NATIONAL QUALITY FORUM

National Voluntary Consensus Standards for Patient Outcomes
Measure Summary

Measure number: OT1-010-09

Measure name: Acute Myocardial Infarction (AMI) Mortality Rate

Description: Number of deaths per 100 discharges with a principal diagnosis code of acute myocardial infarction.

Numerator statement: Number of inpatient deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.

Denominator statement: All discharges, age 18 years and older, with a principal diagnosis code of acute myocardial infarction.

Level of Analysis: Facility/Agency

Type of Measure: Outcome

Data Source: Electronic adminstrative data/claims

Measure developer: AHRQ

Type of Endorsement: (full or time-limited): Full Endorsement (Recommend-21, Do not Recommend-0, Abstain-0, April 20-21, 2010 Meeting)

Summary table of TAP ratings of sub criteria and comments:

IMPORTANCE TO MEASURE AND REPORT		
1a Impact	Completely	Mortality is an important outcome. The focus is on inpatient care. There is a need for both inpatient and 30-day mortality measures. TAP suggested adding "inpatient" to the title for clarity.
1b Gap	Completely	
1c Relation to outcomes	Completely	
SCIENTIFIC ACCEPTABILTY		
2a Specifications	Completely	Excludes patients with AMI as secondary diagnosis – why not include patients who are hospitalized for other reasons and experience an AMI while in hospital? AHRQ provided 2007 hospital data that only 66% of AMIs are primary diagnoses – 34% of AMIs in hospital are not captured in this measure. Measure developer explained that excluding the secondary diagnoses is "cleaner" because there is a question of how and when the diagnosis is made – the AMI may be a result of quality issues. Endorsed 30-day mortality measure also uses primary diagnosis only. TAP asked about including patients who have arrested and are brought in for PCI. These patients would have died in field or ED but are now admitted for "salvage" PCI in centers that have an open door policy. Some patients do benefit from the attempt. Users have the ability to stratify by age, gender, race, urban/rural,
2b Reliability	Completely	
2c Validity	Completely	
2d Exclusions	Completely	
2e Risk adjustment	Completely	
2f Meaningful differences	Completely	
2g Comparability	NA	
2h Disparities	Completely	

		etc.
USEABILITY		
3a Distinctive	Completely	Similar to NQF endorsed AMI mortality measure (#161) from Joint Commission. The differences are in the risk model and that measure 161 excludes all transfers in and out. This AHRQ measure only excludes transfers out and includes transfers in. Some adjustment for the transfers in is included in the risk model. The transfers out are excluded – this will have a big impact on rural and small hospitals that transfer frequently, particularly for procedures. Sicker patients may be unstable for transfer. This measure is part of an inpatient mortality composite measure that will be reported on Hospital Compare in December 2010.
3b Harmonization	Completely	
3c Added value	Completely	
FEASIBILITY		
4a Data a byproduct of care	Completely	Straightforward data collection using claims data. Software available to calculate the measure.
4b Electronic	Completely	
4c Exclusions	Completely	
4d Inaccuracies	Completely	
4e Implementation	Completely	

Summary of SC ratings of sub criteria and comments:

IMPORTANCE TO MEASURE AND REPORT	
In-hospital data is still important along with 30-day morality data.	SC Vote on Importance Yes - 21 No - 1
SCIENTIFIC ACCEPTABILITY	
Definition is aligned with the CMS measure. The measure is based on the principal diagnosis of AMI and patients who experience AMI during hospitalization for other conditions, such as surgery, are not included (approximately 30% of AMIs). The Committee expressed concern that these patients are not being accounted for in any measure at this time. This measure is more inclusive than TJC measure as it includes transfers in to the hospital. The measure includes all ages compared to the 30-day mortality measures, which is limited to age 65 years and above.	SC vote on scientific acceptability Completely - 13 Partially – 7 Minimally – 0 Not at all – 0

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USABILITY	
The measure is based on administrative data and the risk adjustment methodology is widely available.	SC vote on usability Completely – 17 Partially – 3 Minimally –0 Not at all – 0
FEASIBILITY	
Missing discharge disposition is extremely rare less than 1/10 of a percent.	SC vote on feasibility Completely – 17 Partially – 3 Minimally - 0 Not at all -0

Summary of Biostatistical review:

Type of Risk Model : *Based on a 2001 technical report, Refinement of the HCUP Quality Indicators, the risk model appears to be a linear regression estimated via ordinary least squares. Key covariates include APR DRG mortality risk subclass, age, gender, transfer in status. The IQI software has the ability to compute conventional as well as smoothed risk-adjusted estimates.*
RISK FACTORS Are the risk factors clearly identified in the submission information? *The 2001 technical report (referenced in the submission material) indicates that the IQI models include gender; but gender is not in the list of covariates provided in the risk adjustment section of the submission form.*
Does the model include risk factors associated with differences/inequalities with care such as race, socioeconomic status or gender?

NO. (Maybe includes gender; developer may be able to clarify.)

Are the conceptual and quantitative criteria for inclusion or exclusion or combining of risk factors explained and appropriate?

The rationale for using the APR DRG system for risk adjustment is discussed in the 2001 technical report "Refinement of the HCUP Quality Indicators". The report states: "A majority of users interviewed already used All Patients Refined (APR)-DRGs, and APR-DRGs have been reported to perform well in predicting resource use and death, when compared to other DRG based systems. APR-DRGs also performed as well as or better than other risk adjustment systems for several conditions in a series of studies by Iezzoni et al.9-13, 17, 18 As a result, we conducted indicator evaluations with the APR-DRG system for two purposes…". The report also discussed the decision not to adjust for race and "do not resuscitate" status. I did not find a discussion of the rationale/methodology for including/excluding additional covariates.

Is quantitative assessment of the relative contribution of the model components described in detail?

NO.

Does the measure have exclusions that influence outcomes that should be included as risk factors?

NO.

Comments on risk factors:

My impression is that a single modeling approach was selected and applied to all of the IQI measures. The selection of risk factors was not customized specifically for the endpoint of AMI mortality. The validity of the risk adjustment depends in part on the ability of APR DRGs to capture variation in patient risk.

VALIDATION OF THE RISK MODEL

Is there information provided on the cross-validation of the model comparing a development sample and a validation sample provided? *NO*

Is there information on independent, external validation of the model in another data set? *NO*

Are the results supportive of a valid model? *Not able to assess.*

RISK MODEL PERFORMANCE (2e)

DISCRIMINATION: *C = 0.84. (I was not sure what sample was used for calculating the C statistic. Is this based on current data or the 2001 technical report?)*

Does the statistic support good discrimination?

Yes. The discrimination is higher than some other AMI short-term mortality prediction models, including some that were mentioned in the "evidence to support measure focus" section, which had C statistics 0.70 – 0.78. Differences in C statistics for different models may be related to differences in the target

populations. (The proposed measure includes all adult patients age 18+, whereas some AMI models are based on age 65+.)

