

# THE NATIONAL QUALITY FORUM

## APPENDIX A – SPECIFICATIONS OF NATIONAL VOLUNTARY CONSENSUS STANDARDS FOR HOSPITAL CARE: READMISSION MEASURES – Endorsed 10/28/2008

<p>0505 Thirty-day all-cause risk standardized readmission rate following acute myocardial infarction (AMI) hospitalization. (CMS) (HOE-001-08)</p>
<p><b>Description:</b> Hospital-specific 30-day all-cause risk standardized readmission rate following hospitalization for AMI among Medicare beneficiaries aged 65 years or older at the time of index hospitalization.</p>
<p><b>Setting:</b> Hospital    <b>Level of Analysis:</b> Facility</p>
<p><b>Type of Measure:</b> Outcome    <b>Data Source:</b> Administrative Claims Data</p>
<p><b>Numerator Statement:</b> The “numerator” of the risk-adjusted ratio is the predicted number of readmissions within 30 days given the hospital’s performance with its observed case mix. The term “predicted” describes the numerator result, which is calculated using the hospital-specific intercept term.</p> <p>The ratio is converted to a rate by multiplying by the national unadjusted rate.</p> <p>Admissions not counted as readmissions: Some AMI patients have planned readmissions for revascularization procedures – for example, to perform angioplasty (percutaneous coronary intervention [PCI]) on a second vessel or a second location in the same vessel, or to perform coronary artery bypass graft (CABG) surgery after AMI and a period of recovery outside the hospital. Because admissions for PCI and CABG may be staged or scheduled readmissions, we do not count as readmissions those admissions after discharge that include PCI or CABG procedures unless the principal discharge diagnosis for the readmission is one of the following diagnoses (which are not consistent with a scheduled readmission): heart failure (HF), AMI, unstable angina, arrhythmia, and cardiac arrest (i.e., readmissions with these diagnoses and a PCI or CABG procedure are counted as readmissions).</p>
<p><b>Denominator Statement:</b> The “denominator” of the risk-adjusted ratio is the expected number of readmissions given the hospital’s case mix. The term “expected” describes the denominator, which is calculated using the average intercept term.</p> <p>Outcome measure cohort definition: Admissions for Medicare fee-for-service beneficiaries aged =&gt;65 years discharged alive from the hospital with a principal discharge diagnosis of AMI and with a complete claims history for 12 months prior to admission and 30 days post-discharge.</p>
<p><b>Exclusions:</b> Cohort exclusions (excluded admissions):</p> <ol style="list-style-type: none"> <li>1. Admissions for patients with an in-hospital death are excluded because they are not eligible for readmission.</li> <li>2. Admissions for patients having a principal diagnosis of AMI during the index hospitalization and subsequently transferred to another acute care facility are excluded because we are focusing on discharges to non-acute care settings.</li> <li>3. Admissions are excluded for patients who are discharged alive not to another acute care facility on the same day that they are admitted, because these patients are unlikely to have had an AMI.</li> <li>4. If a patient has one or more additional AMI admissions within 30 days of discharge from an index AMI admission, we do not consider the additional AMI admissions as index admissions (they are considered as potential readmissions). Thus, any AMI admission is either an index admission or a readmission, but not both.</li> </ol>

**Adjustments:** Hierarchical logistic regression modeling to calculate a hospital-specific risk standardized readmission rate (RSRR). This rate is calculated as the ratio of “predicted” to “expected” readmissions, multiplied by the national unadjusted rate.

More specifically, the expected number of readmissions in each hospital is estimated using its patient mix and the average hospital-specific intercept. The predicted number of readmissions in each hospital is estimated given the same patient mix but an estimated hospital-specific intercept. Operationally, the expected number of readmissions for each hospital is obtained by regressing the risk factors on the readmission outcome using all hospitals in our sample, applying the subsequent estimated regression coefficients to the patient characteristics observed in the hospital, adding the average of the hospital-specific intercepts, transforming, and then summing over all patients in the hospital to get a value. This is a form of indirect standardization. The predicted hospital outcome is the number of readmissions in the “specific” hospital estimated given its performance and case mix. Operationally, this is accomplished by estimating a hospital-specific intercept that herein represents baseline readmission risk within the hospital, applying the estimated regression coefficients to the patient characteristics in the hospital, transforming, and then summing over all patients in the hospital to get a value. To assess hospital performance in any given year, we re-estimate the model coefficients using that year’s data.

