences in hospital case-mix. (See section 2a1.13. "Statistical risk model and variables" for additional details.)

Approach to Assessing Model Performance:

During measure development using Medicare data for FFS patients 65 and older, we computed five summary statistics for assessing model performance (Harrell and Shih, 2001) for the development and validation cohorts:

- (1) over-fitting indices (over-fitting refers to the phenomenon in which a model accurately describes the relationship between predictive variables and outcome in the development dataset but fails to provide valid predictions in new patients)
- (2) predictive ability
- (3) area under the receiver operating characteristic (ROC) curve
- (4) distribution of residuals
- (5) model chi-square (a test of statistical significance usually employed for categorical data to determine whether there is a good fit between the observed data and expected values; i.e., whether the differences between observed and expected values are attributable to true differences in characteristics or instead the result of chance variation).

Assessment of Temporal Trends in Risk Factors and Model Performance (2007-2009):

Across years, we examined consistency in parameter estimates for risk-adjustment variables and model performance (C statistic).

Limiting Risk-adjustment Data to Inpatient Claims:

To assess the validity of using only admission claims data for risk adjustment, we fit the model separately in the California Medicare FFS 65+ cohort using the full data and using only admission claims data and (a) compared the odds ratios (ORs) for the various risk factors; (b) conducted a reclassification analysis to compare risk prediction at the patient level; (c) compared model performance in terms of the C statistic (discrimination); and (d) compared hospital-level risk-standardized rates (scatterplot, ICC) to assess whether the model with only admission claims data is different from the current model in profiling hospital rates.

Applying the Measure to Patients Aged 18 and Older:

To help determine whether the measure could be applied to a population of patients aged 18+ (i.e., including younger patients aged

18-64), we examined the interaction terms between age (18-64 vs. 65+) and each of the other risk factors in 2006 California Patient Discharge Data. Specifically, we fit the model in all patients 18+ with and without interaction terms and (a) conducted a reclassification analysis to compare risk prediction at the patient level; (b) compared the C statistic; and (c) compared hospital-level risk-standardized rates (scatterplot, ICC) to assess whether the model with interactions is different from the current model in profiling hospital rates.

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Reference: Harrell FE, Shih YCT. Using full probability models to compute probabilities of actual interest to decision makers. *Int J Technol Assess Health Care*. 2001;17:17-26.

2b4.3 Testing Results (*Statistical risk model*: Provide quantitative assessment of relative contribution of model risk factors; risk model performance metrics including cross-validation discrimination and calibration statistics, calibration curve and risk decile plot, and assessment of adequacy in the context of norms for risk models. *Risk stratification*: Provide quantitative assessment of relationship of risk factors to the outcome and differences in outcomes among the strata):

Measure Development and Validation in Medicare FFS:

Performance Metrics for Development Cohort

The mean RSRR was 22.0%. In the development cohort, the model has strong discrimination and fit. Results are presented below:

Over-fitting indices: (-0.034, 0.970)

Residuals lack of fit: <-2=0.00%; [-2, 0) = 78.09%; [0, 2) = 14.17%; [2+ = 7.80%

Model Chi-square [# of covariates]: 6144.77 [41] p < 0.0001

Predictive ability (lowest decile %, highest decile %): (11.57, 38.08)

Area under the ROC curve = 0.627

Between-hospital variance (standard error) = 0.014 (0.003)

Performance Metrics for Validation Cohort

The mean RSRR was 22.1%. In the validation cohort, the model has strong discrimination and fit. Results are presented below:

Over-fitting indices: (0.004, 0.994)

Residuals lack of fit: <-2 = 0.00%; [-2, 0) = 77.99%; [0, 2) = 14.26%; [2+ = 7.76%

Model Chi-square [# of covariates]: 6277.91 [41] p < 0.0001

Predictive ability (lowest decile %, highest decile %): (11.93 - 39.10)

Area under the ROC curve = 0.629

Between-hospital variance (standard error) = 0.019 (0.003)

Assessment of Temporal Trends in Risk Factors and Model Performance (2007-2009):

Parameter estimates for risk-adjustment variables were consistent across years. In addition, model performance was also consistent across years of data; the C statistic was 0.63 across all three years.