CALIBRATION: Is a calibration curve included? *NO*
Is a risk decile plot included? *NO*
Hosmer-Lemeshow statistic: *N/A*
Does the data support good model calibration? *Unable to assess.*

Comments on Risk Model Performance:

The validity of the model depends in part on how well APR DRGs capture differences in patient risk. An assessment of the APR DRG system is not included in this review. The 2001 technical report states: "Our incorporation of APR-DRGs into the Version 2 software should not be construed as an unequivocal endorsement of this product. Indeed, customized risk-adjustment systems might be more effective than APR-DRGs or any off-the-shelf product… However, it was beyond the scope of this contract to develop customized risk-adjustment systems for each Quality Indicator. Users may implement other severity stratification systems instead of APR-DRGs if they prefer." Also: "As noted above, we recognize that this system is not ideal, because it provides only four severity levels within each base APR-DRG, omits important physiologic and functional predictors, and potentially misadjusts for iatrogenic complications."

The use of linear regression is unusual when modeling dichotomous (yes/no) endpoints such as in-hospital mortality. In general, generalized linear models (e.g. logistic regression, probit regression) are considered to be more appropriate. The 2001 technical report acknowledged this issue and reported that estimates based on logistic regression were similar. Linear regression was chosen because it was a convenient framework for partitioning sources of variability (signal, noise, etc.) at the level of hospitals and patients.

Reliability testing (2b):
Is the reliability of the key data elements, such as risk factors and the outcome demonstrated?

NO.

Is there information about the reliability of the measure score, such as signal to noise ratio?

The 2001 technical report includes a detailed assessment of measure reliability including signal-to-noise ratio and a variety of related statistics. Compared to other IQI indicators, the mortality measure was considered to have "moderate" signal-to-noise ratio (~43%).

Has a sensitivity analysis been performed for problem or missing data?

Various aspects of data quality were addressed in the 2001 technical report. This was mainly literature review, not empirical analysis of the proposed measure.

Does the data demonstrate that the risk model is reliable? *Unable to assess.*

Comments on reliability testing:

Reliability testing focused on precision (signal to noise ratio), not reliability of data abstraction and coding. Hospital-specific sample sizes for this measure will be slightly larger than the CMS-Yale measure, because this one includes ages 18+ instead of 65+.

Validity testing (2c):

Is validity testing of the measure to demonstrate results can be used to make conclusions about quality provided? *NO.*

Are the results supportive of a valid measure? *Unable to assess.*

Comments on validity testing:

According to IQI software documentation, the software incorporates "present on admission" (POA) codes when available. Otherwise, diagnoses are weighted based on the probability that they were present on admission. It may not be valid to compare mortality rates for hospitals that use POA indicators to mortality rates for hospitals not using POA indicators.

Choice of mortality endpoint. Compared to 30-day mortality, in-hospital mortality is likely to be captured more reliably, but is regarded as a less valid indicator of quality. Observed differences may be influenced by differences in hospital discharge and transfer practices.

Scoring Method Justification (2f):

Is the choice of method for computing risk-adjusted scores and identifying statistically significant differences justified?

The methods were not explained in the measure submission material.

The software produces conventional as well as smoothed mortality estimates. The smoothed estimates account for small sample size by borrowing information across multiple hospitals and measures when estimating results for a single measure at a single hospital. It is not clear whether confidence intervals are provided. Confidence intervals would be useful, given the small numbers of events in some hospitals.

Comments on scoring methods:

Difficult to assess. In my (cursory) review of the 2001 technical report, I did not find a formula for calculating simple (non-smoothed) risk-adjusted estimates. I assume that these are based on simple observed-to-expected (O/E) ratios, but clarification would be helpful.

The interpretation of the various measures produced by the software is not clear to me. They appear to be measured on different scales. The mean observed scores was 0.1526, mean expected score was 0.0082, mean risk-adjusted score was 1.6271. So, the mean risk adjusted score was approximately 11x larger than the mean observed score (1.6271/0.1526=10.66), and the mean observed score was

approximately 19x larger than the mean expected score (0.1526/0.0082=18.61). These results require some explanation.

Summary comments:

Strengths of the measure include: (1) availability of free software; (2) high feasibility due to use of claims data; (3) ability to incorporate "present on admission" (POA) codes when available. Methodological issues include: (1) details of the risk model were not provided; (2) limited information on risk model performance; (3) possible sensitivity to variation in coding practices; (4) unclear explanation of results pertaining to precision.

Reviewer:

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Attachments: None

NATIONAL QUALITY FORUM

Measure Evaluation 4.1
January 2010

This form contains the measure information submitted by stewards. Blank fields indicate no information was provided. Attachments also may have been submitted and are provided to reviewers. The sub-criteria and most of the footnotes from the evaluation criteria are provided in Word comments and will appear if your cursor is over the highlighted area (or in the margin if your Word program is set to show revisions in balloons). Hyperlinks to the evaluation criteria and ratings are provided in each section.

TAP/Workgroup (if utilized)**:** Complete all yellow highlighted areas of the form. Evaluate the extent to which each sub-criterion is met. Based on your evaluation, summarize the strengths and weaknesses in each section.

Note: *If there is no TAP or workgroup, the SC also evaluates the* sub-criteria *(yellow highlighted areas)*.

Steering Committee: Complete all pink highlighted areas of the form. Review the workgroup/TAP assessment of the sub-criterion, noting any areas of disagreement; then evaluate the extent to which each major criterion is met; and finally, indicate your recommendation for the endorsement. Provide the rationale for your ratings.

Evaluation ratings of the extent to which the criteria are met
C = Completely (unquestionably demonstrated to meet the criterion)
P = Partially (demonstrated to partially meet the criterion)
M = Minimally (addressed BUT demonstrated to only minimally meet the criterion)
N = Not at all (NOT addressed; OR incorrectly addressed; OR demonstrated to NOT meet the criterion)
NA = Not applicable (only an option for a few sub-criteria as indicated)

(for NQF staff use) **NQF Review** #: OT1-010-09 **NQF Project:** Patient Outcomes Measures: Phases I and II
MEASURE DESCRIPTIVE INFORMATION
De.1 **Measure Title:** Acute Myocardial Infarction (AMI) Mortality Rate
De.2 **Brief description of measure***:* Number of deaths per 100 discharges with a principal diagnosis code of acute myocardial infarction.
1.1-2 **Type of Measure:** outcome De.3 **If included in a composite or paired with another measure, please identify composite or paired measure** The measure is an individual AHRQ measure and it is also a measure with the NQF endorsed composite titled Mortality for Selected Conditions (NQF # 0530)
De.4 **National Priority Partners Priority Area:** safety De.5 **IOM Quality Domain**: effectiveness, efficiency, safety, timeliness De.6 **Consumer Care Need:** Getting Better

CONDITIONS FOR CONSIDERATION BY NQF	
Four conditions must be met before proposed measures may be considered and evaluated for suitability as voluntary consensus standards:	**NQF Staff**
A. The measure is in the public domain or an intellectual property (measure steward agreement) is signed. *Public domain only applies to governmental organizations. All non-government organizations must sign a measure steward agreement even if measures are made publicly and freely available.* A.1 **Do you attest that the measure steward holds intellectual property rights to the measure and the right to use aspects of the measure owned by another entity (e.g., risk model, code set)?** Yes	**A** **Y☐** **N☐**

