

## 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 #: 0330      NQF Project: Ad-hoc Review: Planned Readmissions
(for Endorsement Maintenance Review) Original Endorsement Date: May 15, 2008    Most Recent Endorsement Date: Jan 18, 2012    Last Updated Date: Oct 25, 2012
<b>BRIEF MEASURE INFORMATION</b>
De.1 Measure Title: Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following heart failure hospitalization
Co.1.1 Measure Steward: Centers for Medicare and Medicaid Services
De.2 Brief Description of Measure: The measure estimates a hospital-level 30-day risk-standardized readmission rate (RSRR) for patients discharged from the hospital with a principal diagnosis of heart failure (HF). The outcome is defined as readmission for any cause within 30 days of the discharge date for the index hospitalization, excluding a specified set of planned readmissions. The target population is patients aged 18 years and older. CMS annually reports the measure for individuals who are 65 years and older and are either Medicare fee-for-service (FFS) beneficiaries hospitalized in non-federal hospitals or patients hospitalized in Department of Veterans Affairs (VA) facilities.  The primary update to this measure since it was last reviewed at NQF is the addition of specifications for planned readmissions as described within this application and in the accompanying report Re-specifying the Hospital 30-Day Acute Myocardial Infarction, Heart Failure, and Total Hip/Knee Arthroplasty Readmission Measures by adding a Planned Readmission Algorithm.
2a1.1 Numerator Statement: The outcome for this measure is 30-day readmission. We define readmission as an inpatient admission for any cause, with the exception of certain planned readmissions within 30 days from the date of discharge from the index HF admission. If a patient has more than one admission (for any reason) within 30 days of the date of discharge of the index admission, only one was counted as a readmission. For more details on how planned readmissions were identified and removed from the outcome, please refer to the attached report, Re-specifying the Hospital 30-Day Acute Myocardial Infarction, Heart Failure, and Total Hip/Knee Arthroplasty Readmission Measures by adding a Planned Readmission Algorithm.
2a1.4 Denominator Statement: The target population for this measure is patients aged 18 years and older hospitalized for HF. The measure is currently publicly reported by CMS for those 65 years and older who are either Medicare FFS beneficiaries admitted to non-federal hospitals or patients admitted to VA hospitals.  The measure includes admissions for patients discharged from the hospital with a principal diagnosis of HF and with a complete claims history for the 12 months prior to admission.  As noted above, this measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years. We have attached a report detailing our all-payer testing for this measure.
2a1.8 Denominator Exclusions: For all cohorts, the measure excludes admissions for patients: <ul style="list-style-type: none"> <li>• with an in-hospital death (because they are not eligible for readmission);</li> <li>• transferred to another acute care hospital (because the readmission is attributed to the hospital that discharges the patient to a non-acute setting);</li> <li>• discharged against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge);</li> <li>• admitted with HF within 30 days of discharge from a qualifying index admission (Admissions within 30 days of discharge of</li> </ul>

an index admission will be considered readmissions. No admission is counted as a readmission and an index admission. The next eligible admission after the 30-day time period following an index admission will be considered another index admission.)

For Medicare FFS patients, the measure additionally excludes admissions for patients:

- without at least 30 days post-discharge enrollment in FFS Medicare (because the 30-day readmission outcome cannot be assessed in this group).

1.1 Measure Type: Outcome

2a1. 25-26 Data Source: Administrative claims, Other

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, it is harmonized with a measure of hospital-level, all-cause, 30-day, risk-standardized mortality following HF 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): Cardiovascular, Cardiovascular : Congestive Heart Failure

De.5 Cross Cutting Areas (Check all the areas that apply):

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

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

1a.3 Summary of Evidence of High Impact (Provide epidemiologic or resource use data):

The Medicare Payment Advisory Commission (MedPAC) has called for hospital-specific public reporting of readmission rates, identifying HF as a priority condition (MedPAC, 2007). MedPAC finds that readmissions are common, costly, and often preventable. Based on 2005 Medicare data, MedPAC estimates that about 12.5% of Medicare HF admissions were followed by a readmission within 15 days, accounting for more than 90,000 admissions at a cost of \$590 million. Between July 2005 and June 2008, the median 30-day readmission rate for heart failure was 24.4%, with a range of 15.9% to 34.4% (Krumholz et al., 2009).

See Guidance for Definitions of Rating Scale: H=High; M=Moderate; L=Low; I=Insufficient; NA=Not Applicable

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HF is the most common principal discharge diagnosis among older adults and the third highest for hospital reimbursements in 2005 (CMS/OIS, 2006), and the leading cause of readmission among Medicare beneficiaries, with nearly half of HF patients expected to return to the hospital within 6 months of discharge (Jencks et al., 2009; Krumholz et al., 1997). All-cause 30-day readmission rates per 1,000 patients discharged with HF increased by 11% between 1992 and 2001 (CMS/MPR/MQMS, 2003). HF readmission is a costly event and represents an undesirable outcome of care from the patient's perspective, and highly disparate HF readmission rates among hospitals suggest there is room for improvement (MedPAC, 2007; Bernheim et al., 2010).

Readmission rates are influenced by the quality of inpatient and outpatient care, the availability and use of effective disease management programs, and the bed capacity of the local health care system. Some of the variation in readmissions may be attributable to delivery system characteristics (Fisher et al., 1994). Also, interventions during and after a hospitalization can be effective in reducing readmission rates in geriatric populations generally (Benbassat and Taragin, 2000; Naylor et al., 1999; Coleman et al., 2006; Courtney et al., 2009; Jack et al., 2009; Voss et al., 2011) and for heart failure patients specifically (Gonseth et al., 2004; Phillips et al., 2004; Koelling et al., 2005; Jovicic et al., 2006). Moreover, such interventions can be cost saving (Coleman et al., 2006; Naylor et al., 1999;). Tracking readmissions also emphasizes improvement in care transitions and care coordination. Although discharge planning is required by Medicare as a condition of participation for hospitals, transitional care focuses more broadly on "hand-offs" of care from one setting to another, and may have implications for quality and costs (Coleman, 2005).

**1a.4 Citations for Evidence of High Impact cited in 1a.3:** MedPAC. Report to the Congress: Promoting Greater Efficiency in Medicare. Washington, DC: Medicare Payment Advisory Commission, 2007.

Krumholz HM, Merrill AR, Schone EM, Schreiner GC, Chen J, Bradley EH, Wang Y, Wang Y, Lin Z, Straube BM, Rapp MT, Normand SL, Dye EE. 2009. Patterns of hospital performance in acute myocardial infarction and heart failure 30-day mortality and readmission. *Circ Cardiovasc Qual Outcomes* (2):407-413.

Centers for Medicare & Medicaid Services, Office of Information Services (OIS). Available at: <http://www.cms.hhs.gov/MedicareFeeForSvcPartsAB/Downloads/SSDischarges0405.pdf>, accessed October 21, 2006.

Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *N Engl J Med*. 2009;360(14):1418-28.

Krumholz HM, Parent EM, Tu N, Vaccarino V, Wang Y, Radford MJ, Hennen J. Readmission after hospitalization for congestive heart failure among Medicare beneficiaries. *Arch Intern Med*. 1997;157:99-104.