Limiting Risk-adjustment Data to Inpatient Claims:

Using 2007 CMS data for Medicare FFS 65+ beneficiaries in California hospitals: (a) the magnitude of odds ratios for most risk factors was similar when comparing the model using full data and using only admission claims data; (b) when comparing the model with full data and with only admissions data, the reclassification analysis demonstrated good patient-level risk prediction; (c) the C statistic was similar (0.628 vs. 0.623); and (d) hospital-level risk standardized rates were highly correlated (ICC=0.978).

Applying the Measure to Patients Aged 18 and Older:

When the model was applied to all patients aged 18+ in 2006 California Patient Discharge Data, overall discrimination was good (C statistic=0.669). In addition, there was good discrimination and predictive ability in both those aged 18-64 and those aged 65+.

Moreover, the distribution of Pearson residuals was comparable across the patient subgroups. When comparing the model with and without interaction terms: (a) the reclassification analysis demonstrated that nearly all patients were found to be in a similar risk category; (b) the C statistic was nearly identical (0.673 vs. 0.669); and (c) hospital-level risk-standardized rates were highly

correlated (ICC=0.991). Thus, the inclusion of interactions did not substantively affect either patient-level model performance or hospital-level results.

These analyses support applying the measure to patients age 40 and older.

2b4.4 If outcome or resource use measure is not risk adjusted, provide rationale and analyses to justify lack of adjustment: The measure is risk-adjusted.

2b5. Identification of Meaningful Differences in Performance. (The performance measure scores were appropriately analyzed and discriminated meaningful differences in quality.)

2b5.1 Data/Sample (Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

The data are based on RSRRs calculated for COPD hospitalization among Medicare FFS patients aged 65+ from the 2008 calendar year (applying the new planned readmission algorithm), and include 352,631 hospitalizations from 4,637 hospitals.

2b5.2 Analytic Method (Describe methods and rationale to identify statistically significant and practically/meaningfully differences in performance):

The method for discriminating hospital performance has not been determined. For three publicly reported readmission measures of hospital outcomes developed with similar methodology, CMS currently estimates an interval estimate for each risk-standardized rate to characterize the amount of uncertainty associated with the rate, compares the interval estimate to the national crude rate for the outcome, and categorizes hospitals as "better than," "worse than," or "no different than" the US national rate. However, the decision to publicly report this measure and the approach to discriminating performance has not been determined.

See Calculation Algorithm attachment for description of analytic method.

2b5.3 Results (Provide measure performance results/scores, e.g., distribution by quartile, mean, median, SD, etc.; identification of statistically significant and meaningful differences in performance):

There is substantial variation in COPD RSRRs among hospitals. The median hospital RSRR for COPD was 21.2% with a range of 17.8% to 26.2%. The 5th percentile was 19.9% and the 95th percentile was 23.0%. The interquartile range was 20.8% to 21.7%.

The variation in rates suggests there are meaningful differences in the quality of care received for patients following hospitalization for an acute exacerbation of COPD.

2b6. Comparability of Multiple Data Sources/Methods. (If specified for more than one data source, the various approaches result in comparable scores.)

2b6.1 Data/Sample (Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

The measure performs well in both Medicare FFS data and all-payer data.

2b6.2 Analytic Method (Describe methods and rationale for testing comparability of scores produced by the different data sources specified in the measure):

See above.

2b6.3 Testing Results (Provide statistical results, e.g., correlation statistics, comparison of rankings; assessment of adequacy in the context of norms for the test conducted):

See above.

2c. Disparities in Care: H M L I NA (If applicable, the measure specifications allow identification of disparities.)

2c.1 If measure is stratified for disparities, provide stratified results (Scores by stratified categories/cohorts): Measure is not stratified for disparities.

2c.2 If disparities have been reported/identified (e.g., in 1b), but measure is not specified to detect disparities, please

explain:

There were no disparities detected during measure development. Please see "Summary of Data on Disparities by Population Group" (section 1b.4) for additional details.

2.1-2.3 Supplemental Testing Methodology Information:

Attachment

COPD All-payer Data Report_1-13-12_for NQF-634620673303494595.pdf

Steering Committee: Overall, was the criterion, *Scientific Acceptability of Measure Properties*, met?

(Reliability and Validity must be rated moderate or high) Yes No

Provide rationale based on specific subcriteria:

If the Committee votes No, STOP

3. USABILITY

Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making. **(evaluation criteria)**

C.1 Intended Actual/Planned Use (Check all the planned uses for which the measure is intended): [Public Reporting](#), [Quality Improvement with Benchmarking](#) (external benchmarking to multiple organizations)

3.1 Current Use (Check all that apply; for any that are checked, provide the specific program information in the following questions): [Not in use](#)

3a. Usefulness for Public Reporting: H M L I

(The measure is meaningful, understandable and useful for public reporting.)

3a.1. Use in Public Reporting - disclosure of performance results to the public at large (If used in a public reporting program, provide name of program(s), locations, Web page URL(s)). If not publicly reported in a national or community program, state the reason AND plans to achieve public reporting, potential reporting programs or commitments, and timeline, e.g., within 3 years of endorsement: **[For Maintenance** – If not publicly reported, describe progress made toward achieving disclosure of performance results to the public at large and expected date for public reporting; provide rationale why continued endorsement should be considered.]

[This recently-developed measure is designed for use in public reporting but is not yet in use.](#)

3a.2. Provide a rationale for why the measure performance results are meaningful, understandable, and useful for public reporting. If usefulness was demonstrated (e.g., focus group, cognitive testing), describe the data, method, and results: [During the measure development process, developers received critical input from an advisory working group comprised of physicians and health services researchers with expertise in pulmonology, measure methodology, and quality improvement. We also received feedback from a TEP. Meetings were held throughout the development process and we received input and feedback on key methodological and clinical decisions to ensure the measure is meaningful and useful. In addition, similar measures for acute myocardial infarction \(AMI\) and heart failure underwent consumer testing prior to being publicly report and were found to be useful for publicly reporting outcomes.](#)

3.2 Use for other Accountability Functions (payment, certification, accreditation). If used in a public accountability program, provide name of program(s), locations, Web page URL(s): [This measure is not currently used in a public accountability program.](#)

3b. Usefulness for Quality Improvement: H M L I

(The measure is meaningful, understandable and useful for quality improvement.)

3b.1. Use in QI. If used in quality improvement program, provide name of program(s), locations, Web page URL(s):

[For Maintenance – If not used for QI, indicate the reasons and describe progress toward using performance results for improvement].

Measure is not currently used in a QI program.

3b.2. Provide rationale for why the measure performance results are meaningful, understandable, and useful for quality improvement. If usefulness was demonstrated (e.g., QI initiative), describe the data, method and results:

A hospital-level, 30-day readmission measure for COPD patients may encourage hospitals to improve the quality of care for this high-risk population in order to reduce the risk of / prevent readmission. COPD patients are at increased risk for readmission due to the ongoing care and treatment needs post discharge. Improvements in transitional care for this ambulatory-care-sensitive condition are likely to reduce costly readmissions and improve quality of care.

Overall, to what extent was the criterion, *Usability*, met? H M L I

Provide rationale based on specific subcriteria:

4. FEASIBILITY

Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement. (evaluation criteria)

4a. Data Generated as a Byproduct of Care Processes: H M L I

4a.1-2 How are the data elements needed to compute measure scores generated? (Check all that apply).

Data used in the measure are:

Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims)

4b. Electronic Sources: H M L I

4b.1 Are the data elements needed for the measure as specified available electronically (Elements that are needed to compute measure scores are in defined, computer-readable fields): ALL data elements in electronic claims

4b.2 If ALL data elements are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources:

4c. Susceptibility to Inaccuracies, Errors, or Unintended Consequences: H M L I

4c.1 Identify susceptibility to inaccuracies, errors, or unintended consequences of the measurement identified during testing and/or operational use and strategies to prevent, minimize, or detect. If audited, provide results:

Using administrative claims variables for risk adjustment:

This measure uses variables from claims data submitted by hospitals for payment. Prior research has demonstrated that administrative claims data can be used to develop risk-adjusted outcomes measures for both mortality and readmission following hospitalization for acute myocardial infarction,1,2 heart failure,3,4 and pneumonia,5,6 and that the models produce estimates of risk-standardized rates that are very similar to rates estimated by models based on medical record data. This high level of agreement supports the use of the claims-based risk-adjusted models for public reporting. The models have also demonstrated consistent performance across years of claims data.