A.2 Indicate if Proprietary Measure (*as defined in measure steward agreement*)**:** **A.3 Measure Steward Agreement:** government entity- public domain- No Agreement **A.4 Measure Steward Agreement attached:**	
B. The measure owner/steward verifies there is an identified responsible entity and process to maintain and update the measure on a schedule that is commensurate with the rate of clinical innovation, but at least every 3 years. Yes, information provided in contact section	**B** **Y**☐ **N**☐
C. The intended use of the measure includes both public reporting and quality improvement. ►**Purpose:** public reporting, quality improvement Payment Incentive	**C** **Y**☐ **N**☐
D. The requested measure submission information is complete. Generally, measures should be fully developed and tested so that all the evaluation criteria have been addressed and information needed to evaluate the measure is provided. Measures that have not been tested are only potentially eligible for a time-limited endorsement and in that case, measure owners must verify that testing will be completed within 12 months of endorsement. **D.1Testing:** Yes, fully developed and tested **D.2 Have NQF-endorsed measures been reviewed to identify if there are similar or related measures?** Yes	**D** **Y**☐ **N**☐
(for NQF staff use) **Have all conditions for consideration been met?** **Staff Notes to Steward** (*if submission returned*)**:**	**Met** **Y**☐ **N**☐
Staff Notes to Reviewers (*issues or questions regarding any criteria*)**:**	
Staff Reviewer Name(s):	

TAP/Workgroup Reviewer Name:	
Steering Committee Reviewer Name:	
1. IMPORTANCE TO MEASURE AND REPORT	
Extent to which the specific measure focus is important to making significant gains in health care quality (safety, timeliness, effectiveness, efficiency, equity, patient-centeredness) and improving health outcomes for a specific high impact aspect of healthcare where there is variation in or overall poor performance. *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**	Eval Rating
(for NQF staff use) **Specific NPP goal**:	
1a.1 Demonstrated High Impact Aspect of Healthcare: patient/societal consequences of poor quality **1a.2** **1a.3 Summary of Evidence of High Impact:** See "Summary of Evidence" under "Evidence-Based (Measure evaluation criterion 1c)". **1a.4 Citations for Evidence of High Impact:** See "Citations for Evidence" under "Evidence-Based (Measure evaluation criterion 1c)".	**1a** **C**☐ **P**☐ **M**☐ **N**☐
1b. Opportunity for Improvement **1b.1 Benefits (improvements in quality) envisioned by use of this measure:** **1b.2 Summary of data demonstrating performance gap (variation or overall poor performance) across providers:** Within the 2004 Nationwide Inpatient Sample from the AHRQ Healthcare Cost and Utilization Project, there was a mortality rate of 8.44 per 100 eligible discharges.	**1b** **C**☐ **P**☐ **M**☐ **N**☐

1b.3 Citations for data on performance gap:
http://www.qualityindicators.ahrq.gov/downloads/iqi/iqi_provider_comparative_v31.pdf

1b.4 Summary of Data on disparities by population group:
Males: 7.17% Females:10.27%
Age 18-39 years: 2.24% 40-64 years: 3.41% 65-74 years: 7.81% 75+ years: 13.92%
Medicare: 11.39% Medicaid: 6.53% Other payor: 3.85%

• The overall AMI mortality rate was significantly higher for persons admitted to hospitals in noncore areas (94.1 per 1,000 admissions) than for persons living in large or small metropolitan areas (78.1 per 1,000 and 83.9 per 1,000 admissions, respectively; Figure 4.56).
• The overall rate was also significantly higher for persons admitted to hospitals in micropolitan areas than for persons living in large metropolitan areas (91.5 per 1,000 compared with 78.1 per 1,000 admissions).
• In large metropolitan areas, the AMI mortality rate was lower for Blacks than for Whites (71.5 per 1,000 compared with 79.0 per 1,000).
• In small metropolitan areas, the rate was lower for Blacks (74.4 per 1,000) but higher for APIs (97.4 per 1,000) and Hispanics (90.1 per 1,000) compared with Whites (83.7 per 1,000).
• In micropolitan areas, the rate was lower for APIs (79.4 per 1,000) and for Hispanics (74.5 per 1,000) than for Whites (92.5 per 1,000).
• In noncore areas, the rate was significantly higher for APIs than for Whites (169.9 per 1,000 compared with 93.5 per 1,000).

NOTE: API = Asian or Pacific Islander. White, Black, and API are non-Hispanic groups. Large metropolitan = metropolitan area >1 million inhabitants; small metropolitan = metropolitan area <1 million inhabitants; micropolitan = urban area >10,000 and <50,000 inhabitants; noncore = not metropolitan or micropolitan.

1b.5 Citations for data on Disparities:
http://www.qualityindicators.ahrq.gov/downloads/iqi/iqi_provider_comparative_v31.pdf

http://www.ahrq.gov/qual/nhdr07/nhdr07.pdf

1c. Outcome or Evidence to Support Measure Focus

1c.1 Relationship to Outcomes (*For non-outcome measures, briefly describe the relationship to desired outcome. For outcomes, describe why it is relevant to the target population*)**:** NA (This is an outcome measure).

1c.2-3. Type of Evidence: meta-analysis, randomized controlled trial, observational study

1c.4 Summary of Evidence (*as described in the criteria; for outcomes, summarize any evidence that healthcare services/care processes influence the outcome*)**:**
The literature provided below provide evidence that treatments impact mortality. This literature provides support for use of AMI mortality as a quality measure, but is not specific to the AHRQ Quality Indicator specification of AMI mortality. For this reason, all information is provided under section 1c.

Face validity.
Acute myocardial infarction (AMI) affects 1.5 million people each year and approximately one-third die in the acute phase of the heart attack.1 Many clinical and observational studies have been conducted showing processes of care linked to survival improvements. These research findings have resulted in detailed practice guidelines covering all phases of AMI management.2 Starting in 1992, the Health Care Financing Administration implemented a national initiative to gather data for quality improvement. The project, "the Cooperative Cardiovascular Project (CCP)," focuses on improving treatment of AMI patients.

Precision.
The precision of AMI mortality rate estimates may be problematic for medium and small hospitals. About 13% of AMI patients in the California Hospital Outcomes Project died during hospitalization, or within 30 days of admission.3 Since 19.5% of AMI patients were transferred from their initial hospital to another acute

1c
C☐
P☐
M☐
N☐

care facility, the percentage of deaths in an unlinked episode of care would have been somewhat less. In a study using the 1992 MedisGroups Comparative Database with 100 hospitals, mostly in Pennsylvania and the southern United States, the in-hospital mortality rate was 13.2% for AMI patients. In elderly Medicare AMI patients, 30-day mortality rates varied from 18% in Connecticut to 23% in Alabama.4 Although these outcome rates are high, the number of AMI patients varies widely across hospitals, based on the size and risk profile of each hospital's catchment area.

Minimum bias.
Starting in 1990, ICD-9-CM included a fifth digit for AMI codes to distinguish treatment during the "initial episode of care" from subsequent treatment related to the same AMI (within 8 weeks of the event). In studies comparing chart and administrative data since this time, the agreement in identification of new AMI cases has been shown to be at least 93%, and as high as 98%.3,5 The California Hospital Outcomes Project found that "unlikely" AMI patients had significantly higher mortality than patients with definite or possible AMI.3 However, there was no evidence of systematic bias across hospitals; high-mortality and low-mortality hospitals had similar proportions of "unlikely" AMI patients.
About 19.5% of AMI patients were transferred from the initial hospital to another acute care facility in the California Hospital Outcomes Project, and these transfer rates varied across hospitals.3 In studies using unlinked data, hospitals transferring a large proportion of their AMI patients may have lower death rates than hospitals that do not regularly transfer patients. A related bias results from the fact that many deaths related to AMI occur after hospital discharge, but within 30-days.6 Thus, as described below (under "Fosters True Quality Improvement"), hospitals with long mean length-of-stay (LOS) may appear to have higher mortality rates than hospitals with shorter mean LOS. Investigating hospital LOS and transfer rates in conjunction with AMI mortality may help resolve these concerns.

Risk adjustment.
Numerous studies have established the importance of risk adjustment for AMI patients. As a result, researchers have developed a number of risk adjustment models. Normand et al. developed and validated two models, one of which was based on conditions likely to be present on admission and therefore applicable to comparisons of hospital-based care.7 The claims-based model included 25 comorbidities not related to treatment. Hypertension (18.3%), diabetes (13.8%), and pulmonary disease (11.2%) were the most frequent comorbidities in an AMI Medicare cohort of 164,427 patients. Examples of frequent comorbidities that were considered possibly related to hospital treatment, and therefore omitted from their model, included congestive heart failure (33.9%), chronic angina (27.4%), and arrhythmias (25.2%). The same team developed another model using the clinical predictors available from the Cooperative Cardiovascular Project.7 From these and numerous other studies, the most important predictors of short-term AMI mortality have been shown to include age, previous AMI, tachycardia, pulmonary edema and other signs of congestive heart failure, hypotension and cardiogenic shock, anterior wall and Q-wave infarction, cardiac arrest, and serum creatinine or urea nitrogen. Fewer studies have addressed whether adjusting for potential complications as well as comorbidities, or adjusting only for predictors available from administrative data, leads to bias in comparisons across hospitals.
Krumholz et al. compared seven models including a newly developed 7-variable clinical/demographic risk adjustment model for 30-day mortality in AMI patients.8 The models based on clinical data demonstrated better discrimination and calibration than two models4 based on ICD-9-CM codes (area under the receiver operating curve 0.74-0.78 versus 0.70-0.71, respectively). In addition, the clinical models classified hospital performance somewhat differently than the models based on administrative data. Such differences were further explored by Iezzoni and colleagues, who used several proprietary products to estimate risk-adjusted AMI mortality, and found 40-60% disagreement in identifying the 10 best and 10 worst hospitals in a nationwide sample.9,10 Adding full clinical data to administrative data for risk-adjustment, Pine found that 73% of Cleveland hospitals' expected mortality rates changed by less than one standard deviation, and 100% changed by less than two.11 In St. Louis, 95% of hospitals' expected mortality rates changed by less than 0.5 standard deviations, and 100% changed by less than one. These estimates were better than those for other major medical conditions, including pneumonia, stroke, and congestive heart failure.12 In the California Hospital Outcomes Project, the addition of clinical risk factors to a re-estimated model based on re-abstracted ICD-9-CM codes had a minimal effect on the difference in risk-adjusted mortality between low-mortality and high-mortality hospitals, although individual hospitals were affected.3 In summary, these studies found that the method of risk-adjustment does affect which specific hospitals are identified as mortality outliers, but that the correlations within pairs of risk-adjusted or expected mortality rates are generally high (e.g., 0>0.80)13 to 0.94,12 and higher for AMI than for other medical conditions.

When risk adjustment models include ICD-9-CM conditions that may represent consequences of poor care, then discrimination is exaggerated.8 Romano and Chan compared an administrative data set to a re-abstraction of diagnoses present at admission, with two versions of the All Patient Refined-Diagnosis-Related Groups (APR-DRG), Risk of Mortality (ROM) and Severity of Illness (SOI).14 The authors showed empirically that APR-DRGs predicted 30-day mortality better when all diagnoses were included than when only diagnoses present at admission were included. Hospitals' expected mortality rates based on all re-abstracted ICD-9-CM codes were moderately correlated (r=0.72-0.77) with expected mortality rates based only on diagnoses present at admission. However, 2 of the 3 hospitals classified as having higher than expected mortality, 8 of the 23 hospitals classified as having neither higher nor lower than expected mortality, and 0 of the 4 hospitals classified as having lower than expected mortality, switched categories when diagnoses not present at admission were excluded from risk-adjustment.

Construct validity.
Numerous randomized controlled trials have conclusively demonstrated that early administration of aspirin and thrombolytic agents can reduce AMI mortality.15-19 Similarly, early revascularization by percutaneous coronary angioplasty reduces mortality in high-risk patients.20-22 Angiotensin converting enzyme inhibitors reduce mortality among post-infarction patients with impaired left ventricular function.23-25 Therefore, there is clear evidence at the patient level that specific processes of care improve patient outcomes. Furthermore, numerous studies based on large regional or national samples have shown substantial practice variation in AMI patients, with underutilization of clearly beneficial therapies and overutilization of harmful treatments.26-28
Over the last several years, substantial evidence for construct validity at the hospital level has emerged. In the first study of this type, Park et al. estimated the contribution of differences in severity of illness and quality of care to the classification of some hospitals as having unexpectedly high inpatient death rates (age and gender adjusted).29 Not unexpectedly, severity of illness (using chart data) accounted for some of the variation. However, a quality score derived from an explicit set of process measures did not explain differences between low-mortality and high-mortality hospitals. In fact, the relationship was in the opposite direction from the authors' expectation under several analysis scenarios.
More favorable evidence came from Meehan and colleagues, who evaluated coding accuracy, severity of illness, and process-based quality of care in Connecticut hospitals.5 Three process measures were selected by an expert panel based on medical literature and local practice patterns: 1) administration of thrombolytic therapy, 2) discharged on aspirin if no contraindication, and 3) discharged on a beta blocker if no contraindication. The hospitals with the highest risk-adjusted mortality had significantly lower utilization of beneficial therapies than the other hospitals in the sample. Although the Medicare Prospective Payment System Quality of Care study did not focus on specific therapeutic interventions, it also demonstrated significantly higher risk-adjusted mortality rates (using risk factors derived by chart review) among hospitals with "poor" processes of care than among hospitals with "good" or "medium" processes of care (30.1% versus 22.0% and 23.9%, respectively).30 Chen31 showed that the hospitals designated by US News and World Report as "America's Best Hospitals" in cardiology, based on risk-adjusted mortality (using APR-DRGs) and reputation among physicians, had lower risk-adjusted mortality (using clinical predictors) among Medicare patients (15.6% versus 18.3-18.6%) and used aspirin and beta blockers more often than hospitals that were not so designated. Similarly, major teaching hospitals in the same Medicare data set had 20% lower risk-adjusted 30-day mortality than nonteaching hospitals; about half of this difference was attributable to greater use of beneficial therapies.32 In the RAND PPS Quality of Care study in 1990, patients with higher process scale scores for AMI demonstrated significantly lower risk-adjusted 30-day AMI mortality on four out of five subscales and on an overall process scale.30 In another study, quality improvement interventions lowered the risk of in hospital death in patients with AMI about 40%.33 In the California Hospital Outcomes Project, hospitals with low risk-adjusted AMI mortality were more likely to give aspirin within 6 hours of arrival in the emergency room, more likely to perform cardiac catheterization and revascularization procedures within 24 hours, and more likely to give heparin to prevent thromboembolic complications. However, there were no differences between low and high-mortality hospitals in the use or timing of thrombolytic or beta blocker therapy.3
These somewhat conflicting findings may relate to the general insensitivity of mortality rates to process measures. Mant and Hicks conducted a systematic review of the literature to estimate the effect sizes for therapies proven effective for AMI patients, based on clinical trials and meta-analyses.34 The therapies assessed were beta blockade, aspirin, fibrinolysis, and angiotensin converting enzyme inhibitors. Using the best estimates of effect size and the proportion of patients eligible for treatment, the authors calculated the absolute risk reduction for low and high baseline mortality situations, with a resulting range of 5.1% to

16.4%. Given this range, they simulated the number of patients required to detect differences in care using either a "perfect system" for risk-adjusted mortality or a process-based quality of care audit. Using the same population of AMI patients, the difference in lives lost was detectable with one year of data collection on mortality or only two weeks of data collection on process of care.
In a recent study Chen et al. examined the association between JCAHO accreditation of hospitals and survival among Medicare patients with AMI. They found that hospitals accredited with commendation had lower 30-day mortality rates and compared with that 30-day mortality was higher for accredited hospitals and hospitals with recommendations.35 Also, risk adjusted mortality rates were lower for patients treated at higher- rated hospitals based on HealthGrade performance evaluation.36 Other studies found that AMI mortality was significantly lower in major teaching hospitals than in minor and non-teaching hospitals.32,37 Looking at the association between volume and outcome of AMI, researchers found that primary PTCA in high volume hospitals associated with lower AMI mortality.33,35,38-42

The widespread recognition of the exceptionally strong evidence base supporting specific processes of care for AMI patients has led to numerous professional guidelines, guideline implementation projects,43,44 and regional and national quality improvement initiatives. Through its Cooperative Cardiovascular Project and Sixth Scope of Work, the Health Care Financing Administration has focused considerable attention on improving processes of care for AMI, as a way to improve mortality and other outcomes. Hospitals in the four pilot states involved in this project (AL, CT, IA, WI) significantly improved their performance on each process indicator between 1992 and 1995, and simultaneously achieved a greater reduction in 30-day mortality (19.9% to 17.6%) than hospitals in other states (19.6% to 18.2%). This finding suggests, but does not prove, that hospitals can lower their AMI mortality rates by improving adherence to evidence-based guidelines.

Fosters true quality improvement.
In general, physicians and hospitals have little discretion in their decisions to admit AMI patients, so it seems unlikely that the use of this indicator would impede access to needed care. However, a few patients who fail to respond to, or are ineligible for, resuscitative efforts in the emergency room may not be admitted if there is pressure to reduce inpatient mortality. Although such practices might bias comparisons of risk-adjusted inpatient mortality across hospitals, they would be unlikely to compromise patient outcomes (as resuscitative measures that fail in an emergency room would also fail in a coronary care unit). It is conceivable that patients could be discharged early to die at home or in a nursing home, although this may be unlikely due to the acute nature of the condition. Patient transfers to other hospitals will also have a greater effect on inpatient mortality rates, as noted in the OSHPD study, because hospitals vary widely in their transfer rates. According to one study, double-counting patients has resulted in a significant overestimation in the incidence rate for hospitalization for AMI. Correction of this double counting reveals a significantly lower incidence rate and a higher in-hospital mortality rate for AMI.45 Typically, 30-day overall mortality rates and 30-day inpatient mortality rates have been considered more valid than inpatient mortality rates based only on the initial hospitalization for AMI. The rank correlation between standardized AMI mortality measures based on inpatient deaths and measures based on 30-day deaths (at the hospital level) was 0.79 in a study of Medicare data.46 This finding suggests that changes in length of stay may modestly alter the ranking of hospital performance using this measure.
In another study, the authors found that applying a broader definition of AMI reveals that in-hospital mortality is higher than believed until now. This study indicated that a high proportion of early occurring in-hospital death which –with conventional clinical definition- are usually not considered as AMI cases, are in fact due to an acute manifestation of coronary heart disease.47
Prior use.
Inpatient AMI mortality, based on administrative data, has recently been used as a hospital quality indicator by the University Hospital Consortium,48 the California Hospital Outcomes Project,49 HealthGrades.com,50 the Michigan Hospital Association (aggregated with congestive heart failure and angina),51 and the Greater New York Hospital Association.52 In addition, the following organizations have used this indicator with risk-adjustment based on clinical data obtained through review of medical records: the Pennsylvania Health Care Cost Containment Council53 and Cleveland Health Quality Choice.54 The Joint Commission for the Accreditation of HealthCare Organizations has adopted AMI mortality (from the MEDSTAT Corporation) as one of its core hospital performance measures.55 AMI mortality is also a High-Level Performance Indicator for the United Kingdom's National Health Service.56

1c.5 Rating of strength/quality of evidence (*also provide narrative description of the rating and by whom***):**
NA

1c.6 Method for rating evidence: NA

1c.7 Summary of Controversy/Contradictory Evidence: NA

1c.8 Citations for Evidence (*other than guidelines***):**

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1c.9 Quote the Specific guideline recommendation (*including guideline number and/or page number***):**
All included guidelines referenced below

1c.10 Clinical Practice Guideline Citation: • ACC/AHA 2007 guidelines for the management of patients with unstable angina/non–ST-elevation myocardial infarction—executive summary. 2007 Aug 14.

• Fesmire FM, Decker WW, Diercks DB, Ghaemmaghami CA, Nazarian D, Brady WJ, Hahn S, Jagoda AS, American College of Emergency Physicians. Clinical policy: critical issues in the evaluation and management of adult patients with non-ST-segment elevation acute coronary syndromes. Ann Emerg Med 2006 Sep;48(3):270-301. [115 references] PubMed

1c.11 National Guideline Clearinghouse or other URL:
http://www.guideline.gov/summary/summary.aspx?doc_id=11333&nbr=005906&string=infarction ,
http://www.guideline.gov/summary/summary.aspx?doc_id=9736&nbr=005210&string=Acute+AND+myocardial+AND+infarction

1c.12 Rating of strength of recommendation (*also provide narrative description of the rating and by whom***):**
Level B: Limited (2–3) population risk strata evaluated* and Level C: Very limited (1–2) population risk strata evaluated* From the ACC "A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Even though randomized trials are not available, there may be a very clear clinical consensus that a particular test or therapy is useful or effective."

1c.13 Method for rating strength of recommendation (*If different from* USPSTF system*, also describe rating and how it relates to USPSTF)***:** USPSTF system **1c.14 Rationale for using this guideline over others:** These guidelines support the indicator by providing actionable interventions to improve patient survival. These two guidelines are recent guidelines from national clinical organizations.	
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria **for** *Importance to Measure and Report?*	**1**
Steering Committee: Was the threshold criterion, *Importance to Measure and Report***, met?** **Rationale:**	**1** **Y☐** **N☐**
2. 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)	Eval Rating
2a. MEASURE SPECIFICATIONS	
S.1 Do you have a web page where current detailed measure specifications can be obtained? **S.2 If yes, provide web page URL:** **2a. Precisely Specified**	
2a.1 Numerator Statement (*Brief, text description of the numerator - what is being measured about the target population, e.g. target condition, event, or outcome***):** Number of inpatient deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator. **2a.2 Numerator Time Window (***The time period in which cases are eligible for inclusion in the numerator***):** During admission **2a.3 Numerator Details (***All information required to collect/calculate the numerator, including all codes, logic, and definitions***):** See above	
2a.4 Denominator Statement (*Brief, text description of the denominator - target population being measured***):** All discharges, age 18 years and older, with a principal diagnosis code of acute myocardial infarction. **2a.5 Target population gender:** Female, Male **2a.6 Target population age range:** Age 18 years and older **2a.7 Denominator Time Window (***The time period in which cases are eligible for inclusion in the denominator***):** The denominator time window is typically 12 months, but may be defined by the user. **2a.8 Denominator Details (***All information required to collect/calculate the denominator - the target population being measured - including all codes, logic, and definitions***):** ICD-9-CM Acute Myocardial Infarction (AMI) diagnosis code in the principal diagnosis code position: 41001 AMI of anterolateral wall, initial episode of care 41011 AMI of other anterior wall, initial episode of care 41021 AMI of inferolateral wall, initial episode of care 41031 AMI of inferoposterior wall, initial episode of care 41041 AMI of other inferior wall, initial episode of care	**2a-specs** **C☐** **P☐** **M☐** **N☐**

41051 AMI of other lateral wall, initial episode of care
41061 AMI, true posterior wall infarction, initial episode of care
41071 AMI, subendocardial infarction, initial episode of care
41081 AMI of other specified sites, initial episode of care
41091 AMI, unspecified site, initial episode of care

2a.9 Denominator Exclusions (*Brief text description of exclusions from the target population***):** Exclude cases:
• Missing discharge disposition (DISP=missing)
• Transferring to another short-term hospital (DISP=2)

2a.10 Denominator Exclusion Details (*All information required to collect exclusions to the denominator, including all codes, logic, and definitions***):**
See above

2a.11 Stratification Details/Variables (*All information required to stratify the measure including the stratification variables, all codes, logic, and definitions***):**
N/A

2a.12-13 Risk Adjustment Type: case-mix adjustment

2a.14 Risk Adjustment Methodology/Variables (*List risk adjustment variables and describe conceptual models, statistical models, or other aspects of model or method***):**
The risk adjustment model includes age, APR-DRG risk of mortality subclass, MDC and transfer in status. Specific follow:

Parameter	Label
Age	Under 40
Age	40 to 44
Age	45 to 49
Age	50 to 54
Age	55 to 59
Age	65 to 79
Age	80 to 84
Age	85+
APR-DRG	'1611' to'1612'
APR-DRG	'1613' to'1614'
APR-DRG	'1621' to'1622'
APR-DRG	'1623'
APR-DRG	'1624'
APR-DRG	'1651' to'1652'
APR-DRG	'1653'
APR-DRG	'1654'
APR-DRG	'1731' to'1734'
APR-DRG	'1742'
APR-DRG	'1743'
APR-DRG	'1744'
APR-DRG	'1901'
APR-DRG	'1902'
APR-DRG	'1903'
APR-DRG	'1904'
MDC	5
Transfer-in	TRNSFER

2a.15-17 Detailed risk model available Web page URL or attachment: URL
http://www.qualityindicators.ahrq.gov/iqi_download.htm

2a.18-19 Type of Score: rate/proportion
2a.20 Interpretation of Score: better quality = lower score
2a.21 Calculation Algorithm (*Describe the calculation of the measure as a flowchart or series of steps***):**
This indicator is expressed as a rate: the number of times an event occurs out of the number of persons at risk for that event. The Quality Indicators software identifies the numerator, the denominator and calculates an observed rate for the indicator. In addition to the observed rate, the software calculates an expected rate or the rate one would expect for hospitals with the same demographics and case mix, risk adjusted rate or the rate adjusted to reflect a typical case mix, and the statistical confidence intervals and smoothed rate. The software calculates Risk-adjusted and Expected Rates using a reference population that is an aggregation of 3 years of discharges (approximately 100 million records) from all of the states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID). See http://www.ahrq.gov/data/hcup/ for information on the HCUP SID. Risk-adjustment covariates and population rates for data that include Present on Admission values were calculated using three years of pooled SID data from California and New York. As additional states collect the POA indicator and provide the data to the HCUP program, the reference population will be updated in future AHRQ QI releases to include these states.

2a.22 Describe the method for discriminating performance *(e.g., significance testing)***:**
significance testing

2a.23 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)*:
The application of this indicator uses administrative data, all patients without sampling.

2a.24 Data Source (*Check the source(s) for which the measure is specified and tested)*
Electronic adminstrative data/claims

2a.25 Data source/data collection instrument (*Identify the specific data source/data collection instrument, e.g. name of database, clinical registry, collection instrument, etc.***):**
Hospital administrative discharge data

2a.26-28 Data source/data collection instrument reference web page URL or attachment: URL
http://www.qualityindicators.ahrq.gov/iqi_download.htm

2a.29-31 Data dictionary/code table web page URL or attachment: URL
http://www.qualityindicators.ahrq.gov/downloads/winqi/AHRQ_QI_Windows_Software_Documentation_V40.pdf , page 11, Table 3.1

2a.32-35 Level of Measurement/Analysis (*Check the level(s) for which the measure is specified and tested)*
Facility/Agency

2a.36-37 Care Settings (*Check the setting(s) for which the measure is specified and tested)*
Hospital

2a.38-41 Clinical Services (*Healthcare services being measured, check all that apply*)

TESTING/ANALYSIS

2b. Reliability testing

2b.1 Data/sample *(description of data/sample and size)***:** 1995-1997 Nationwide Inpatient Sample (NIS) and the complete State Inpatient Data (SID) for 5 HCUP participating states (California, Florida, Illinois, New York, and Pennsylvania).

2b.2 Analytic Method *(type of reliability & rationale, method for testing)***:**
The technique used for reliability testing on this indicator is signal extraction. This technique is designed to "clean" or "smooth" the data of noise, and extract the actual signal associated with provider or area performance. We used two techniques for signal extraction to potentially improve the precision of the

2b
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indicator. First, univariate methods estimated the "true" quality signal of an indicator based on information from the specific indicator and one year of data. Second, new multivariate signal extraction (MSX) methods estimated the signal based on information from a set of indicators and multiple years of data. In most cases, MSX methods extract additional signal. 2b.3 **Testing Results** *(reliability statistics, assessment of adequacy in the context of norms for the test conducted)*: The reliability testing was completed during the original development of the indicator. The indicator demonstrated high variation between hospitals and adequate signal to qualify as an AHRQ quality indicator. The testing results follow: Mean = 0.244, Standard Deviation = 0.161; Std. Dev. (High; 3.0-7.9%) Share (Moderate; Less than 1.0%) Ratio (Moderate; 40.0-70.0%) R-square (Moderate)	
2c. Validity testing 2c.1 **Data/sample** *(description of data/sample and size)*: No additional validity testing conducted. See "Citations for Evidence" under "Evidence-Based (Measure evaluation criterion 1c)". 2c.2 **Analytic Method** *(type of validity & rationale, method for testing)*: See "Citations for Evidence" under "Evidence-Based (Measure evaluation criterion 1c)". 2c.3 **Testing Results** *(statistical results, assessment of adequacy in the context of norms for the test conducted)*: See "Citations for Evidence" under "Evidence-Based (Measure evaluation criterion 1c)".	**2c** C☐ P☐ M☐ N☐
2d. Exclusions Justified 2d.1 **Summary of Evidence supporting exclusion(s):** The only exclusions are for those patients for which we do not know their mortality outcome due to missing discharge disposition or transfer. No testing was conducted. 2d.2 **Citations for Evidence:** The only exclusions are for those patients for which we do not know their mortality outcome due to missing discharge disposition or transfer. No testing was conducted. 2d.3 **Data/sample** *(description of data/sample and size)*: The only exclusions are for those patients for which we do not know their mortality outcome due to missing discharge disposition or transfer. No testing was conducted. 2d.4 **Analytic Method** *(type analysis & rationale)*: The only exclusions are for those patients for which we do not know their mortality outcome due to missing discharge disposition or transfer. No testing was conducted. 2d.5 **Testing Results** *(e.g., frequency, variability, sensitivity analyses)*: The only exclusions are for those patients for which we do not know their mortality outcome due to missing discharge disposition or transfer. No testing was conducted.	**2d** C☐ P☐ M☐ N☐ NA☐
2e. Risk Adjustment for Outcomes/ Resource Use Measures 2e.1 **Data/sample** *(description of data/sample and size)*: 2007 State Inpatient Databases 2e.2 **Analytic Method** *(type of risk adjustment, analysis, & rationale)*: Adjustments were made for age, 3M™ All Patient Refined Diagnosis Related Groups (APR-DRGs) risk of mortality subclass, MDC and transfer in status using the regression-based standardization that is part of the AHRQ IQI software.	**2e** C☐ P☐ M☐ N☐ NA☐

Details regarding the development of this model can be found at: http://www.qualityindicators.ahrq.gov/downloads/technical/qi_technical_review.zip, in Section 2D and 3C. This model is updated yearly based on the most recent Statewide Inpatient Databases (SID) available. We update the C statistic annually. No additional testing is available. **2e.3 Testing Results** *(risk model performance metrics)*: C-statistic = 0.840 **2e.4 If outcome or resource use measure is not risk adjusted, provide rationale:** NA	
2f. Identification of Meaningful Differences in Performance **2f.1 Data/sample from Testing or Current Use** *(description of data/sample and size)*: 2003-2005 Nationwide Inpatient Sample (NIS) **2f.2 Methods to identify statistically significant and practically/meaningfully differences in performance** *(type of analysis & rationale)*: We calculated the variation between hospitals for risk adjusted mortality rates to determine differences in performance. **2f.3 Provide Measure Scores from Testing or Current Use** *(description of scores, e.g., distribution by quartile, mean, median, SD, etc.; identification of statistically significant and meaningfully differences in performance)*: Notable variation exists between hospitals on the performance of this measure (N=2,042): observed score (mean = 0.1526, Standard Deviation (SD) = 0.1503), expected score (mean = 0.0082, SD = 0.0006), risk-adjusted score (mean = 1.6271, SD = 1.5995), smoothed score (mean = 1.740, SD = 0.7818). See section on the Calculation Algorithm for more details on the calculation of these scores.	**2f** C☐ P☐ M☐ N☐
2g. Comparability of Multiple Data Sources/Methods **2g.1 Data/sample** *(description of data/sample and size)*: NA. There is only one data source. **2g.2 Analytic Method** *(type of analysis & rationale)*: NA. There is only one data source. **2g.3 Testing Results** *(e.g., correlation statistics, comparison of rankings)*: NA. There is only one data source.	**2g** C☐ P☐ M☐ N☐ NA☐
2h. Disparities in Care **2h.1 If measure is stratified, provide stratified results** *(scores by stratified categories/cohorts)*: Males: 7.17% Females:10.27% Age 18-39 years: 2.24% 40-64 years: 3.41% 65-74 years: 7.81% 75+ years: 13.92% Medicare: 11.39% Medicaid: 6.53% Other payor: 3.85% **2h.2 If disparities have been reported/identified, but measure is not specified to detect disparities, provide follow-up plans:** Disparities in outcomes summarized in Opportunity for Improvement (Measure evaluation criterion 1b).	**2h** C☐ P☐ M☐ N☐ NA☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria **for** *Scientific Acceptability of Measure Properties*?	**2**
Steering Committee: Overall, to what extent was the criterion, *Scientific Acceptability of Measure Properties*, **met?** **Rationale:**	*2* C☐ P☐ M☐ N☐

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)	Eval Rating
3a. Meaningful, Understandable, and Useful Information **3a.1 Current Use:** in use **3a.2 Use in a public reporting initiative (disclosure of performance results to the public at large)** (*If used in a public reporting initiative, provide name of initiative(s), locations, Web page URL(s). If not publicly reported, state the plans to achieve public reporting within 3 years*)**:** Transparency initiatives utilizing the AMI Mortality measure are currently active through the following known public reports: 1) Kentucky Cabinet for Health and Family Services (see http://chfs.ky.gov/ohp/healthdata/IQI.htm), 2) Maine Health Data Organization (see http://www.healthweb.maine.gov/quality/reports/OutputOnlyIQIs_Maine_US_NE_2001_2003.pdf), 3) Office of Health Care Quality Assessment, New Jersey Department of Health and Senior Services (see http://www.state.nj.us/health/healthcarequality/documents/iqi2003.pdf), 4) Office for Oregon Health Policy and Research (see http://www.oregon.gov/OHPPR/HQ/), 5) Florida Agency for Health Care Administration (see ahca.myflorida.com), 6) Wisconsin Hospitals Accountable for Transparency (see www.whainfocenter.com/data_resources/2003_QI_Report.pdf), 7) Commonwealth of Massachusetts Health Care Quality and Cost Council (see http://www.mass.gov/healthcareqc), 8) My Health Finder (hospitals in the State of New York) (see http://www.myhealthfinder.com/) 9) Texas Department of State Health Services (see http://www.dshs.state.tx.us/THCIC/Publications/Hospitals/IQIReport/IQIReport.shtm) **3a.3 If used in other programs/initiatives (***If used in quality improvement or other programs/initiatives, name of initiative(s), locations, Web page URL(s). If not used for QI, state the plans to achieve use for QI within 3 years***):** 1) University Healthcare Consortium - An alliance of 103 academic medical centers and 219 of their affiliated hospitals. Reporting the AHRQ QIs to their member hospitals. (see www.uhc.edu. Note: measure results reported to hospitals; not reported on site). 2) Dallas Fort Worth Hospital Council – Reporting on measure results to over 70 hospitals in Texas (see www.dfwhc.ord. Note: measure results reported to hospitals; not reported on site). 3) Norton Healthcare - a multi-hospital system in Kentucky (see http://www.nortonhealthcare.com/about/Our_Performance/index.aspx) 4) Ministry Health Care - a multi-hospital system in Wisconsin (see http://ministryhealth.org/display/router.aspx. Note: measure results reported to hospitals; not reported on site). **Testing of Interpretability** (*Testing that demonstrates the results are understood by the potential users for public reporting and quality improvement*) **3a.4 Data/sample** *(description of data/sample and size)***:** A research team from the School of Public Affairs,	**3a** **C**☐ **P**☐ **M**☐ **N**☐

Baruch College, under contracts with the Department of Public Health, Weill Medical College and Battelle, Inc., has developed a pair of Hospital Quality Model Reports at the request of the Agency for Healthcare Research & Quality (AHRQ). The AHRQ AMI mortality measure is included in the reports. These reports are designed specifically to report comparative information on hospital performance based on the AHRQ Quality Indicators (QIs). The work was done in close collaboration with AHRQ staff and the AHRQ Quality Indicators team. 3a.5 **Methods** *(e.g., focus group, survey, QI project)*: The Model Reports (discussed immediately above) are based on: • Extensive search and analysis of the literature on hospital quality measurement and reporting, as well as public reporting on health care quality more broadly; • Interviews with quality measurement and reporting experts, purchasers, staff of purchasing coalitions, and executives of integrated health care delivery systems who are responsible for quality in their facilities; • Two focus groups with chief medical officers of hospitals and/or systems and two focus groups with quality managers from a broad mix of hospitals; • Four focus groups with members of the public who had recently experienced a hospital admission; and • Four rounds of cognitive interviews (a total of 62 interviews) to test draft versions of the two Model Reports with members of the public with recent hospital experience, basic computer literacy but widely varying levels of education. 3a.6 **Results** *(qualitative and/or quantitative results and conclusions)*: Given the above review of the literature and original research that was conducted, a Model report was the result that could help sponsors use the best evidence on public reports so they are most likely to have the desired effects on quality.	
3b/3c. Relation to other NQF-endorsed measures 3b.1 **NQF # and Title of similar or related measures:** NQF# 0161, entitled: AMI inpatient mortality (risk-adjusted). This measure was endorsed May 09, 2007. The measure steward, The Joint Commission, described this measure thus: Percentage of acute myocardial infarction (AMI) patients who expired during hospital stay. The current proposed measure includes transfers into an admitting institution unlike the exclusion contained in the previous measure stewarded by The Joint Commission.	
(for NQF staff use) **Notes on similar/related endorsed or submitted measures:**	
3b. Harmonization If this measure is related to measure(s) already endorsed by NQF (e.g., same topic, but different target population/setting/data source or different topic but same target population): 3b.2 **Are the measure specifications harmonized? If not, why?** The major differences between NQF#0161 and the proposed measure are 1) the proposed indicator includes transfer in patients while NQF#0161 excludes all transfers and 2) the proposed indicator uses APR-DRG, age and gender risk adjustment, while NQF #0161 uses a risk adjustment system designed for that indicator.	**3b** **C**☐ **P**☐ **M**☐ **N**☐ **NA**☐
3c. Distinctive or Additive Value 3c.1 **Describe the distinctive, improved, or additive value this measure provides to existing NQF-endorsed measures:** AHRQ will continue to maintain this measure and update it yearly. Further, in this measure transfer patients are not lost, which is useful for certain evaluations of quality care. 5.1 **Competing Measures If this measure is similar to measure(s) already endorsed by NQF (i.e., on the same topic and the same target population), describe why it is a more valid or efficient way to measure quality:**	**3c** **C**☐ **P**☐ **M**☐ **N**☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria **for** *Usability*?	**3**
Steering Committee: Overall, to what extent was the criterion, *Usability*, **met?**	**3**

Rationale:	**C☐ P☐ M☐ N☐**
4. FEASIBILITY	
Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement. (evaluation criteria)	Eval Rating
4a. Data Generated as a Byproduct of Care Processes 4a.1-2 **How are the data elements that are needed to compute measure scores generated?** coding/abstraction performed by someone other than person obtaining original information,	**4a** **C☐ P☐ M☐ N☐**
4b. Electronic Sources 4b.1 **Are all the data elements available electronically?** (*elements that are needed to compute measure scores are in defined, computer-readable fields, e.g., electronic health record, electronic claims*) Yes 4b.2 **If not, specify the near-term path to achieve electronic capture by most providers.**	**4b** **C☐ P☐ M☐ N☐**
4c. Exclusions 4c.1 **Do the specified exclusions require additional data sources beyond what is required for the numerator and denominator specifications?** No 4c.2 **If yes, provide justification.**	**4c** **C☐ P☐ M☐ N☐ NA☐**
4d. Susceptibility to Inaccuracies, Errors, or Unintended Consequences 4d.1 **Identify susceptibility to inaccuracies, errors, or unintended consequences of the measure and describe how these potential problems could be audited. If audited, provide results.** Mortality is a distinct outcome and is rarely miscoded.	**4d** **C☐ P☐ M☐ N☐**
4e. Data Collection Strategy/Implementation 4e.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/frequency of data collection, patient confidentiality, time/cost of data collection, other feasibility/ implementation issues:** This issues involved in data collection for this measure are standard for all administrative based data indicators. For hospitals missing present on admission data, we have imputed covariates for risk adjustment purposes. 4e.2 **Costs to implement the measure** (*costs of data collection, fees associated with proprietary measures*)**:** Since this measure is based on electronic administrative data, the cost of implementation is minimal. 4e.3 **Evidence for costs:** Software to compute the measure is provided at no charge from AHRQ. Cost to obtain electronic data sets varies state by state. 4e.4 **Business case documentation:** We have no business case documentation.	**4e** **C☐ P☐ M☐ N☐**
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria **for** *Feasibility?*	**4**

Steering Committee: Overall, to what extent was the criterion, *Feasibility*, met? **Rationale:**	**4** **C☐** **P☐** **M☐** **N☐**
RECOMMENDATION	
(for NQF staff use) **Check if measure is untested and only eligible for time-limited endorsement.**	**Time-limited ☐**
Steering Committee: Do you recommend for endorsement? **Comments:**	**Y☐** **N☐** **A☐**

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner)
Co.1 Organization
Agency for Healthcare Research and Quality | 540 Gaither Road | Rockville | Maryland | 20850

Co.2 Point of Contact
John | Bott, MSSW, MBA | john.bott@ahrq.hhs.gov | 301-427-1317

Measure Developer If different from Measure Steward
Co.3 Organization
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Co.4 Point of Contact
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Co.5 Submitter If different from Measure Steward POC
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Co.6 Additional organizations that sponsored/participated in measure development

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.
The Agency for Healthcare Research and Quality (AHRQ) has developed an array of health care decision making and research tools that can be used by various audiences such as health care professionals, purchasers, consumers, researchers, government agencies and others. One of these tools, the AHRQ Quality Indicators (QIs), are widely used to highlight potential quality concerns, identify areas that need further study and investigation, and track changes over time.

The AHRQ QIs were initially designed for quality tracking and improvement and have been extensively used for these purposes. While the focus of the initial measure development work was not on hospital-level comparative reporting or other uses of the measures for purchasing, the increased demand for standardized hospital-level comparative data in a time of growing quality concerns has led to their adaptation and adoption for these purposes.

Ad.2 If adapted, provide name of original measure: NA
Ad.3-5 If adapted, provide original specifications URL or attachment

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.6 Year the measure was first released: 2003
Ad.7 Month and Year of most recent revision: 2009-05
Ad.8 What is your frequency for review/update of this measure? Annually
Ad.9 When is the next scheduled review/update for this measure? 2010-05

Ad.10 Copyright statement/disclaimers: The AHRQ QI software is publicly available. We have no copyright disclaimers. APR-DRGs used in the risk adjustment are also available as an integrated part of the software.
Ad.11 -13 Additional Information web page URL or attachment:
Date of Submission (*MM/DD/YY*)**:** 11/10/2009