Centers for Medicare & Medicaid Services, Mathematica Policy Research, Medicare Quality Monitoring System (MQMS) Report: Heart Failure, 1992-2001. Available at: <http://www.mathematica-mpr.com/publications/PDFs/mqmsheart.pdf>, accessed December 06, 2010.

Bernheim SM, Grady JN, Lin Z, Wang Y, Wang Y, Savage SV, Bhat KR, Ross JS, Desai MM, Merrill AR, Han LF, Rapp MT, Dye EE, Normand SL, Krumholz HM. National patterns of risk-standardized mortality and readmission for acute myocardial infarction and heart failure. Update on publicly reported outcomes measures based on the 2010 release. *Circ Cardiovasc Qual Outcomes*. 2010;3(5):459-67.

Fisher ES, Wennberg JE, Stukel TA, et al. 1994. Hospital readmission rates for cohorts of Medicare beneficiaries in Boston and New Haven. *N Engl J Med* 331(15):989-995.

Benbassat J, Taragin M. 2000. Hospital readmissions as a measure of quality of health care: advantages and limitations. *Arch Intern Med* 160(8):1074-1081.

Naylor MD, Broton D, Campbell R, et al. 1999. Comprehensive discharge planning and home follow-up of hospitalized elders: a

randomized clinical trial. JAMA 281(7):613-620.

Coleman EA, Parry C, Chalmers S, et al. 2006. The care transitions intervention: results of a randomized controlled trial. Arch Intern Med 166:1822-1828.

Courtney M, Edwards H, Chang A, Parker A, Finlayson K, Hamilton K. Fewer emergency readmissions and better quality of life for older adults at risk of hospital readmission: a randomized controlled trial to determine the effectiveness of a 24-week exercise and telephone follow-up program. J Am Geriatr Soc 2009;57(3):395-402.

Jack BW, Chetty VK, Anthony D, Greenwald JL, Sanchez GM, Johnson AE, et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. Ann Intern Med 2009;150(3):178-87.

Voss R, Gardner R, Baier R, Butterfield K, Lehrman S, Gravenstein S. The care transitions intervention: translating from efficacy to effectiveness. Arch Intern Med Jul 25 2011;171(14):1232-1237.

Gonseth J, Guallar-Castillon P, Banegas JR, Rodriguez-Artalejo F. The effectiveness of disease management programmes in reducing hospital re-admission in older patients with heart failure: a systematic review and meta-analysis of published reports. Eur Heart J. 2004;25:1570-95.

Phillips CO, Wright SM, Kern DE, Singa RM, Shepperd S, Rubin HR. Comprehensive discharge planning with postdischarge support for older patients with congestive heart failure: a meta-analysis. JAMA. 2004;291:1358-67.

Koelling T, Johnson M, Cody R, Aaronson K. Discharge education improves clinical outcomes in patients with chronic heart failure. Circulation. 2005;111:179-85.

Jovicic A, Holroyd-Leduc JM, Straus SE. Effects of self-management intervention on health outcomes of patients with heart failure: a systematic review of randomized controlled trials. BMC Cardiovasc Disord. 2006;6:43.

Coleman EA. 2005. Background Paper on Transitional Care Performance Measurement. Appendix I. In: Institute of Medicine, Performance Measurement: Accelerating Improvement. Washington, DC: National Academy Press.

**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:**

The goal of this measure is to improve patient outcomes by providing patients, physicians, and hospitals with information about hospital-level, risk-standardized readmission rates following hospitalization for HF. Measurement of patient outcomes allows for a broad view of quality of care that encompasses more than what can be captured by individual process-of-care measures. Complex and critical aspects of care, such as communication between providers, prevention of and response to complications, patient safety, and coordinated transitions to the outpatient environment, all contribute to patient outcomes but are difficult to measure by individual process measures. The goal of outcomes measurement is to risk-adjust for patients' conditions at the time of hospital admission and then evaluate patient outcomes. This measure was developed to identify institutions whose performance is better or worse than would be expected based on their patient case mix, and therefore promote hospital quality improvement and better inform consumers about care quality.

**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.]**

Recent analyses of Medicare FFS data show substantial variation in HF RSRRs among hospitals. Using data from July 2008-June 2011 and updating the measure by applying the new planned readmission algorithm, the median hospital RSRR for HF was 23.4%, with a range of 17.4% to 32.4%. The 5th percentile was 20.7% and the 95th percentile was 26.6%. The interquartile range was 22.4% to 24.5%.

**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*]  
 The sample for the above analyses is a 3-year cohort of Medicare FFS hospitalizations for HF (July 2008-June 2011). The analyses were performed using the version of the measure with the new planned readmission algorithm.

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

Given that the measure is a hospital-level measure, CMS assessed evidence of disparities by examining hospital performance based on the proportion of African-American patients served and the proportion of low-income patients served by the hospital.

The analyses examining the association between a hospital's proportion of Medicare FFS patients who are African-American and its RSRR for HF show slightly higher RSRRs for hospitals with higher proportions of African-American patients compared to hospitals with lower proportions of African-American patients, and both groups of hospitals show a wide range of performance. We performed the analyses on the version of the measure prior to completion of the new planned readmission algorithm. We divided hospitals into deciles based on the proportion of their patients that were African-American and looked at hospital performance on the measure across groups. The hospitals with the lowest proportion of African-American patients had 0% African-American patients and had a median HF RSRR of 24.4% (range 21.1%-28.8%). In comparison, hospitals with the highest proportion of African-American patients (with greater than or equal to 23% African-American patients) had a median HF RSRR of 25.8% (range 21.1%-32.2%). Although this demonstrates slightly worse performance of hospitals with a larger proportion of African-American patients, these analyses also show wide variation in performance of hospitals regardless of the proportion of African-American patients and suggest that hospitals with large proportions of African-American patients are not consistently performing at a lower or higher level than other hospitals.

Similar analyses were completed to evaluate hospital differences in performance on RSRR based on the socioeconomic status (SES) of their patients. We divided hospitals into deciles based on the proportion of their patients that were enrolled in Medicaid and looked at performance on the measure across groups. These analyses suggest a slightly higher median HF RSRR at the hospitals with the highest proportion of Medicaid patients (those with =29% Medicaid patients). The hospitals with the highest proportion of Medicaid patients had a median RSRR of 25.2% compared with a median RSRR of 24.5% for hospitals with the lowest proportion of Medicaid patients (=6% Medicaid patients). However, the range for the two groups is similar (20.6%-33.7% vs. 20.5%-30.3%, respectively), demonstrating that substantial numbers of hospitals serving low SES patients perform well on the measure.

Overall these analyses provide little compelling evidence of clinically significant disparities at the hospital level.

**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*]

The sample for the above analyses is a three-year cohort of hospitalizations (January 2008-December 2010) but limited to hospitals with at least 25 HF cases over the three-year period. The analyses were performed using the original measure specification (without the new planned readmission algorithm).

Reference:

Medicare Hospital Quality Chartbook 2012. Performance Report on Outcome Measures. Yale New Haven Health System Corporation/Center for Outcomes Research and Evaluation. New Haven, CT: 2012.

**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"/>

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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 one healthcare structure, process, intervention, or service		Does the measure pass subcriterion 1c? Yes <input type="checkbox"/> IF rationale supports relationship	
<p><b>1c.1 Structure-Process-Outcome Relationship</b> (<i>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</i>):  This measure calculates hospital-level, 30-day readmission rates after hospitalization for HF. The goal is to directly affect patient outcomes by measuring risk-standardized rates of readmission.</p> <p><b>1c.2-3 Type of Evidence</b> (<i>Check all that apply</i>):  Other  N/A This is an outcomes measure, not a process measure.</p> <p><b>1c.4 Directness of Evidence to the Specified Measure</b> (<i>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</i>):  Studies have shown that interventions during and after a hospitalization can be effective in reducing readmission rates in geriatric populations (Benbassat and Taragin, 2000; Naylor et al. 1999; Coleman et al. 2006) and for elderly HF patients particularly (Phillips et al. 2004; Naylor et al. 2004; Koelling et al. 2005; Krumholz et al. 2002). Such interventions can be cost saving (Coleman et al. 2006; Krumholz et al. 2002; Naylor et al. 2004; Koelling et al. 2005; Phillips et al. 2004).</p> <p>References:  Benbassat J, Taragin M. Hospital readmissions as a measure of quality of health care: advantages and limitations. Arch Intern Med. 2000 Apr 24;160(8):1074-81.  Naylor MD, Broton D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. JAMA. 1999 Feb 17;281(7):613-20.  Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. Arch Intern Med. 2006 Sep 25;166(17):1822-8.  Phillips CO, Wright SM, Kern DE, et al. Comprehensive discharge planning with postdischarge support for older patients with congestive heart failure: a meta-analysis. JAMA. 2004 Mar 17;291(11):1358-67.  Naylor MD, Broton DA, et al. Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial. J Am Geriatr Soc. 2004 May;52(5):675-84.  Koelling TM, Johnson ML, Cody RJ, Aaronson KD. Discharge education improves clinical outcomes in patients with chronic heart failure. Circulation. 2005 Jan 18;111(2):179-85.  Krumholz HM, Amatruda J, Smith GL, et al. Randomized trial of an education and support intervention to prevent readmission of patients with heart failure. J Am Coll Cardiol. 2002 Jan 2;39(1):83-9.</p> <p><b>1c.5 Quantity of Studies in the Body of Evidence</b> (<i>Total number of studies, not articles</i>):</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):

1c.7 **Consistency of Results across Studies** (Summarize the consistency of the magnitude and direction of the effect):

1c.8 **Net Benefit** (Provide estimates of effect for benefit/outcome; identify harms addressed and estimates of effect; and net benefit - benefit over harms):

1c.9 **Grading of Strength/Quality of the Body of Evidence.** Has the body of evidence been graded? **No**

1c.10 If body of evidence graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias:

1c.11 **System Used for Grading the Body of Evidence:** **N/A (outcomes measure)**

1c.12 If other, identify and describe the grading scale with definitions:

1c.13 **Grade Assigned to the Body of Evidence:** **N/A (outcomes measure)**

1c.14 **Summary of Controversy/Contradictory Evidence:** **None**

1c.15 **Citations for Evidence other than Guidelines(Guidelines addressed below):**  
**N/A**

1c.16 **Quote verbatim, the specific guideline recommendation** (Including guideline # and/or page #):  
**N/A**

1c.17 **Clinical Practice Guideline Citation:** **N/A This is an outcomes measure, not a process measure.**

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:** **N/A**

1c.22 If other, identify and describe the grading scale with definitions:

1c.23 **Grade Assigned to the Recommendation:** **N/A**

1c.24 **Rationale for Using this Guideline Over Others:** **N/A**

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? Yes

S.2 If yes, provide web page URL:

<http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=OnetPublic%2FPage%2FOnetTier4&cid=1219069855841>

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 readmission. We define readmission as an inpatient admission for any cause, with the exception of certain planned readmissions within 30 days from the date of discharge from the index HF admission. If a patient has more than one admission (for any reason) within 30 days of the date of discharge of the index admission, only one was counted as a readmission. For more details on how planned readmissions were identified and removed from the outcome, please refer to the attached report, Re-specifying the Hospital 30-Day Acute Myocardial Infarction, Heart Failure, and Total Hip/Knee Arthroplasty 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):  
We define the time period for readmission as within 30 days from the date of discharge of the index HF hospitalization.

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):  
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); thus, we use this field to define the measure outcome.

The measure counts readmissions to any acute care hospital for any cause within 30 days of the date of discharge of the index HF admission, excluding planned readmissions as defined below.

Admissions not Counted as Readmissions

Unplanned readmissions are acute clinical events experienced by a patient that require urgent rehospitalization. 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 within 30 days of discharge. This measure uses an algorithm to identify "planned readmissions" that will not count as outcomes in the readmission measure. Analyzing Medicare FFS data from July 2008 to June 2011, 1.2% of index hospitalizations for HF were followed by a planned readmission within 30 days of discharge. The rationale for this algorithm and a discussion of its application to this measure are set forth in the attached report, Re-specifying the Hospital 30-Day Acute Myocardial Infarction, Heart Failure, and Total Hip/Knee Arthroplasty Readmission Measures by adding a Planned Readmission Algorithm. The detailed specifications are provided here.

#### Planned Readmission Algorithm

There are three principles that underlie the algorithm:

1. A few specific, limited types of care are always considered planned (obstetrical delivery, transplant surgery, maintenance chemotherapy, rehabilitation);
2. A planned readmission is defined as a non-acute readmission for a scheduled procedure; and
3. Admissions for acute illness or for complications of care are never planned.

Hence, for all readmissions, the measure first evaluates whether the principal discharge diagnosis or procedure category associated with each readmission is for care that is always planned (List 1 below). If yes, the readmission is classified as planned and is not counted in the outcome for the measure. If not, the measure checks for a potentially planned procedure (List 2 below). If the procedure is not in List 2, then the readmission is classified as unplanned and is counted in the outcome for the measure. If the procedure is in List 2, the measure checks whether the primary discharge diagnosis is acute or a complication of care (List 3 below). If the primary discharge diagnosis is in List 3, then the readmission is classified as unplanned and is counted in the outcome for the measure. If the primary discharge diagnosis is not in List 3, then the readmission is classified as planned and is not counted in the outcome for the measure.

Lists 1-3 below use the Clinical Classification Software (CCS), developed by the Agency for Healthcare Research and Quality (AHRQ). The software creates clinically-coherent, mutually-exclusive condition categories (diagnosis groups) and procedure categories.

List 1. AHRQ Procedure and Diagnosis CCS Categories that are always planned regardless of diagnosis:

#### AHRQ Procedure CCS/Description

64/Bone marrow transplant  
105/Kidney transplant  
134/Cesarean section  
135/Forceps; vacuum; and breech delivery  
176/Other organ transplantation

#### AHRQ Diagnosis CCS/Description

45/Maintenance chemotherapy  
194/Forceps delivery  
196/Normal pregnancy and/or delivery  
254/Rehabilitation

AHRQ Diagnosis CCS categories 194 and 196 are intended to be included only in all-payer settings, and are not intended for inclusion in CMS's claims-based readmission measures for Medicare fee-for-service beneficiaries aged 65 years and older.

List 2. Typically scheduled procedures (60 AHRQ procedure CCS categories from among 231 AHRQ procedure CCS categories; 11 individual ICD-9 procedure codes)

#### AHRQ Procedure CCS/Description

3/Laminectomy; excision intervertebral disc  
5/Insertion of catheter or spinal stimulator and injection into spinal  
9/Other OR therapeutic nervous system procedures  
10/Thyroidectomy; partial or complete  
12/Other therapeutic endocrine procedures  
33/Other OR therapeutic procedures on nose; mouth and pharynx  
36/Lobectomy or pneumonectomy  
38/Other diagnostic procedures on lung and bronchus  
40/Other diagnostic procedures of respiratory tract and mediastinum  
43/Heart valve procedures  
44/Coronary artery bypass graft (CABG)  
45/Percutaneous transluminal coronary angioplasty (PTCA)  
47/Diagnostic cardiac catheterization; coronary arteriography  
48/Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator  
49/Other OR heart procedures  
51/Endarterectomy; vessel of head and neck  
52/Aortic resection; replacement or anastomosis  
53/Varicose vein stripping; lower limb  
55/Peripheral vascular bypass  
56/Other vascular bypass and shunt; not heart  
59/Other OR procedures on vessels of head and neck  
62/Other diagnostic cardiovascular procedures  
66/Procedures on spleen  
67/Other therapeutic procedures; hemic and lymphatic system  
74/Gastrectomy; partial and total  
78/Colorectal resection  
79/Local excision of large intestine lesion (not endoscopic)  
84/Cholecystectomy and common duct exploration  
85/Inguinal and femoral hernia repair  
86/Other hernia repair  
99/Other OR gastrointestinal therapeutic procedures  
104/Nephrectomy; partial or complete  
106/Genitourinary incontinence procedures  
107/Extracorporeal lithotripsy; urinary  
109/Procedures on the urethra  
112/Other OR therapeutic procedures of urinary tract  
113/Transurethral resection of prostate (TURP)  
114/Open prostatectomy  
119/Oophorectomy; unilateral and bilateral  
120/Other operations on ovary  
124/Hysterectomy; abdominal and vaginal  
129/Repair of cystocele and rectocele; obliteration of vaginal vault  
132/Other OR therapeutic procedures; female organs  
142/Partial excision bone  
152/Arthroplasty knee  
153/Hip replacement; total and partial  
154/Arthroplasty other than hip or knee  
157/Amputation of lower extremity  
158/Spinal fusion  
159/Other diagnostic procedures on musculoskeletal system

166/Lumpectomy; quadrantectomy of breast  
167/Mastectomy  
169/Debridement of wound; infection or burn  
172/Skin graft  
211/Therapeutic radiology for cancer treatment

ICD-9 Codes/Description

30.1, 30.29, 30.3, 30.4, 31.74, 34.6/Laryngectomy, revision of tracheostomy, scarification of pleura (from AHRQ Procedure CCS 42- Other OR Rx procedures on respiratory system and mediastinum)

38.18/Endarterectomy leg vessel (from AHRQ Procedure CCS 60- Embolectomy and endarterectomy of lower limbs)

55.03, 55.04/Percutaneous nephrostomy with and without fragmentation (from AHRQ Procedure CCS 103 Nephrotomy and nephrostomy)

94.26, 94.27/Electroshock therapy (from AHRQ Procedure CCS 218- Psychological and psychiatric evaluation and therapy)

List 3. Acute diagnoses or complications of care that indicate the readmission is not planned (99 acute diagnosis groups from among 285 AHRQ condition CCS categories; 4 groupings of individual ICD-9 diagnosis codes that represent cardiac diagnoses that would not be associated with a planned readmission).

AHRQ Diagnosis CCS/Description

1/Tuberculosis  
2/Septicemia (except in labor)  
3/Bacterial infection; unspecified site  
4/Mycoses  
5/HIV infection  
7/Viral infection  
8/Other infections; including parasitic  
9/Sexually transmitted infections (not HIV or hepatitis)  
54/Gout and other crystal arthropathies  
55/Fluid and electrolyte disorders  
60/Acute posthemorrhagic anemia  
61/Sickle cell anemia  
63/Diseases of white blood cells  
76/Meningitis (except that caused by tuberculosis or sexually transmitted disease)  
77/Encephalitis (except that caused by tuberculosis or sexually transmitted disease)  
78/Other CNS infection and poliomyelitis  
82/Paralysis  
83/Epilepsy; convulsions  
84/Headache; including migraine  
85/Coma; stupor; and brain damage  
87/Retinal detachments; defects; vascular occlusion; and retinopathy  
89/Blindness and vision defects  
90/Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease)  
91/Other eye disorders  
92/Otitis media and related conditions

93/Conditions associated with dizziness or vertigo  
100/Acute myocardial infarction  
102/Nonspecific chest pain  
104/Other and ill-defined heart disease  
107/Cardiac arrest and ventricular fibrillation  
109/Acute cerebrovascular disease  
112/Transient cerebral ischemia  
116/Aortic and peripheral arterial embolism or thrombosis  
118/Phlebitis; thrombophlebitis and thromboembolism  
120/Hemorrhoids  
122/Pneumonia (except that caused by TB or sexually transmitted disease)  
123/Influenza  
124/Acute and chronic tonsillitis  
125/Acute bronchitis  
126/Other upper respiratory infections  
127/Chronic obstructive pulmonary disease and bronchiectasis  
128/Asthma  
130/Pleurisy; pneumothorax; pulmonary collapse  
131/Respiratory failure; insufficiency; arrest (adult)  
135/Intestinal infection  
137/Diseases of mouth; excluding dental  
139/Gastroduodenal ulcer (except hemorrhage)  
140/Gastritis and duodenitis  
142/Appendicitis and other appendiceal conditions  
145/Intestinal obstruction without hernia  
146/Diverticulosis and diverticulitis  
148/Peritonitis and intestinal abscess  
153/Gastrointestinal hemorrhage  
154/Noninfectious gastroenteritis  
157/Acute and unspecified renal failure  
159/Urinary tract infections  
165/Inflammatory conditions of male genital organs  
168/Inflammatory diseases of female pelvic organs  
169/Debridement of wound; infection or burn  
172/Ovarian cyst  
197/Skin and subcutaneous tissue infections  
198/Other inflammatory condition of skin  
225/Joint disorders and dislocations; trauma-related  
226/Fracture of neck of femur (hip)  
227/Spinal cord injury  
228/Skull and face fractures  
229/Fracture of upper limb  
230/Fracture of lower limb  
232/Sprains and strains  
233/Intracranial injury  
234/Crushing injury or internal injury  
235/Open wounds of head; neck; and trunk  
237/Complication of device; implant or graft  
238/Complications of surgical procedures or medical care  
239/Superficial injury; contusion  
240/Burns

241/Poisoning by psychotropic agents  
242/Poisoning by other medications and drugs  
243/Poisoning by nonmedicinal substances  
244/Other injuries and conditions due to external causes  
245/Syncope  
246/Fever of unknown origin  
247/Lymphadenitis  
249/Shock  
250/Nausea and vomiting  
251/Abdominal pain  
252/Malaise and fatigue  
253/Allergic reactions  
259/Residual codes; unclassified  
650/Adjustment disorders  
651/Anxiety disorders  
652/Attention-deficit, conduct, and disruptive behavior disorders  
653/Delirium, dementia, and amnesic and other cognitive disorders  
656/Impulse control disorders, NEC  
658/Personality disorders  
660/Alcohol-related disorders  
661/Substance-related disorders  
662/Suicide and intentional self-inflicted injury  
663/Screening and history of mental health and substance abuse codes  
670/Miscellaneous disorders

ICD-9 codes/Description

Acute ICD-9 codes within AHRQ Diagnosis CCS 97: Peri-; endo-; and myocarditis; cardiomyopathy

03282/Diphtheritic myocarditis  
03640/Meningococcal carditis nos  
03641/Meningococcal pericarditis  
03642/Meningococcal endocarditis  
03643/Meningococcal myocarditis  
07420/Coxsackie carditis nos  
07421/Coxsackie pericarditis  
07422/Coxsackie endocarditis  
07423/Coxsackie myocarditis  
11281/Candidal endocarditis  
11503/Histoplasma capsulatum pericarditis  
11504/Histoplasma capsulatum endocarditis  
11513/Histoplasma duboisii pericarditis  
11514/Histoplasma duboisii endocarditis  
11593/Histoplasmosis pericarditis  
11594/Histoplasmosis endocarditis  
1303/Toxoplasma myocarditis  
3910/Acute rheumatic pericarditis  
3911/Acute rheumatic endocarditis  
3912/Acute rheumatic myocarditis  
3918/Acute rheumatic heart disease nec  
3919/Acute rheumatic heart disease nos

3920/Rheumatic chorea w heart involvement  
3980/Rheumatic myocarditis  
39890/Rheumatic heart disease nos  
39899/Rheumatic heart disease nec  
4200/Acute pericarditis in other disease  
42090/Acute pericarditis nos  
42091/Acute idiopath pericarditis  
42099/Acute pericarditis nec  
4210/Acute/subacute bacterial endocarditis  
4211/Acute endocarditis in other diseases  
4219/Acute/subacute endocarditis nos  
4220/Acute myocarditis in other diseases  
42290/Acute myocarditis nos  
42291/Idiopathic myocarditis  
42292/Septic myocarditis  
42293/Toxic myocarditis  
42299/Acute myocarditis nec  
4230/Hemopericardium  
4231/Adhesive pericarditis  
4232/Constrictive pericarditis  
4233/Cardiac tamponade  
4290/Myocarditis nos

Acute ICD-9 codes within AHRQ Diagnosis CCS 105: Conduction disorders

4260/Atrioventricular block complete  
42610/Atrioventricular block nos  
42611/Atrioventricular block-1st degree  
42612/Atrioventricular block-mobitz ii  
42613/Atrioventricular block-2nd degree nec  
4262/Left bundle branch hemiblock  
4263/Left bundle branch block nec  
4264/Right bundle branch block  
42650/Bundle branch block nos  
42651/Right bundle branch block/left posterior fascicular block  
42652/Right bundle branch block/left ant fascicular block  
42653/Bilateral bundle branch block nec  
42654/Trifascicular block  
4266/Other heart block  
4267/Anomalous atrioventricular excitation  
42681/Lown-ganong-levine syndrome  
42682/Long qt syndrome  
4269/Conduction disorder nos

Acute ICD-9 codes within AHRQ Diagnosis CCS 106: Dysrhythmia

4272/Paroxysmal tachycardia nos  
7850/Tachycardia nos  
42789/Cardiac dysrhythmias nec  
4279/Cardiac dysrhythmia nos  
42769/Premature beats nec



Acute ICD-9 codes within AHRO Diagnosis CCS 108: Congestive heart failure; nonhypertensive

39891/Rheumatic heart failure  
4280/Congestive heart failure  
4281/Left heart failure  
42820/Unspecified systolic heart failure  
42821/Acute systolic heart failure  
42823/Acute on chronic systolic heart failure  
42830/Unspecified diastolic heart failure  
42831/Acute diastolic heart failure  
42833/Acute on chronic diastolic heart failure  
42840/Unpec combined syst & dias heart failure  
42841/Acute combined systolic & diastolic heart failure  
42843/Acute on chronic combined systolic & diastolic heart failure  
4289/Heart failure nos

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

The target population for this measure is patients aged 18 years and older hospitalized for HF. The measure is currently publicly reported by CMS for those 65 years and older who are either Medicare FFS beneficiaries admitted to non-federal hospitals or patients admitted to VA hospitals.

The measure includes admissions for patients discharged from the hospital with a principal diagnosis of HF and with a complete claims history for the 12 months prior to admission.

As noted above, this measure can also be used for an all-payer population aged 18 years and older. We have explicitly tested the measure in both patients aged 18+ years and those aged 65+ years. We have attached a report detailing our all-payer testing for this measure.

**2a1.5 Target Population Category** (Check all the populations for which the measure is specified and tested if any):

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

This measure was developed with 12 months of data. Currently, the measure is publicly reported with three years of index hospitalizations.

**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):

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 use this field to define the measure cohort.

The denominator includes patients aged 18 years and older hospitalized for HF. The measure is currently publicly reported by CMS for those 65 years and older who are either Medicare FFS beneficiaries admitted to non-federal hospitals or patients admitted to VA hospitals. To be included in the Medicare FFS cohort the patients must have been continuously enrolled in Medicare FFS Parts A and B for the 12 months prior to the index hospitalization.

The denominator includes admissions for patients discharged from the hospital with a principal diagnosis of heart failure.

ICD-9 codes that define the measure cohort:

402.01 Malignant hypertensive heart disease with congestive heart failure (CHF)  
402.11 Benign hypertensive heart disease with CHF  
402.91 Hypertensive heart disease with CHF

404.01	Malignant hypertensive heart and renal disease with CHF
404.03	Malignant hypertensive heart and renal disease with CHF & renal failure (RF)
404.11	Benign hypertensive heart and renal disease with CHF
404.13	Benign hypertensive heart and renal disease with CHF & RF
404.91	Unspecified hypertensive heart and renal disease with CHF
404.93	Hypertension and non-specified heart and renal disease with CHF & RF
428.0	Congestive heart failure, unspecified
428.1	Left heart failure
428.20	Systolic heart failure, unspecified
428.21	Systolic heart failure, acute
428.22	Systolic heart failure, chronic
428.23	Systolic heart failure, acute or chronic
428.30	Diastolic heart failure, unspecified
428.31	Diastolic heart failure, acute
428.32	Diastolic heart failure, chronic
428.33	Diastolic heart failure, acute or chronic
428.40	Combined systolic and diastolic heart failure, unspecified
428.41	Combined systolic and diastolic heart failure, acute
428.42	Combined systolic and diastolic heart failure, chronic
428.43	Combined systolic and diastolic heart failure, acute or chronic
428.9	Heart failure, unspecified

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

For all cohorts, the measure excludes admissions for patients:

- with an in-hospital death (because they are not eligible for readmission);
- transferred to another acute care hospital (because the readmission is attributed to the hospital that discharges the patient to a non-acute setting);
- discharged against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge);
- admitted with HF within 30 days of discharge from a qualifying index admission (Admissions within 30 days of discharge of an index admission will be considered readmissions. No admission is counted as a readmission and an index admission. The next eligible admission after the 30-day time period following an index admission will be considered another index admission.)

For Medicare FFS patients, the measure additionally excludes admissions for patients:

- without at least 30 days post-discharge enrollment in FFS Medicare (because the 30-day readmission outcome cannot be assessed in this group).

**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*):

For all cohorts, the measure excludes:

- Admissions with an in-hospital death, which are identified in the discharge disposition indicator in claims data.
- Admissions for patients who were transferred to another acute care hospital or VA hospital, which are identified in the claims when a patient with a qualifying 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), which are identified by examining the discharge destination indicator in claims data.
- HF admissions within 30 days of discharge from a qualifying index admission, which are identified by comparing the discharge date from the index admission with the readmission date.

For Medicare FFS patients, the measure additionally excludes:

- Admissions without at least 30 days post-discharge enrollment in FFS Medicare, which is determined by examining the Medicare Enrollment Database (EDB).

**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):

N/A

**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" (Krumholz et al., 2006).

The measure employs a hierarchical logistic regression model to create a hospital-level 30-day RSRR. In brief, the approach simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals (Normand & Shahian, 2007). At the patient level, the model adjusts the log-odds of readmission within 30 days of discharge for age, sex, and selected clinical covariates. The second level models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of readmission at the hospital, after accounting for patient risk. See section 2a1.20. Calculation Algorithm/Measure Logic for more detail.

Candidate and Final Risk-adjustment Variables: 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, sex, and indicators of comorbidity and disease severity. For each patient, covariates are obtained from claims records extending 12 months prior to and including the index admission. For the measure currently implemented by CMS, these risk-adjustors are identified using both inpatient and outpatient Medicare FFS claims data. However, in the all-payer hospital discharge database measure, the risk-adjustment variables can be obtained only from inpatient claims in the prior 12 months and the index admission. (This was tested explicitly in our all-payer testing, as many all-payer datasets do not include outpatient claims.)

The model adjusts for case-mix differences based on the clinical status of patients at the time of admission. We use condition categories (CCs), which are clinically meaningful groupings of more than 15,000 ICD-9-CM diagnosis codes (Pope et al., 2000). A file that contains a list of the ICD-9-CM codes and their groupings into CCs is available at <http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1182785083979>. In addition, only comorbidities that convey information about the patient at admission or in the 12 months prior, and not complications that arise during the course of the index hospitalization, are included in the risk adjustment. Hence, we do not risk adjust for CCs that may represent adverse events of care and that are only recorded in the index admission.

The final set of risk-adjustment variables is:

Demographics

Age

-For Medicare FFS patients, the age variable is defined as "Age-65" (years above 65, continuous)

-For all-payer populations, the age variable is treated as a continuous variable with values of 18 and over

Male

Comorbidities

History of CABG

Cardio-respiratory failure or shock (CC 79)

Congestive heart failure (CC 80)

Acute coronary syndrome (CC 81-82)  
Coronary atherosclerosis or angina (CC 83-84)  
Valvular or rheumatic heart disease (CC 86)  
Specified arrhythmias (CC 92-93)  
Other or unspecified heart disease (CC 94)  
Vascular or circulatory disease (CC 104-106)  
Metastatic cancer or acute leukemia (CC 7)  
Cancer (CC 8-12)  
Diabetes or DM complications (CC 15-20, 119-120)  
Protein-calorie malnutrition (CC 21)  
Disorders of fluid, electrolyte, acid-base (CC 22-23)  
Liver or biliary disease (CC 25-30)  
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)  
Other gastrointestinal disorders (CC 36)  
Severe hematological disorders (CC 44)  
Iron deficiency or other anemias and blood disease (CC 47)  
Dementia or other specified brain disorders (CC 49-50)  
Drug/alcohol abuse/dependence/psychosis (CC 51-53)  
Major psychiatric disorders (CC 54-56)  
Depression (CC 58)  
Other psychiatric disorders (CC 60)  
Hemiplegia, paraplegia, paralysis, functional disability (CC 67-69, 100-102, 177-178)  
Stroke (CC 95-96)  
Chronic obstructive pulmonary disease (CC 108)  
Fibrosis of lung or other chronic lung disorders (CC 109)  
Asthma (CC 110)  
Pneumonia (CC 111-113)  
End stage renal disease or dialysis (CC 129-130)  
Renal failure (CC 131)  
Nephritis (CC 132)  
Other urinary tract disorders (CC 136)  
Decubitus ulcer or chronic skin ulcer (CC 148-149)

References:

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.

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. *Stat Sci* 22(2): 206-226.

Pope GC, et al. 2000. Principal Inpatient Diagnostic Cost Group Models for Medicare Risk Adjustment. *Health Care Financing Review* 21(3): 93-118.

**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:

URL

<http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=OnetPublic%2FPage%2FOnetTier4&cid=1219069855841>

N/A

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 measure employs a hierarchical logistic regression model to create a hospital-level 30-day RSRR. In brief, the approach simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals (Normand & Shahian, 2007). At the patient level, the model adjusts the log-odds of readmission within 30 days of discharge for age, sex, and selected clinical covariates. The second level models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of readmission at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution in order to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The 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 the 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 the 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.

Reference:

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. *Stat Sci* 22(2): 206-226.

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

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, Other](#)

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.*): [Data sources for the Medicare FFS measure:](#)

1. [Medicare Part A inpatient and Part B outpatient claims:](#) This database contains claims data for FFS inpatient and outpatient

services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as 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 as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992).

The measure was originally developed with claims data from a 2004 sample of 283,919 cases from 4,669 hospitals. We have maintained and re-evaluated the models each year since public reporting of the measure began in 2009.

Reference:

Fleming C, Fisher ES, Chang CH, Bubolz TA, Malenka DJ. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs hospitals. *Medical Care*. 1992; 30(5): 377-91.

Data sources for the all-payer update

For our analyses, we used all-payer data from California in addition to 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. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 non-Federal acute care hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the HF readmission measure can be applied to all adult patients, including not only FFS Medicare patients aged 65+ but also non-FFS Medicare patients aged 65+ and younger patients aged 18-64 years at the time of admission.

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

<http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1219069856694>  
N/A

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

Attachment

[Planned\\_Readmissions\\_Updates-AMI\\_HF\\_Hip-Knee\\_to\\_NQF\\_9.17.12.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):

Medicare Part A inpatient and outpatient claims data for calendar years 2007-2009 were used to test reliability of the original model specification (prior to the completion of the new planned readmission algorithm). Specifically, two datasets were used to assess reliability:

2007-2009 Subset A1 (683,488 index hospital HF admissions at 4,844 hospitals)

2007-2009 Subset A2 (682,292 index hospital HF admissions at 4,840 hospitals)

(Of note, Subsets A1 and A2 were created by randomly splitting the full 2007-2009 dataset)



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

Data element reliability

In constructing the measure 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 3 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. In line with this thinking, our approach to assessing reliability is to consider the extent to which assessments of a hospital using different but randomly selected subsets of patients produces 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 finally comparing the agreement between the two resulting performance measures across hospitals (Rousson et al., 2002).

For test-retest reliability, 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 coefficient (ICC) (Shrout and Fleiss, 1979), and assessed the values according to conventional standards (Landis and Koch, 1977). Specifically, we used data Subsets A1 and A2, 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 the ICC (2,1) by Shrout and Fleiss (1979).

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:

Rousson V, Gasser T, Seifert B. Assessing intrarater, interrater and test-retest reliability of continuous measurements. *Statistics in Medicine* 2002;21:3431-3446.

Shrout P, Fleiss J. Intraclass correlations: uses in assessing rater reliability. *Psychological Bulletin* 1979;86:420-428.

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 results**

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 results**

There were 1,365,780 admissions in the combined three-year sample, with 683,488 in one randomly selected sample and 682,292 in the remaining sample. The agreement between the two RSRRs for each hospital was 0.518, which according to the conventional interpretation is "Moderate" (Landis & Koch, 1977). 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 even higher.

**Reference:**

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:**

**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*):

We validated the administrative model with a medical record-based model when the measure was created. For the derivation of the chart-based model, we used cases identified through a Health Care Financing Administration (now CMS) quality initiative, which sampled admissions from Medicare FFS beneficiaries for several clinical conditions, including HF. Cases were identified between April 1998 and March 1999 or between July 2000 and June 2001. Based on the principal discharge diagnosis, approximately 800 HF discharges per state were identified, and the corresponding medical records were abstracted by a data abstraction center. In states with fewer than 800 HF discharges, all cases were used. The abstractors first grouped the claims by state, then sorted the universe of eligible claims by age, race, sex, and treating hospital, and then systematically sampled cases from a random starting point. Patients must have been enrolled in FFS Medicare, resulting in a dataset of 78,882 records.

These analyses were performed during model development prior to the completion of the planned readmission algorithm.

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

We developed a medical record measure to compare with the administrative measure. We defined a measure cohort with the medical record data using the inclusion/exclusion criteria that were consistent with the claims-based administrative measure but using chart-based risk adjusters, such as blood pressure, not available in the claims data. We then matched a sample of the same patients in the administrative data for comparison. The matched sample included 64,329 patients. We compared the output of the two measures, that is, the state performance results, in the same group of patients.

**ICD-9 to ICD-10 Conversion**

**Statement of Intent**

Convert measure to the new code set, but there are no changes to the measure.

Take advantage of new specific code set for the measure with changes.

The intent of the measure has changed.

## Process of Conversion

We enlisted the help of clinicians with expertise in relevant areas to select and evaluate which ICD-10 codes map to the ICD-9 codes currently in use for this measure. The conversion of ICD-9 to ICD-10 is currently ongoing and the codes we have selected cannot yet be finalized since we lack sufficient ICD-10 data to evaluate the accuracy of coding/prevalence of ICD-10 codes. Once ICD-10 codes are officially in place and more data are available we will be able to provide a more accurate crosswalk.

**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*):

The performance of the administrative and medical record models is similar. The areas under the receiver operating characteristic (ROC) curve are 0.60 and 0.58, respectively, for the two models. In addition, they are similar with respect to predictive ability. For the administrative model, the predicted readmission rate ranges from 15% in the lowest predicted decile to 38% in the highest predicted decile, a range of 23%. For the medical record model, the corresponding range is 16% to 34%, a range of 18%.

We estimated hospital-level RSRRs using the corresponding hierarchical logistic regression administrative and medical record models for the linked patient sample. We then examined the linear relationship between the two sets of estimates using regression techniques and weighting by the total number of cases in each state. The correlation coefficient of the standardized rates from the administrative and medical record models is 0.97, and the proportion of the variance explained by the administrative model is 0.96.

**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*):

We used all HF admissions in 2008-2010 Medicare FFS data (initial cohort which included 1,547,867 admissions) for the 65 and over model. We included 28,734 admissions in the 2006 all-payer California data for the 18 and over model.

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

All exclusions were determined by careful clinical review and have been made 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*):

For the 65 and over model we examined overall frequencies and proportions of the admissions excluded for each exclusion criterion in all HF admissions in 2008-2010 Medicare FFS data (initial cohort included 1,547,867 admissions). The exclusion categories are not mutually exclusive.

1. In-hospital deaths (3.81%)
2. Transfers to another acute care hospital (0.93%)
3. Discharges against medical advice (AMA) (0.41%)
4. Hospitalizations without at least 30 days post-discharge information (0.54%)
5. Admissions within 30 days of a prior index admission (7.96%)

For the 18 and over model we examined overall frequencies and proportions of the admissions excluded for each exclusion criterion in all HF admissions in 2006 all-payer California data (initial cohort included 28,734 admissions). The exclusion categories are not mutually exclusive.

1. In-hospital deaths (6.02%)
2. Transfers to another acute care hospital (0.28%)
3. Discharges against medical advice (AMA) (0.67%)

4. Admissions within 30 days of a prior index admission (3.04%)

**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:

During initial measure development, using Medicare FFS beneficiaries aged 65 years and older, we tested the performance of the model developed in a randomly selected half of the hospitalizations for HF in 2004 (representing 283,919 cases discharged from 4,669 hospitals) against hospitalizations from the other half (representing 283,528 cases discharged from 4,680 hospitals).

Assessment of Temporal Trends in Model Performance Across Years of Data

For the 2008-2010 calendar year dataset, we reported results for each individual year as well as the 3-year combined results.

Application to Medicare FFS Beneficiaries Using Inpatient Data Only for Risk Adjustment

As part of testing the model in all-payer data, we also applied the model to CMS data for Medicare FFS 65+ patients in California hospitals using only inpatient data for risk adjustment. Specifically, we created a 2006 measure cohort with complete one-year history data and 30-day follow-up data (N= 29,169).

Application to Patients Aged 18 and Older

We also applied the model to all-payer data from California. The analytic sample included 29,169 cases aged 18 and older in the 2006 California Patient Discharge Data. When used in all-payer data, only admission claims data are used for risk adjustment, as the hospital discharge databases do not have outpatient claims.

All the above were performed prior to the completion of the planned readmission algorithm.

**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

This measure is fully risk-adjusted using a hierarchical logistic regression model to calculate hospital RSRRs accounting for differences in hospital case-mix. (See "risk adjustment methodology" for additional details.)

Approach to Assessing Model Performance

During measure development, we computed five summary statistics for assessing model performance (Harrell and Shih, 2001) for the development and validation cohort:

(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

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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.)

We tested the performance of the model developed in a randomly selected half of the hospitalizations for HF in 2004 against hospitalizations from the other half.

#### Assessment of Temporal Trends in Model Performance across Years of Data

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

#### Application to Medicare FFS Beneficiaries Using Inpatient Data Only for Risk Adjustment

To help determine whether the measure could be applied to Medicare FFS 65+ patients using only Medicare Part A data, we performed analyses to assess how the model performs when using only inpatient claims data for risk adjustment, as all-payer hospital discharge databases do not have outpatient claims. To assess the validity of using only admission claims data for risk adjustment, we fit the model separately 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, correlation coefficient, and R<sup>2</sup>) to assess whether the model with only admission claims data is different from the current model in profiling hospital rates.

#### Application to Patients Aged 18 and Older

To help determine whether the measure could be applied to a population of patients aged 18+, we examined the interaction terms between age (18-64 vs. 65+) and each of the other risk factors. 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, correlation coefficient, and R-square) to assess whether the model with interactions is different from the current model in profiling hospital rates.

#### 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

The performance was not substantively different in the validation sample (ROC area = 0.60) compared with the development sample (ROC area = 0.60). The models appear well calibrated, with over-fitting indices of (0.089, 1.05).

For the development cohort the results are summarized below:

Residuals lack of fit (<2, [-2,0],[0,2],[2+]): 0, 76.40, 17.62, 5.98

Model Chi-square [# of covariates]: 6,462 [37]

Predictive ability (lowest decile %, highest decile %): 15%, 37%

Area under ROC curve: 0.60

For the validation cohort the results are summarized below:

Residuals lack of fit (<2, [-2,0],[0,2],[2+]): 0, 76.29, 17.83, 5.88  
Model Chi-square [# of covariates]: 6,632 [37]  
Predictive ability (lowest decile %, highest decile %): 15%, 37%  
Area under ROC curve: 0.60

#### Assessment of Temporal Trends in Model Performance Across Years of Data

The frequency of risk-adjustment variables and parameter estimates for risk-adjustment variables and model performance was stable over all time periods.

#### Model Performance in Medicare FFS Beneficiaries Using Inpatient Data Only for Risk

Analyzing 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 admission claims data, the reclassification analysis demonstrated good patient-level risk prediction; (c) the c-statistic was similar (0.610 vs. 0.611); and (d) hospital-level risk-standardized rates were highly correlated (ICC=0.978).

#### Model Performance in Patients Aged 18 and Older

When the model was applied to all patients 18+, overall discrimination was good (c-statistic=0.638). 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 (0.640 vs. 0.638); and (c) hospital-level risk-standardized rates were highly correlated (ICC=0.996). Thus, the inclusion of the interactions did not substantively affect either patient-level model performance or hospital-level results.

Therefore, the measure can be applied to all-payer data for patients 18 and older.

**2b4.4 If outcome or resource use measure is not risk adjusted, provide rationale and analyses to justify lack of adjustment:** N/A—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 HF hospitalizations among Medicare FFS patients aged 65+ from July 2008-June 2011 (applying the new planned readmission algorithm), and includes 1,297,008 hospitalizations from 4,829 hospitals.

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

Below we present the distribution of the current measure.

For public reporting of the measure, CMS characterizes the uncertainty associated with the RSRR by estimating the 95% interval estimate. This is similar to a 95% confidence interval but is calculated differently. If the RSRR's interval estimate does not include the national crude readmission rate (is lower or higher than the rate), then CMS is confident that the hospital's RSRR is different from the national rate, and describes the hospital on the Hospital Compare website as "better than the U.S. national rate" or "worse than the U.S. national rate." If the interval includes the national rate, then CMS describes the hospital's RSRR as "no different than the U.S. national rate" or "the difference is uncertain." CMS does not classify performance for hospitals that have fewer than 25 HF cases in the three-year period.

**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*):

Recent analyses of Medicare FFS data show substantial variation in HF RSRRs among hospitals. Using data from July 2008-June

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2011 and updating the measure by applying the new planned readmission algorithm, the median hospital RSRR for HF was 23.4%, with a range of 17.4% to 32.4%. The 5th percentile was 20.7% and the 95th percentile was 26.6%. The interquartile range was 22.4% to 24.5%.

**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:

The analyses performed by CMS demonstrate that hospitals with high proportions of low SES patients or high proportions of African-American patients are able to perform well on the measure. For this reason CMS does not plan to stratify the measure.

**2.1-2.3 Supplemental Testing Methodology Information:**

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): Payment Program, 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):

**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.*]

The measure has been publicly reported on Hospital Compare (<http://www.hospitalcompare.hhs.gov/>) since 2009 and is used in CMS's Hospital Inpatient Quality Reporting Program (formerly RHQDAPU).

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.

The measure has been systematically evaluated by a group of clinical experts throughout the development process to construct a measure for use in public reporting. We have received input and feedback on key issues related to the meaningfulness, usefulness, and design of the measure. 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, this and another, similar measure (for acute myocardial infarction [AMI]) underwent consumer testing prior to being publicly reported and were found to be useful for publicly reporting outcomes.

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:

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): The measure has been publicly reported on Hospital Compare (<http://www.hospitalcompare.hhs.gov/>) since 2009 and is used in CMS's Hospital Inpatient Quality Reporting Program (formerly RHQDAPU).

3b.2. Provide a 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 HF patients may incentivize hospitals to improve quality of care for this high-risk population.

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))

The measure has been publicly reported on Hospital Compare (<http://www.hospitalcompare.hhs.gov/>) since 2009 and is used in CMS's Hospital Inpatient Quality Reporting Program (formerly RHQDAPU).

This year, CMS used the measure's methodology to calculate hospitals' excess readmissions for the Hospital Readmissions Reduction Program, Section 3025 of the Affordable Care Act.

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*].

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:

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*): [Yes](#)

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:

[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 \(Krumholz et al., 2006a; Krumholz et al., 2011\), heart failure \(Krumholz et al., 2006b; Keenan et al., 2008\), and pneumonia \(Bratzler et al., 2011; Lindenauer et al., 2011\), 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, 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 Medicare FFS data. 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 from the index admission, then they are not adjusted for in the analysis.](#)

References:

[Krumholz HM, Wang Y, Mattera JA, Wang Y-F, Han LF, Ingber MJ, Roman S, Normand SL \(2006a\). 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.](#)

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.

Krumholz HM, Wang Y, Mattera JA, Wang Y-F, Han LF, Ingber MJ, Roman S, Normand SL (2006b). 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.

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.

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.

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*):  
 Administrative data are routinely collected as part of the billing process.

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:

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?

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/AN/A

Related Measures: NQF # 0505- Thirty-day all-cause risk standardized readmission rate following acute myocardial infarction (AMI) hospitalization. NQF # 0506- Thirty-day all-cause risk standardized readmission rate following pneumonia hospitalization.

**CONTACT INFORMATION**

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Co.4 Point of Contact: Susannah, Bernheim, MD, MHS, Project Director, susannah.bernheim@yale.edu, 203-764-7231-

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

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**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.

We held technical consultations with the following experts to obtain feedback about methodological and analytic decisions.

Frederick Masoudi, MD, MSPH, FACC

Martha Radford, MD

John Rumsfeld, MD, PhD, FACC

John Spertus, MD, MPH, FACC

Frank Harrell, PhD

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: N/A

Measure Developer/Steward Updates and Ongoing Maintenance Ad.3 Year the measure was first released: 2009 Ad.4 Month and Year of most recent revision: 09, 2012 Ad.5 What is your frequency for review/update of this measure? Annual Ad.6 When is the next scheduled review/update for this measure? 06, 2013
Ad.7 Copyright statement: N/A
Ad.8 Disclaimers:
Ad.9 Additional Information/Comments:
Date of Submission (MM/DD/YY): 12/14/2010