The approach to gathering risk factors for patients also mitigates the potential limitations of claims data. Because not every diagnosis is coded at every visit, for Medicare FFS patients we use inpatient, outpatient, and physician claims data for the year prior to admission, and diagnosis codes during the index admission, for risk adjustment. When the measure is used in all-payer data, only admission claims data (from the index hospitalization and prior year) are used for risk adjustment; however, model testing demonstrated both strong patient-level model performance and consistent hospital-level results when using only admission claims data. The 1-year time frame provides a more comprehensive view of patients' medical histories than is provided by the secondary diagnosis codes from the index hospitalization alone. If a diagnosis appears in some visits and not others, it is included, minimizing the effect of incomplete coding. We were careful, however, to include information about each patient's status at admission and not to adjust for possible complications of the admission. Although some codes, by definition, represent conditions that are present before admission (e.g. cancer), other codes and conditions cannot be differentiated from complications during the hospitalization (e.g. infection or shock). If these are secondary diagnoses coded only in the index admission, then they are not adjusted for in the

analysis.

References:

1. Krumholz HM, Wang Y, Mattera JA, Wang Y-F, Han LF, Ingber MJ, Roman S, Normand SL. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with an acute myocardial infarction. *Circulation*. 2006 Apr 4;113(13):1683-92.
2. Krumholz HM, Lin Z, Drye EE, Desai MM, Han LF, Rapp MT, Mattera JA, Normand SL. An administrative claims measure suitable for profiling hospital performance based on 30-day all-cause readmission rates among patients with acute myocardial infarction. *Circulation: Cardiovascular Quality and Outcomes*. 2011 Mar 1;4(2):243-52.
3. Krumholz HM, Wang Y, Mattera JA, Wang Y-F, Han LF, Ingber MJ, Roman S, Normand SL. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with heart failure. *Circulation*. 2006 Apr 4;113(13):1693-701.
4. Keenan PS, Normand SL, Lin Z, Drye EE, Bhat KR, Ross JS, Schuur JD, Stauffer BD, Bernheim SM, Epstein AJ, Wang Y-F, Herrin J, Chen J, Federer JJ, Mattera JA, Wang Y, Krumholz HM. An administrative claims measure suitable for profiling hospital performance on the basis of 30-day all-cause readmission rates among patients with heart failure. *Circulation: Cardiovascular Quality and Outcomes*. 2008 Sep;1(1):29-37.
5. Bratzler DW, Normand SL, Wang Y, O'Donnell WJ, Metersky M, Han LF, Rapp MT, Krumholz HM. An administrative claims model for profiling hospital 30-day mortality rates for pneumonia patients. *Public Library of Science One*. 2011 Apr 12;6(4):e17401.
6. Lindenauer PK, Normand SL, Drye EE, Lin Z, Goodrich K, Desai MM, Bratzler DW, O'Donnell WJ, Metersky ML, Krumholz HM. Development, validation, and results of a measure of 30-day readmission following hospitalization for pneumonia. *Journal of Hospital Medicine*. 2011 Mar;6(3):142-50.

4d. Data Collection Strategy/Implementation: H M L I

A.2 Please check if either of the following apply (regarding proprietary measures):

4d.1 Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues (e.g., fees for use of proprietary measures):

The measure is not in operational use

Overall, to what extent was the criterion, *Feasibility*, met? H M L I

Provide rationale based on specific subcriteria:

OVERALL SUITABILITY FOR ENDORSEMENT

Does the measure meet all the NQF criteria for endorsement? Yes No

Rationale:

If the Committee votes No, STOP.

If the Committee votes Yes, the final recommendation is contingent on comparison to related and competing measures.

5. COMPARISON TO RELATED AND COMPETING MEASURES

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure before a final recommendation is made.

5.1 If there are related measures (either same measure focus or target population) or competing measures (both the same

measure focus and same target population), list the NQF # and title of all related and/or competing measures:
 0330 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure hospitalization
 0505 : Hospital 30-day all-cause risk-standardized readmission rate (RSRR) following acute myocardial infarction (AMI) hospitalization.
 0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization

5a. Harmonization

5a.1 If this measure has EITHER the same measure focus OR the same target population as NQF-endorsed measure(s): Are the measure specifications completely harmonized? Yes

5a.2 If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden:

5b. Competing Measure(s)

5b.1 If this measure has both the same measure focus and the same target population as NQF-endorsed measure(s): Describe why this measure is superior to competing measures (e.g., a more valid or efficient way to measure quality); OR provide a rationale for the additive value of endorsing an additional measure. (Provide analyses when possible):
 N/A

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner): Centers for Medicare and Medicaid Services, 500 Security Blvd, Mail Stop S3-02-01, Baltimore, Maryland, 21244-9045

Co.2 Point of Contact: Lein, Han, Ph.D., Government Task Leader, Lein.han@cms.hhs.gov, 410-786-0205-

Co.3 Measure Developer if different from Measure Steward: Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHC/CORE), 1 Church Street, 2nd Floor, Suite #200, New Haven, Connecticut, 06510

Co.4 Point of Contact: Laura, Grosso, Ph.D., M.P.H., Laura.grosso@yale.edu, 203-764-5742-

Co.5 Submitter: Jaymie, Potteiger, M.P.H., jaymie.potteiger@yale.edu, 203-764-5877-, Center for Outcomes Research and Evaluation

Co.6 Additional organizations that sponsored/participated in measure development:
 MPR: Mathematica Policy Research; RTI: Research Triangle Institute

Co.7 Public Contact: Jaymie, Potteiger, MPH, jaymie.potteiger@yale.edu, 203-764-5877-, Center for Outcomes Research and Evaluation

ADDITIONAL INFORMATION

Workgroup/Expert Panel involved in measure development

Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.

Technical Expert Panel Members:

Darlene Bainbridge, RN,MS,NHA,CPQUZ CPHRM, National Rural Health Association

Robert Balk, MD, American College of Physicians

Dale Bratzler, DO, MPH, Oklahoma Foundation of medical Quality

Scott Cerreta, RRT, COPD Foundation

Gerard Criner, MD, Temple University

Guy D' Andrea, MBA, Discern Consulting

NQF #1891 Hospital 30-Day, All-Cause, Risk-Standardized Readmission Rate (RSRR) following Chronic Obstructive Pulmonary Disease (COPD) Hospitalization, Last Updated Date: Oct 26, 2012

Jonathan Fine, MD, Norwalk Hospital
David Hopkins, MS, PHD, Pacific Business Group on Health
Fred Martin Jacobs, MD, JD, FACP, FCCP, FCLM, American Hospital Association
Natalie Napolitano, MPH, RRT-NPS, American Association for Respiratory Care
Russell Robbins, MD, MBA, Mercer

Working Group Panel Members:

David Au, MD, MS VA Puget Sound Health Care System
Jerry Krishnan, MD, PhD, Associate Professor, Departments of Medicine and Health Studies, UChicago
Todd Lee, PharmD, PhD, Senior Investigator, Center for Management of Complex Chronic Care (CMC3) at the Hines VA Hospital
Richard Mularski, MD, MCR, MSHS, Senior Scholar, Center for Ethics in Health Care, Oregon Health & Science University

Ad.2 If adapted, provide title of original measure, NQF # if endorsed, and measure steward. Briefly describe the reasons for adapting the original measure and any work with the original measure steward:

Measure Developer/Steward Updates and Ongoing Maintenance

Ad.3 Year the measure was first released:

Ad.4 Month and Year of most recent revision:

Ad.5 What is your frequency for review/update of this measure?

Ad.6 When is the next scheduled review/update for this measure?

Ad.7 Copyright statement: [N/A](#)

Ad.8 Disclaimers:

Ad.9 Additional Information/Comments: [Technical Report, calculation algorithm, ICD-9 to ICD-10 maps, and all-payer testing report attached](#)

Date of Submission (MM/DD/YY): [01/13/2012](#)