**Risk Adjustment Variables:**

Male

Age-65 (years above 65, continuous)

CC 15-20, 119-120 Diabetes and DM complications

CC 47 Iron deficiency and other/unspecified anemias and blood disease

CC 80 Congestive heart failure

CC 86 Valvular and rheumatic heart disease

CC108 COPD

CC129-130 End-stage renal disease or dialysis

CC136 Other urinary tract disorders

CC 92-93 Arrhythmias

CC 111-113 Pneumonia

CC 131 Renal failure

CC 104-106 Vascular or circulatory disease

CC 22-23 Disorders of fluid/electrolyte/acid-base

CC 84 Coronary atherosclerosis/other chronic ischemic heart disease

CC 1,3-6 History of infection

CC 97-99,103 Cerebrovascular disease

CC 7 Metastatic cancer and acute leukemia

CC 8-12 Cancer

CC 148-149 Decubitus ulcer or chronic skin ulcer

CC 49-50 Dementia and senility

CC 83 Angina pectoris/old myocardial infarction

CC 95-96 Stroke

CC 110 Asthma

CC 81-82 Acute coronary syndrome

CC 67-69,100-102,177-178 Hemiplegia, paraplegia, paralysis, functional disability

CC 21 Protein-calorie malnutrition

Anterior myocardial infarction (ICD-9-CM 410.00-410.19)-

Other location of myocardial infarction (ICD-9-CM 410.20-410.69)

History of CABG (ICD-9-CM V45.81, 36.10-36.16)

History of PCI (ICD-9-CM V45.82, 00.66, 36.01, 36.02, 36.05, 36.06, 36.07)

Note: CCs are condition categories or diagnostic groups that combine related sets of ICD-9-CM codes

(Pope et al., 2000). For more details, please see the methodology report.

**Numerator Codes:** ICD-9-CM codes used to define excluded readmissions:

ICD-9-CM codes associated with PCI and CABG revascularization procedures:

PCI: 00.66, 36.01, 36.02, 36.05, 36.06, 36.07

CABG: 36.10-36.16

ICD-9-CM codes associated with HF, AMI, unstable angina, arrhythmia, and cardiac arrest:

HF: 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.xx

AMI: 410.xx except 410.x2 (AMI, subsequent episode of care)

Unstable angina: 411.xx

Arrhythmia: 427.xx, except 427.5

Cardiac arrest: 427.5.

**Denominator Codes:** ICD-9-CM codes that define the patient cohort:

- 410.00 AMI (anterolateral wall) - episode of care unspecified
- 410.01 AMI (anterolateral wall) - initial episode of care
- 410.10 AMI (other anterior wall) - episode of care unspecified
- 410.11 AMI (other anterior wall) - initial episode of care
- 410.20 AMI (inferolateral wall) - episode of care unspecified
- 410.21 AMI (inferolateral wall) - initial episode of care
- 410.30 AMI (inferoposterior wall) - episode of care unspecified
- 410.31 AMI (inferoposterior wall) - initial episode of care
- 410.40 AMI (other inferior wall) - episode of care unspecified
- 410.41 AMI (other inferior wall) - initial episode of care
- 410.50 AMI (other lateral wall) - episode of care unspecified
- 410.51 AMI (other lateral wall) - initial episode of care
- 410.60 AMI (true posterior wall) - episode of care unspecified
- 410.61 AMI (true posterior wall) - initial episode of care
- 410.70 AMI (subendocardial) - episode of care unspecified
- 410.71 AMI (subendocardial) - initial episode of care
- 410.80 AMI (other specified site) - episode of care unspecified
- 410.81 AMI (other specified site) - initial episode of care
- 410.90 AMI (unspecified site) - episode of care unspecified
- 410.91 AMI (unspecified site) - initial episode of care

Note: We do not include 410.x2 (AMI, subsequent episode of care).

**Exclusion Codes:**

<b>0506 Thirty-day all-cause risk standardized readmission rate following pneumonia hospitalization. (CMS) (HOE-002-08)</b>
<b>Description:</b> Hospital-specific 30-day all-cause risk standardized readmission rate following hospitalization for pneumonia among Medicare beneficiaries aged 65 years or older at the time of index hospitalization
<b>Setting:</b> Hospital <b>Level of Analysis:</b> Facility
<b>Type of Measure:</b> Outcome <b>Data Source:</b> Administrative Claims Data
<p><b>Numerator Statement:</b> The “numerator” of the risk-adjusted ratio is the predicted number of readmissions within 30 days given the hospital’s performance with its observed case mix. The term “predicted” describes the numerator result, which is calculated using the hospital-specific intercept term.</p> <p>The ratio is converted to a rate by multiplying by the national unadjusted rate.</p>
<p><b>Denominator Statement:</b> The “denominator” of the risk-adjusted ratio is the expected number of readmissions given the hospital’s case mix. The term “expected” describes the denominator, which is calculated using the average intercept term.</p> <p>Outcome measure cohort definition: Admissions for Medicare fee-for-service beneficiaries aged =&gt;65 years discharged alive from the hospital with a principal discharge diagnosis of pneumonia and with a complete claims history for 12 months prior to admission and 30 days post-discharge.</p>
<p><b>Exclusions:</b> Cohort exclusions (excluded admissions):</p> <ol style="list-style-type: none"> <li>1. Admissions for patients with an in-hospital death are excluded because they are not eligible for readmission.</li> <li>2. Admissions for patients having a principal diagnosis of pneumonia during the index hospitalization and subsequently transferred to another acute care facility are excluded because we are focusing on discharges to non-acute care settings;</li> <li>3. If a patient has one or more additional pneumonia admissions within 30 days of discharge from an index pneumonia admission, we do not consider the additional pneumonia admissions as index admissions (they are considered as potential readmissions). Thus, any pneumonia admission is either an index admission or a readmission, but not both.</li> </ol>
<p><b>Adjustments:</b> Hierarchical logistic regression modeling to calculate a hospital-specific risk standardized readmission rate (RSRR). This rate is calculated as the ratio of “predicted” to “expected” readmissions, multiplied by the national unadjusted rate.</p> <p>More specifically, the expected number of readmissions in each hospital is estimated using its patient mix and the average hospital-specific intercept. The predicted number of readmissions in each hospital is estimated given the same patient mix but an estimated hospital-specific intercept. Operationally, the expected number of readmissions for each hospital is obtained by regressing the risk factors on the readmission outcome using all hospitals in our sample, applying the subsequent estimated regression coefficients to the patient characteristics observed in the hospital, adding the average of the hospital-specific intercepts, transforming, and then summing over all patients in the hospital to get a value. This is a form of indirect standardization. The predicted hospital outcome is the number of readmissions in the “specific” hospital estimated given its performance and case mix. Operationally, this is accomplished by estimating a hospital-specific intercept that herein represents baseline readmission risk within the hospital, applying the estimated regression coefficients to the patient characteristics in the hospital, transforming, and then summing over all patients in the hospital to get a value. To assess hospital performance in any given year, we re-estimate the model coefficients using that year’s data.</p> <p><b>Risk Adjustment Variables:</b> Age-65 (years above 65, continuous)</p>

Male

History of CABG ICD-9-CM V45.81, 36.10-36.16

CC 1, 3-6 History of infection

CC 2 Septicemia/shock

CC 7 Metastatic cancer and acute leukemia

CC 8 Lung, upper digestive tract, and other severe cancers

CC 9-10 Lymphatic, head and neck, brain, and other major cancers; breast, prostate, colorectal and other cancers and tumors

CC 15-20, 119, 120 Diabetes and DM complications

CC 21 Protein-calorie malnutrition

CC 22, 23 Disorders of fluid/electrolyte/acid-base

CC 36 Other gastrointestinal disorders

CC 44 Severe hematological disorders

CC 47 Iron deficiency and other/unspecified anemias and blood disease

CC 49, 50 Dementia and senility

CC 51-53 Drug/alcohol abuse/dependence/psychosis

CC 54-56 Major psychiatric disorders

CC 60 Other psychiatric disorders

CC 67-69, 100-102, 177, 178 Hemiplegia, paraplegia, paralysis, functional disability

CC 79 Cardio-respiratory failure and shock

CC 80 Congestive heart failure

CC 81, 82 Acute coronary syndrome

CC 83, 84 Chronic atherosclerosis

CC 86 Valvular and rheumatic heart disease

CC 92, 93 Arrhythmias

CC 95, 96 Stroke

CC 104-106 Vascular or circulatory disease

CC 108 COPD

CC 109 Fibrosis of lung and other chronic lung disorders

CC 110 Asthma

CC 111-113 Pneumonia

CC 114 Pleural effusion/pneumothorax

CC 115 Other lung disorders

CC 129, 130 End-stage renal disease or dialysis

CC 131 Renal failure

CC 135 Urinary tract infection

CC 136 Other urinary tract disorders

CC 148, 149 Decubitus ulcer or chronic skin ulcer

CC 157 Vertebral fractures

CC 162 Other injuries

Note: CCs are condition categories or diagnostic groups that combine related sets of ICD-9-CM codes (Pope et al., 2000). For more details, please see the methodology report.

**Numerator Codes:**

**Denominator Codes:** ICD-9-CM codes that define the patient cohort:

480.0 Pneumonia due to adenovirus

480.1 Pneumonia due to respiratory syncytial virus

480.2 Pneumonia due to parainfluenza virus

480.3 Pneumonia due to SARS-associated coronavirus

480.8 Viral pneumonia: pneumonia due to other virus not elsewhere classified

480.9	Viral pneumonia unspecified
481	Pneumococcal pneumonia [streptococcus pneumoniae pneumonia]
482.0	Pneumonia due to klebsiella pneumoniae
482.1	Pneumonia due to pseudomonas
482.2	Pneumonia due to hemophilus influenzae (h. influenzae)
482.30	Pneumonia due to streptococcus unspecified
482.31	Pneumonia due to streptococcus group a
482.32	Pneumonia due to streptococcus group b
482.39	Pneumonia due to other streptococcus
482.40	Pneumonia due to staphylococcus unspecified
482.41	Pneumonia due to staphylococcus aureus
482.49	Other staphylococcus pneumonia
482.81	Pneumonia due to anaerobes
482.82	Pneumonia due to escherichia coli [e.coli]
482.83	Pneumonia due to other gram-negative bacteria
482.84	Pneumonia due to legionnaires' disease
482.89	Pneumonia due to other specified bacteria
482.9	Bacterial pneumonia unspecified
483.0	Pneumonia due to mycoplasma pneumoniae
483.1	Pneumonia due to chlamydia
483.8	Pneumonia due to other specified organism
485	Bronchopneumonia organism unspecified
486	Pneumonia organism unspecified
487.0	Influenza with pneumonia

Exclusion Codes: