NATIONAL QUALITY FORUM

National Voluntary Consensus Standards for Patient Outcomes
Measure Summary

Measure number: OT1-006-09

Measure name: 30-day post-hospital HF discharge emergency department visit measure

Description: This measure estimates the percentage of eligible Medicare hospital discharges with a diagnosis of heart failure(HF) and evidence of an emergency department (ED) visit within 30-days of discharge and prior to a readmission.

Numerator statement: The numerator is the number of eligible hospital discharges with a discharge diagnosis of heart failure in the target population for which there is evidence of an ED visit within 30-days of hospital discharge and prior to a readmission.

Denominator statement: The total hospital discharges among Medicare fee-for-service beneficiaries 65 years of age and older during the measurement time-frame with a hospital discharge for HF.

Level of Analysis: Population: national

Type of Measure: Outcome

Data Source: Electronic adminstrative data/claims

Measure developer: Brandeis University/CMS

Type of Endorsement (full or time-limited): Recommended for endorsement as part of a composite (Steering Committee—March 24, 2010 [Recommend as a stand-alone measure—8; Recommend as part of the composite only—9; Do not recommend—1])

Summary table of TAP ratings of sub criteria and comments:

IMPORTANCE TO MEASURE AND REPORT		
1a. Impact	Completely	1a—High impact. 1b—Opportunity for unrelated visits unclear. 1c—The non-specific nature of the visits may be unrelated to the AMI; confounded by relationships between the private physicians and hospital staffs on use of the ED versus other venues; NQF has already endorsed the 30-day readmission rate—will the ED visit add anything? The measure will capture colds and other minor ailments particularly in locations where the ED is used as a primary care source. Would like to see data on reasons for ED visits. Validity is reduced in areas where the ED is used in place of a primary care.
1b. Gap	Partially	
1c. Relation to outcomes	Partially/ Minimally	
SCIENTIFIC ACCEPTABILTY		
2a. Specs	Completely	2a—The measure is well-specified using administrative data;

2b. Reliability	Completely	question of how patients who die within the 30-day window are handled? 2b—Reliability testing—correlation coefficient satisfactory. 2c —Validity testing—no date. 2d—Exclusions OK. 2e—The c-statistic of the model is low at 0.53—low c-stat suggests there is much variability not accounted for in the model [measure developers comment—the risk model and the statistics are similar to the endorsed 30-day post-AMI readmission measure]. 2f—Narrow spread of differences among hospitals—not much variation to identify meaningful differences; What about palliative care?—included in the denominator.
2c. Validity	Minimally	
2d. Exclusions	Partially	
2e. Risk adjustment	Partially	
2f. Meaningful differences	Partially	
2g. Comparability	Not applicable	
2h. Disparities	Not applicable	
USEABILITY		
3a. Distinctive	Not at all	3a—No testing. 3b—Measure is harmonized with endorsed 30-day readmission and mortality measures. 3c—No data to support adding meaningful information distinct from the readmission or E&M measures ; some concerns about actionability; concerns as an isolated measures—may need others for context.
3b. Harmonization	Completely	
3c. Added value	Minimally	
FEASIBILITY		
4a. Data a byproduct of care	Completely	4a—Measures constructed with administrative data— expect high feasibility.
4b. Electronic	Completely	
4c. Exclusions	Completely	
4d. Inaccuracies/errors	Completely	
4e. Implementation	Completely	

Measure Developer Responses:

Topic, Measure # and Title	Follow-Up Issues
Topic Area: AMI	**Questions/Conditions for Measure Developer:** 1. What are the reasons for the ED visit? Is there variation in the reasons

Topic, Measure # and Title	Follow-Up Issues
Measure# OT1-006-09 **Title:** 30-day post-hospital HF discharge emergency department visit	among hospitals? 2. Address and clarify why these measures did not address measuring disparities. **Response from Measure Developer:** 1. For the years 2004 through 2007, 27 to 30 percent of ED visits following a principal discharge diagnosis of HF were for cardiopulmonary diagnoses (ICD9 = 786.xx, 428.xx, 427.xx), six percent were related to the general category of altered consciousness (ICD9 = 780.xx), and three percent were for UTIs (ICD9 = 599.xx). The attached spreadsheet (ED VisitICD9-5_NQF.xls) reports the diagnoses (5-digit ICD9 codes) constituting 50 percent of all ED-visit diagnoses following a hospital discharge for HF. ED visit diagnoses post HF discharge can vary for individual hospitals. Examples of a few hospitals are shown in the attached document (ED Visit_ICD9_Individual Providers_2006.xls). 2. This measure had not been evaluated prior to submission. Our recent evaluation of the proposed measure has demonstrated that performance on the composite measure is not systematically related to race (i.e., Black, White, Hispanic) among Medicare beneficiaries.

Summary Table of SC Ratings of Subcriteria and Comments:

IMPORTANCE TO MEASURE AND REPORT	
The Cardiovascular TAP identified the biggest concern with these measures is the wide variety of reasons patients seek care in the ED. Use of the ED varies by local conditions such as availability of primary care and the relationship between clinicians and the ED particularly after hours. Many ED visits would not have any relationship to the antecedent hospitalization so the data for "all cause" ED visits is very noisy and not necessarily specific to AMI or heart failure. The committee discussed other aspects of ED care that contribute to noisiness including: o use of 23hr 59 min ED stays to avoid admission; and o patients may take themselves to the ER, as a	SC Vote on Importance Yes—17 No—1

preference to be seen immediately.	
SCIENTIFIC ACCEPTABILITY	
The Committee noted that these measures are specified for Medicare only. The Committee urged the developers to broaden the applicability of the measure to all populations. The Committee also suggested stratifying by co-morbidities.	SC vote on Scientific Acceptability Completely—7 Partially—10 Minimally—1 Not at all—0
USABILITY	
A Committee member noted that the hierarchal model allows smaller hospitals to be closer to the mean; the small hospitals will never show up as worse than average The developer noted that their primary goal had been to produce a composite of care trajectories. The same methodology was used in all three components (readmission, ED visits, and E&M service). The measures speak to each other and there are different ways to dampen the noise aside from shrinkage.	SC Vote on Usability Completely—8 Partially—9 Minimally—1 Not at all—0
FEASIBILITY	
The Committee asked the developer to clarify that the measure could be applied to other than Medicare populations.	SC Vote on Feasibility Completely—12 Partially—5 Minimally—1 Not at all—0

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Summary Table of Biostatistical Review:

Type of Risk Model:
RISK FACTORS Are the risk factors clearly identified in the submission information? *YES*
Does the model include risk factors associated with differences/inequalities with care such as race, socioeconomic status or gender? *NO*
Are the conceptual and quantitative criteria for inclusion or exclusion or combining of risk factors explained and appropriate? *Somewhat. Risk factors were selected based on the NQF endorsed .HF readmission measure. The discrimination & fit of this model was compared to a larger model that included codes for a large number of risk factors. Although the larger model had higher discrimination, the developers felt the difference in performance was not large enough to prefer the larger model.*
Is quantitative assessment of the relative contribution of the model components described in detail? *No, but estimated regression coefficients are provided along with t-test statistics.*
Does the measure have exclusions that influence outcomes that should be included as risk factors? *NO*
Comments on risk factors: *Risk factors were chosen based on a model for a similar endpoint (readmission) in the same target population. This approach seems reasonable, provided there is strong prior belief that the same risk factors apply to both endpoints. An alternative approach would be to start with covariates from the readmission model and test whether any individual risk factors should be added. The developers demonstrated that a model with all possible CC codes has marginally better discrimination (0.539 vs. 0.528). This was not a large enough difference to justify the larger number of covariates. If an intermediate size model could achieve most of the improvement, then perhaps an intermediate size model would be warranted. Even a small improvement in discrimination may be important for enhancing acceptance by stakeholders.*
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. The model fit was tested in the same sample that was used for estimating regression coefficients and hospital-specific random effects. This approach may be acceptable provided that uncertainty in the estimation of the regression coefficients is incorporated into the confidence interval calculations. Cross-validation is more crucial when performance estimates are calculated in a manner that ignores uncertainty in the estimation of regression parameters.* Is there information on independent, external validation of the model in another data set? *NO* Are the results supportive of a valid model? *N/A*
RISK MODEL PERFORMANCE (2e)

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DISCRIMINATION: *C = 0.528*
Does the statistic support good discrimination? *NO*

CALIBRATION: Is a calibration curve included? *NO*
Is a risk decile plot included? *NO*
Hosmer-Lemeshow statistic: *NO*
Does the data support good model calibration? *Unable to assess. Developers provided distribution of Pearson residuals in categories of less than -2, -2 to 0, 0 to 2, 2+. I was not sure how the results should be interpreted. A comparison of observed vs. expected event rates would be helpful.*

Comments on Risk Model Performance:

With such low discrimination, it is important to consider whether any potential confounder variables may have been omitted. If there is agreement that the choice of risk factors is appropriate, then low discrimination does not automatically render a measure invalid. (This is my position; others may disagree.) Information about model calibration is needed.

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

Information not provided. Risk adjustment uses same data and variables as previously endorsed readmission model. Would be desirable to provide some validation of algorithm for identifying E&M visits in claims data.

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

Not directly. The developers provided estimates of intra-hospital correlation coefficients (ICCs). This information is relevant but does not directly assess reliability (signal-to-noise ratio) of the hospital-level estimates. The ICCs provide information about patient-level variation, whereas we require information about the properties of the hospital-level estimates. These depend in part on the number of patients per hospital. (Whereas the ICCs do not depend on the hospital-specific sample sizes.)

Information about signal variation in performance estimates can be gleaned from the distribution of the point P/E point estimates. Since these are shrunken estimates, wide variation in the P/E would imply evidence of high signal variation. The observed variation (5.9 percent at 5th percentile to 10.7 percent at 95th percentile) strikes me as substantial variation. It is not clear what proportion of hospitals have large enough sample size to reliably estimate and detect this amount of signal variation.

Has a sensitivity analysis been performed for problem or missing data? *Not reported.*
Does the data demonstrate that the risk model is reliable? *N/A*
Comments on reliability testing:

Validity testing (2c):

Is validity testing of the measure to demonstrate results can be used to make conclusions about quality provided?

No. Developers argue that ED visit measure has intrinsic validity as an outcome of care coordination.

Are the results supportive of a valid measure? *N/A*

Comments on validity testing:

Scoring Method Justification (2f):

Is the choice of method for computing risk-adjusted scores and identifying statistically significant differences justified? *Information not provided.*

Comments on scoring methods:

The developers propose to rank the P/E estimates. The ranks may be converted to star ratings based on quintiles. Such rankings are likely to be unreliable (given the small sample sizes) and may exaggerate the true differences between hospitals. For the majority of hospitals, there may be no statistical evidence of differential performance, but their percentile ranking may differ substantially.

Summary comments:

See attached.

Reviewer:

Sean O'Brien, PhD

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**	**NQF Project:** Patient Outcomes Measures: Phases I and II
MEASURE DESCRIPTIVE INFORMATION	
De.1 **Measure Title:** 30-day Post-hospital HF Discharge Emergency Department visit rate	
De.2 **Brief description of measure***:* This measure estimates the percentage of eligible Medicare hospital discharges with a diagnosis of Heart Failure (HF) and evidence of an Emergency Department (ED) visit within 30-days of discharge and prior to a readmission.	
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 proposed measure is one of three components in a proposed composite measure, 30-day Post-hospital HF Discharge Care Transition measure, submitted under the Patient Outcomes Measures Phase I project's call for measures.	
De.4 **National Priority Partners Priority Area:** care coordination De.5 **IOM Quality Domain**: efficiency De.6 **Consumer Care Need:** Living With Illness	

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.2 **Indicate if Proprietary Measure** (*as defined in measure steward agreement*)**:**	**A** **Y☒** **N☐**

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 Accountability	**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.1**Testing:** 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:** a leading cause of morbidity/mortality, affects large numbers, severity of illness, high resource use 1a.2 1a.3 **Summary of Evidence of High Impact:** Heart failure (HF) is the most common principal discharge diagnosis among Medicare beneficiaries and the diagnosis with the highest readmission rate (Jencks et al, 2009). Treatment for HF has huge cost implications for our national health system with estimated inpatient costs as high as $23.1 billion annually (Peacock, 2005). As a progressive, chronic condition ongoing management is critical in minimizing acute exacerbations requiring high cost hospitalizations. Patients' recognition of early warning signs, the knowledge and skill of effective self-management processes, a comprehensible and doable treatment plan, and a relationship with a primary care physician provide the tools to encourage appropriate utilization of health care resources given HF (Friedman and Quinn, 2008). Ideally, effective integrated outpatient medical care would avert an Emergency Department visit following a hospitalization. Moreover, this measure examines the primary outcomes of interest in intervention studies aimed at improving transitions across care settings, comprehensive and effective discharge planning, and coordination of care (Braunstein,2003; Coleman,2006; Friedman,2008; MedPac,2007; Naylor,2004; Phillips,2004; Rich,10995). As a progressive disorder the frequency of recidivism is high in HF; 79% present to the ED with known diagnosis of HF and 80% of HF presentations in the ED result in hospitalization (Peacock, 2005).	**1a** C☐ P☒ M☐ N☐

1a.4 Citations for Evidence of High Impact: 1. 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.
2. Peacock FW: Using the Emergency Department Clinical Decision Unit for Acute Decompensated Heart Failure. Cardiol Clin 2005; 23:569-588
3. Friedman MM, Quinn JR: Heart failure patients' time, symptoms, and actions before a hospital admission. J Cardiovasc Nurs 2008; 23(6): 506-12.
4. Braunstein JB, Anderson GF, Gerstenblith G, et al.: Noncardiac comorbidity increases preventable hospitalizations and mortality among Medicare beneficiaries with chronic heart failure. J Am Coll Cardiol 2003; 42(7): 1226-33.
5. Coleman EA, Parry C, Chalmers S, Min SJ: The care transitions intervention: results of a randomized controlled trial. Arch Intern Med 2006; 166(17): 1822-8.
6. MedPac: Promoting Greater Efficiency in Medicare. Medicare Payment Advisory Commission, 2007.
7. Naylor MD, Brooten DA, Campbell RL, Maislin G, McCauley KM, Schwartz JS: Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial. J Am Geriatr Soc 2004; 52(5): 675-84.
8. 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(11): 1358-67.
9. Rich MW, Beckham V, Wittenberg C, Leven CL, Freedland KE, Carney RM: A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. N Engl J Med 1995; 333(18): 1190-5.

1b. Opportunity for Improvement

1b.1 Benefits (improvements in quality) envisioned by use of this measure: This ED measure will promote effective discharge planning that ensures the continuity of treatment following an acute hospitalization avoiding a potentially preventable ED visit within 30-days of discharge. While all ED visits may not be related to the discharge diagnosis or be preventable measuring ED visits within 30-days of hospital discharge establishes performance benchmarks for providers. Measuring ED visits also would serve to protect against hospitals using the ED visit as an offset to the measured hospital 30-day readmission.

1b.2 Summary of data demonstrating performance gap (variation or overall poor performance) across providers:
Our literature search failed to identify evidence of poor performance for an Emergency Department (ED) visit rate as tied to a discharge diagnosis of HF. Studies of the ED utilization by the elderly have found that the majority have chronic conditions with complex needs (Aminzadeh, 2002; Palmer et al, 2003). Variation in care - cost, hospitalizations, readmissions - among Medicare beneficiaries has been well documented by the Dartmouth team and presumably exists for this measure as well. Our own testing of the proposed ED measure demonstrated wide variation across hospitals. Variation in the intensity of services provided – cost, hospitalizations, readmissions – has been researched for decades. Benchmarks are needed of relatively efficient providers and actionable feedback to providers for behaviors to be modified.

1b.3 Citations for data on performance gap:
N/A

1b.4 Summary of Data on disparities by population group:
N/A

1b.5 Citations for data on Disparities:
NA

1b
C☒
P☐
M☐
N☐

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*)**:** An ED visit without evidence of an E&M service following discharge from the hospital for HF potentially indicates the failure of an effective care transition from a high-intensity, closely monitored environment (the hospital), to home with outpatient medical support. The ED visit rate is a common outcome measure of programs designed to

1c
C☐
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improve care transitions and improve the self-management of chronic conditions such as heart failure (Berg, Wadhwa, & Johnson, 2004; Chiu & Newcomer, 2007; Feldman et al., 2004; Hershberger et al., 2005; Martineau, Frenette, Blais, & Sauve, 2004; Morcillo et al., 2005; Riegel, Naylor, Stewart, McMurray, & Rich, 2004; Schwarz, Mion, Hudock, & Litman, 2008; Tsuyuki et al., 2004) . An ED visit measure within 30-days of hospital discharge constitutes the outcome to measure the effectiveness of uniquely designed interventions to address system-identified deficiencies in care transitions following hospital discharge among the elderly.

NQF has identified transitions or "hand-offs" as the fifth domain in their definition and framework for measuring care coordination. Transitions between care settings involve multiple providers and often compromised patients with complex needs resulting in care that is often unsafe, disconnected, and uncoordinated. Experts agree that breakdown in medical information occurs frequently during transitions between care settings, especially hospital to home.

An ED visit as specified is less resource intense than a hospital readmission, however if it occurs prior to an E&M service following hospital discharge it indicates a failure in the transition process. As heart failure is a chronic, progressive disease ongoing monitoring is critical to optimize treatment value for this condition. A patient requiring ED care following discharge did not have a successful transition from hospital to home. Within this context, the ED visit is the outcome desired and "care coordination" is the unobserved process/structure construct. Changing these post-hospital care trajectories signifies the attainment or improvement achieved via intermediate process steps initiated by hospital/provider systems.

1c.2-3. Type of Evidence: expert opinion

1c.4 Summary of Evidence (*as described in the criteria; for outcomes, summarize any evidence that healthcare services/care processes influence the outcome*)**:**
We posit that measurement of an ED visit following discharge from the hospital with HF is an outcome measure. As specified relative to E&M follow-up this measure reflects the latent construct of poor care coordination or the lack of an optimal care transition plan that resulted in an ED visit. As presented earlier numerous intervention studies use ED visit as the outcome measure of interest in determining program effectiveness.1. 1. Chiu WK, Newcomer R: A systematic review of nurse-assisted case management to improve hospital discharge transition outcomes for the elderly. Prof Case Manag 2007; 12(6): 330-6; quiz 337-8.
2. Hershberger RE, Nauman DJ, Byrkit J, et al.: Prospective evaluation of an outpatient heart failure disease management program designed for primary care: the Oregon model. J Card Fail 2005; 11(4): 293-8.
3. Martineau P, Frenette M, Blais L, Sauve C: Multidisciplinary outpatient congestive heart failure clinic: impact on hospital admissions and emergency room visits. Can J Cardiol 2004; 20(12): 1205-11.
4. Morcillo C, Valderas JM, Aguado O, et al.: [Evaluation of a home-based intervention in heart failure patients. Results of a randomized study]. Rev Esp Cardiol 2005; 58(6): 618-25.
5. Riegel B, Naylor M, Stewart S, McMurray JJ, Rich MW: Interventions to prevent readmission for congestive heart failure. JAMA 2004; 291(23): 2816; author reply 2816-7.
6. Tsuyuki RT, Fradette M, Johnson JA, et al.: A multicenter disease management program for hospitalized patients with heart failure. J Card Fail 2004; 10(6): 473-80.
7. Schwarz KA, Mion LC, Hudock D, Litman G: Telemonitoring of heart failure patients and their caregivers: a pilot randomized controlled trial. Prog Cardiovasc Nurs 2008; 23(1): 18-26.
8. Berg GD, Wadhwa S, Johnson AE: A matched-cohort study of health services utilization and financial outcomes for a heart failure disease-management program in elderly patients. J Am Geriatr Soc 2004; 52(10): 1655-61.
9. Feldman PH, Peng TR, Murtaugh CM, et al.: A randomized intervention to improve heart failure outcomes in community-based home health care. Home Health Care Serv Q 2004; 23(1): 1-23.

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***):** NA **1c.9 Quote the Specific guideline recommendation (***including guideline number and/or page number***):** NA **1c.10 Clinical Practice Guideline Citation:** NA **1c.11 National Guideline Clearinghouse or other URL:** NA **1c.12 Rating of strength of recommendation (***also provide narrative description of the rating and by whom***):** NA **1c.13 Method for rating strength of recommendation** (*If different from* USPSTF system*, also describe rating and how it relates to USPSTF)***:** NA **1c.14 Rationale for using this guideline over others:** NA	
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria **for** *Importance to Measure and Report?* 1a - Post-AMI ED visits occur about 8% of the time. Currently the diagnosis of AMI is "fluid" and evolving clinical definitions for AMI may not match the claims coding; reasons for ED visit are not specifically related to the AMI or coronary artery disease; 1b. The opportunity is substantial; 1c - the non-specific nature of the visits may be unrelated to the AMI; confounded by relationships between the private physicians and hospital staffs on use of the ED versus other venues; NQF has already endorsed the 30-day readmission rate -- will the ED visit add anything? The measure will capture colds and other minor ailments particularly in locations where the ED is used as a primary care source.	**1**
Steering Committee: Was the threshold criterion, *Importance to Measure and Report***, met?** **Rationale:** The Cardiovascular TAP identified the biggest concern with these measures is the wide variety of reasons patients seek care in the ED. Use of the ED varies by local conditions such as availability of primary care and the relationship between clinicians and the ED particularly after hours. Many ED visits would not have any relationship to the antecedent hospitalization so the data for "all cause" ED visits is very noisy and not necessarily specific to AMI or heart failure.	**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***):** The numerator is the number of eligible hospital discharges in the target population for which there is evidence of an ED visit within 30-days of hospital discharge for HF and prior to a readmission. **2a.2 Numerator Time Window (***The time period in which cases are eligible for inclusion in the numerator***):** The opportunity for each eligible Medicare discharge is 30-days following an eligible hospitalization. **2a.3 Numerator Details (***All information required to collect/calculate the numerator, including all codes, logic, and definitions***):** ED visit occurring any time within a 30-day period following a hospital discharge for HF among Medicare beneficiaries age 65 years and older identified via CMS's Outpatient Standard Analytical File (SAF) using	**2a-specs** **C☒** **P☐** **M☐** **N☐**

revenue codes = 0450 to 0459 and 0981. ED visit is not counted in the numerator if the beneficiary has a hospital claim prior to the ED visit during the 30-day post hospital discharge period.

2a.4 Denominator Statement (*Brief, text description of the denominator - target population being measured***):**
Total hospital discharges among Medicare Fee-For-Service beneficiaries 65 years of age and older during the measurement time-frame with a discharge diagnosis of Heart Failure.

2a.5 Target population gender: Female, Male
2a.6 Target population age range: Medicare Fee-For-Service beneficiaries 65 years of age and older

2a.7 Denominator Time Window (*The time period in which cases are eligible for inclusion in the denominator***):**
Computed as a three-year rolling average (January through December each year)

2a.8 Denominator Details (*All information required to collect/calculate the denominator - the target population being measured - including all codes, logic, and definitions***):**
Medicare Fee-For-Service beneficiaries 65 years of age and older with a hospital discharge with a principal discharge diagnosis of HF (ICD-9-CM codes: 402.01, 402.11, 402.91, 404.01, 404.11, 404.13, 404.91, 404.93, 428.xx)and continuously enrolled in Parts A and B during the measurement period.

2a.9 Denominator Exclusions (*Brief text description of exclusions from the target population***):** 1) In-hospital deaths are excluded
2) Transfers-out to other acute care facilities

2a.10 Denominator Exclusion Details (*All information required to collect exclusions to the denominator, including all codes, logic, and definitions***):**
1) In-hospital mortality does not permit for any post-hospital follow-up care; identify exclusion via the patient status discharge table, code='20'
2) If patient is transferred to another acute facility during the hospitalization, the receiving hospital is accountable for the post-hospital follow-up care; identify exclusion via the patient status discharge table, code='02'

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

2a.12-13 Risk Adjustment Type: risk adjustment method widely or commercially available

2a.14 Risk Adjustment Methodology/Variables (*List risk adjustment variables and describe conceptual models, statistical models, or other aspects of model or method***):**
We employ Yale risk-adjustment methodology; modified approach to the Hierarchical Condition Category (HCC) clinical classification system (Pope et al, 2000)-1)Part A secondary diagnoses from the index admission, 2)Part A principal diagnosis from any hospitalization in the 12 months prior to the index admission, 3)Part A secondary diagnoses from any hospitalization in the 12 months prior to the index admission, 4) diagnoses from hospital outpatient services in the 12 months prior to the index admission, 5) diagnoses from Part B physician encounters in the 12 months prior to the index admission. Diagnoses identified from all sources are grouped into single CC indicator flags. Secondary diagnoses identified on the index admission that are potential complications as identified by the Yale convened team of medical experts are removed as potential CC flags. Age, sex, hx of CBAG and CC flags are entered as risk adjusters into the final statistical models. Variables maintained in the final model include the following: CHF (CC80), acute coronary syndrome (CC81,82), anterior myocardial infarction (ICD9 410.00-41.19), other location MI (ICD9 410.20-41.69), angina pectoris/old infarct (CC83), coronary atherosclerosis or other IHD (CC84), valvular and rheumatic heart disease (CC86), arrythmias (CC92,93), CVD (CC97-99,103), vascular or circulatory disease (CC104-106), hemiplegia, paraplegia (CC67-69, 100-102,177,178), diabetes (CC15-20,119,120), renal failure (CC131), ESRD (CC129,130), urinary tract disorders (CC136), COPD (108), hx of PNA(CC111-113), asthma (CC110), disorders of fluid/electrolyte/acid-base (CC22-23), hx infection (C1,3-6), metastatic cancer and acute leukemia (CC7) , cancer (CC8-12), iron deficiency (CC47), decubitus ulcer (CC148,149), dementia/senility (CC49,50), protein-calorie malnutrition (CC21), hx of CBAG (ICD9

V45.81,36.10-36.16), age as continuous variable - 65 and above, and male sex. As an outcome measure of care coordination, our proposed measure is sensitive to health status constituting the need for adequate risk adjustment. Hence it is desirable to control for relevant clinical characteristics of the patients.

2a.15-17 Detailed risk model available Web page URL or attachment: URL www.qualitynet.orgdcs/ContentServer?c=Page&pagename=//HFRM_DryRunMockHSR_02Sept2008,0.pdf

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***):**
Calculation Algorithm for ED measure:

Step 1: Claims for all beneficiaries (regardless of clinical condition) from 2003-2007 Medicare Inpatient files were combined and cleaned to create a claims file with one claim per inpatient per provider stay. Next, a single-stay claims file for all beneficiaries (regardless of clinical condition) in which transfer claims are combined into a single inpatient stay record was created. This process is described in the "Input File Processing for 2009 CMS 30-day Mortality and Readmission Measures" documentation.

Step 2: Each stay in the five year period is then defined as either an index admission or a 30-day readmission. A single stay cannot count as both an index admission and a readmission for another index admission. Thus, additional admissions within 30-days of an index admission are not counted as index admissions. Index admissions with a qualifying primary discharge diagnosis from beneficiaries meeting the inclusion criteria were included in this measure. This process is described in the Hospital 30-Day Acute Myocardial Infarction Readmission Measure Methodology submitted by YNHH-CORE, and the Hospital 30-Day Heart Failure Readmission Measure Methodology submitted by YNHH-CORE.

Step 3: For each qualifying index admission, the beneficiary's inpatient and outpatient claims in the 12-months prior to the hospitalization are examined. All diagnoses from non-DME, non-diagnostic testing claims are used to construct flags for 184 clinical Condition Categories (CCs). Secondary diagnoses (excluding diagnoses associated with potential complications) from the index admission are used also to assign the 184 CCs. The process for creating the CC flags is described in the RiskSmart Stand Alone Users Guide, v2.2. These flags are used for risk adjustment.

Step 4: The following two flags (0/1 indicators) are then set for each index admission.
• Readmission=1 if a subsequent readmission occurs within 30 days of discharge from the qualifying index admission
• ED visit=1 if an ED visit occurs in the 30 days after discharge from the index admission, and the ED visit is not after the first readmission.

Step 5: Calculate the ratio of ED visit=1 events over the total number of qualifying index admissions to get unadjusted ED rate. This is for descriptive purposes only.
Step 6: Estimate risk adjustment regression model on ED visit indicator using methodology developed for CMS 30-day all cause readmission measure.
Step 7: Applying the CMS 30-day readmission measure methodology, compute P/E ratio and corresponding risk standardized rate (the RSR is defined as P/E times overall population mean).
Step 8: For ease of interpretation rank computed RSRs across all hospitals and calculate percentile rank, with a higher percentile rank associated with better performance.

2a.22 Describe the method for discriminating performance *(e.g., significance testing)***:**
Individual hospital 30-day post discharge E&M service measures are standardized and all hospitals are ranked on the resulting standardized percentile; may be converted to star rating based upon quintiles.

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)*:
All eligible cases included in measure; hospitals with fewer than 10 cases with not report measure.

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.)**:**
CMS' Outpatient Standard Analytic File (SAF) and Inpatient SAF or MEDPAR files.

2a.26-28 **Data source/data collection instrument reference web page URL or attachment:**

2a.29-31 **Data dictionary/code table web page URL or attachment:**

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

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)***:** The reliability testing and other analyses described in this submission use the Dartmouth Atlas 20% sample of Medicare Carrier Claim files for 2003-2007. Data from 2003 are used only for pre-admission information for risk-adjustment for patients admitted during 2004, and are not included directly in any of the analysis presented. December 2007 is used only for information about the 30-day post-discharge period; hence December 2007 index admissions are not in the results presented.

Reliability testing used only HF index admissions to the 2,505 hospitals having 10 or more HF index admissions in 2006. This sub-sample has 77,743 HF index admissions for 2006 and 246,421 for the three year period 2004-2006. The 30-day ED visit rates for these patients were 0.077 in 2004, 0.079 in 2005 and 0.079 in 2006.

2b.2 **Analytic Method** *(type of reliability & rationale, method for testing)***:**
Reliability was examined two ways: using correlations across years, and using kappa statistics for hospitals divided into quintiles based on risk-standardized rates in years being compared. In the case of correlations, both Pearson and Spearman (rank) correlations were computed.

Both correlations and kappa statistics were each computed for two periods: (1) between years 2006 and 2007; and (2) between 2007 and the average of three years (2004 through 2006). The proposed measure uses the second, i.e., three years of data, updated annually, in order to increase the signal-to-noise ratio relative to simple annual calculations. We also present here the one-year statistics to show what is gained in exchange for the loss of 'currentness' resulting from the three-year approach.

Both statistics were also computed for risk-standardized rates based on observed-to-expected (O/E) ratios as well as the proposed predicted-to-expected (P/E) ratios. The O/E rate for three years is a weighted average of three one year rates, with weights of 0.5 for the most recent year, 0.3 for the prior year and 0.2 for the first year. This and other approaches will be investigated during the provisional period, seeking to improve the ability of the measure to discriminate among hospitals while drawing on power of persistence in performance over time.

2b.3 **Testing Results** *(reliability statistics, assessment of adequacy in the context of norms for the test conducted)***:**
Correlations to check reliability over time were always highly significant ($p<0.001$). Pearson correlations between single years (2007 and 2006) were 0.165 using P/E and 0.146 using O/E. Spearman correlations (which are less sensitive to outliers) were 0.143 and 0.108 respectively. Pearson correlations between 2007 and the three year average (2004-2006) were even stronger: 0.202 for P/E and 0.166 for O/E. For the same measures Spearman correlations were 0.194 and 0.149 respectively.

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Weighted kappas measuring agreement within quintiles showed the same pattern of reliability. The weighted kappa was 0.124 (p<0.001) for 2007 predicted compared with the prior three year average and 0.103 (p<0.001) for 2007 observed compared with the prior three year average. For single years (2007 compared to 2006) the weighted kappas were 0.084 and 0.089 respectively (both p<0.001). In contrast, these correlations over time and weighted kappas are somewhat higher than those computed for the 30-day readmission measure using the same sample of HF index admissions. For example, the Pearson correlations on the readmission measure between 2007 and the three year average (2004-2006) are 0.166 using P/E and 0.118 using O/E. The weighted kappas for the same period are 0.090 using P/E and 0.091using O/E.	
2c. Validity testing 2c.1 **Data/sample** *(description of data/sample and size)*: N/A (see discussion under Analytic Method) 2c.2 **Analytic Method** *(type of validity & rationale, method for testing)*: Our outpatient ED visit measure is not a direct measure of care coordination, but rather an indication of the outcome of care coordination. Indeed, correlation of other, more direct measures of care coordination with our proposed ED visit indicator (within a specified time period) is used as a test of the direct measure's predictive validity. As such, we would argue that our ED visit measure is intrinsically valid. 2c.3 **Testing Results** *(statistical results, assessment of adequacy in the context of norms for the test conducted)*: N/A (see discussion under Analytic Method)	**2c** C☐ P☐ M☒ N☐
2d. Exclusions Justified 2d.1 **Summary of Evidence supporting exclusion(s):** This measure follows the previously NQF endorsed cohort specification for index admissions for heart failure among Medicare FFS beneficiaries 65 years of age. Cohort specification becomes the measure denominator and includes defensible exclusions identified by the Yale research team in their development of the NQF endorsed Hospital 30-Day Heart Failure Readmission measure. 2d.2 **Citations for Evidence:** N/A (see discussion under Summary of Evidence Supporting Exclusions) 2d.3 **Data/sample** *(description of data/sample and size)*: N/A (see discussion under Summary of Evidence Supporting Exclusions) 2d.4 **Analytic Method** *(type analysis & rationale)*: N/A (see discussion under Summary of Evidence Supporting Exclusions) 2d.5 **Testing Results** *(e.g., frequency, variability, sensitivity analyses)*: N/A (see discussion under Summary of Evidence Supporting Exclusions)	**2d** C☐ P☒ M☐ N☐ NA☐
2e. Risk Adjustment for Outcomes/ Resource Use Measures 2e.1 **Data/sample** *(description of data/sample and size)*: The risk adjustment method was assessed and applied using the 20% Medicare sample described in the section on reliability testing. However, for model estimation we used all index admissions, regardless of hospital volume. The total sample was 278,462 HF index admissions for 2004-2006. 2e.2 **Analytic Method** *(type of risk adjustment, analysis, & rationale)*: Since the risk adjustment method is the same as that used for an existing NQF approved measure, and is used for public reporting by CMS, the primary question examined in our analysis was the appropriateness of using the fixed covariates selected for 30-day readmissions for 30-day ED visits, both following IP HF care. Our method was to estimate the same GLM model used by the YNHH-CORE developers of the model, using our sample of index admissions for 2004-2006 and the ED visit outcome, and to compute the same performance statistics. To gauge the potential for improvement by selecting different covariates for ED visits we estimated an alternate model in which all DxCG condition categories (CCs) were used in lieu of	**2e** C☐ P☒ M☐ N☐ NA☐

the CC-based covariates in the readmission model.

2e.3 Testing Results *(risk model performance metrics)*:
The maximum re-scaled R2 is 0.002 and the c-statistic 0.528. The decile with the lowest predicted ED visit rate had an actual rate of 0.070 whereas the highest decile had an actual rate of 0.095. Additional statistics are presented in Table 2 (p. 3) of the attached supporting document.

The CC model's maximum re-scaled R2 is 0.004 and its c-statistic 0.539. The decile with the lowest predicted ED visit rate had an actual rate of 0.065 whereas the highest decile had an actual rate of 0.102. The alternate model performs somewhat better, but the improvement was judged not sufficient to justify further development at this time, though revision of the set of covariates representing co-morbid conditions may be an area for future refinement of the measure specification.

Table 3 (p. 4) of the attached supporting document also provides the incidence in our sample of each co-morbid condition used for risk adjustment and the parameter estimates, for the GLM model used to assess the covariates. Tables 4 and 5 (pp. 5-6) have parameter estimates for the HGLM model used to compute the measure itself.

2e.4 If outcome or resource use measure is not risk adjusted, provide rationale: N/A

2f. Identification of Meaningful Differences in Performance

2f.1 Data/sample from Testing or Current Use *(description of data/sample and size)*: The distribution of performance was assessed using the 20% Medicare sample described in the section on reliability testing.

2f.2 Methods to identify statistically significant and practically/meaningfully differences in performance *(type of analysis & rationale)*:
We calculated the intra-hospital correlation coefficient (ICC) to estimate the proportion of overall variance in 30-day post discharge ED visits which is variation between hospitals. We also examined the distribution of risk-standardized rates, and compared it to the distribution for the existing 30-day readmission measure. Over the next few months we will explore this issue further. As part of this analysis we'll examine two approaches: one grouping hospitals together based on significance - for example, three categories for 1) hospitals significantly lower than mean, 2) hospitals with no significant difference from mean, and 3) hospitals significantly higher than mean) and a second approach based on percentile ranks, for example, using quintiles as categories. The final selection will maximize the amount of variation in hospital categorization (i.e., many hospitals in each category), as well as the amount of significant differences among hospitals of different categories (i.e., hopefully, categories can be constructed to have significant differences among their means)

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)*:
For the three year period 2004-6 the between hospital variance estimate is 0.101 (se=0.007), residual variance estimate is 0.957 (se=0.003) and the resulting ICC was 0.095, indicating that differences among hospitals account for approximately 10% of total variation. The result is similar for 2006 alone. The between hospital variance estimate is 0.122 (se=0.005), residual variance estimate is 0.933 (se=0.005), with a resulting ICC of 0.116.

This is substantially more variation among hospitals than observed for the 30-day post-discharge readmission measure, for which the between-hospital variance using this sample of index admissions is 0.029 (ICC is 0.028) and that reported by the developers of the measure using all 2004 admissions was 0.021.

The median hospital with 10 or more admissions in 2006 has a risk-standardized ED visit rate for 2004-6 of 0.079. The inter-quartile range is 0.071 to 0.090 and the range of the 5th percentile to the 95th is 0.059 to 0.109. The 25th percentile hospital is predicted to have 1.27 times as many patients with an HF discharge have an ED visit within 30 days of discharge as the 75th percentile hospital, and 5th percentile hospital is predicted to have 1.81 times as many patients with an HF discharge have an ED visit within 30 days of discharge as the 95th percentile hospital. These are larger ranges than observed for readmissions following

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the same index admissions, for which these ratios were 1.10 and 1.27 respectively, which is consistent with the observed lower between hospital variation. For 2006 alone the median rate is 0.080, the inter-quartile range is 0.073 to 0.089 and the range of the 5th percentile to the 95th is 0.064 to 0.104. The distribution is a bit tighter for hospitals with smaller volumes. For example the 2004-6 inter-quartile range of the quartile of hospitals with the fewest cases (10-15 index admissions in the 2006 sample) is 0.075 to 0.091, which in addition to being shifted up is .005 smaller than the 0.066 to 0.087 inter-quartile range of the quartile of hospitals with the most cases (39-232 index admissions in the 2006 sample). As described elsewhere in this submission, we also computed risk-standardized rates using observed-to-expected (O/E) ratios instead of predicted-to-expected (P/E). These rates are somewhat more dispersed. For example, the inter-quartile range of the risk-standardized rates using the 2004-6 weighted O/E average is 0.052 to 0.106 and the range of the 5th percentile to the 95th is 0.022 to 0.165. Tables 7 and 8 (pp. 7-8) of the attached support document have more detail, and the appendix (pp. 10-13) provides histograms for a visual representation of these distributions.	
2g. Comparability of Multiple Data Sources/Methods 2g.1 **Data/sample** *(description of data/sample and size)*: N/A 2g.2 **Analytic Method** *(type of analysis & rationale)*: N/A 2g.3 **Testing Results** *(e.g., correlation statistics, comparison of rankings)*: N/A	**2g** C☐ P☐ M☐ N☐ NA☒
2h. Disparities in Care 2h.**1 If measure is stratified, provide stratified results** *(scores by stratified categories/cohorts)*: We examined hospital mean scores stratified by race/ethnicity quartiles (the ranked proportion of white, black and "other" [non-white, non-black]patients served). No differences were observed in the mean score (0.08) by race/ethnicity quartile. 2h.2 **If disparities have been reported/identified, but measure is not specified to detect disparities, provide follow-up plans:** We recommend continued monitoring of disparities in measure results. We did not evaluate the measure at the individual patient level but rather stratified the measure by the proportion of ethnic minorities served by hospitals. Our preliminary findings do not suggest a relationship between performance on the measure and the proportion of non-white patients served. Additional examination of the distribution of scores within each race/ethnic quartile may be warranted.	**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*? 2a - the measure is well-specified using administrative data; question of how patients who dies within the 30-day window are handled? 2b. reliability testing - only variability testing included - no real reliability information; 2c - validity testing - the c-statistic of the model is low at 0.53 - low c-stat suggests there is much variability not accounted for in the model; 2d - exclusions are justified but incomplete; 2e - low c-statistic; [measure developers comment - the risk model and the statistics are similar to the endorsed 30-day Post-AMI Readmission measure]; 2f - 5-7% differences among hospitals - not much variation to identify meaningful differences;	**2**
Steering Committee: Overall, to what extent was the criterion, *Scientific Acceptability of Measure Properties*, **met?** **Rationale:** The Committee noted that these measures are specified for Medicare only. The Committee urged the developers to broaden the applicability of the measure to all populations. The Committee also suggested stratifying by co-morbidities.	*2* C☐ P☒ M☐ N☐
3. USABILITY	
Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand	Eval

the results of the measure and are likely to find them useful for decision making. (evaluation criteria)	Rating
3a. Meaningful, Understandable, and Useful Information 3a.1 **Current Use:** not in use but testing completed 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*)**:** N/A 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***):** N/A **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)***:** This measure has not been tested for provider and consumer interpretation. Such testing would be a recommended component of initial implementation and use. 3a.5 **Methods** *(e.g., focus group, survey, QI project)***:** N/A 3a.6 **Results** *(qualitative and/or quantitative results and conclusions)***:** N/A	**3a** C☐ P☒ M☐ N☐
3b/3c. Relation to other NQF-endorsed measures 3b.1 **NQF # and Title of similar or related measures:** NQF# 0330 30-Day All-cause Risk Standardized Readmission Rate after Heart Failure Hospitalization	
(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?** Yes; employed the diagnositic coding specification for the population cohort and the risk-adjustment methodology of the currently NQF-endorsed 30-day All-cause Risk Standardized Readmission Rate for Heart Failure (developed by Yale researchers)	**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:** Adds an additional measure of transitional care following discharge from the hospital. 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*? 3a - meaning may be obscured by lack of specific relationship to the antecedent AMI and variation in use of ED in different locations; 3b - measure is harmonized with endorsed 30-day readmission and mortality measures; 3c - no data to support adding meaningful information distinct from the readmission or E&M measures	**3**
Steering Committee: Overall, to what extent was the criterion, *Usability***, met?** **Rationale:** A Committee member noted that the hierarchal model allows smaller hospitals to be closer to	**3** C☐

the mean; the small hospitals will never show up as worse than average The developer noted that their primary goal had been to produce a composite of care trajectories. The same methodology was used in all three components (readmission; ED visits; and E&M service). The measures speak to each other and there are different ways to dampen the noise aside from shrinkage.	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.** Our proposed measure as specified is not susceptible to inaccuracies.	**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:** NA-administrative claims-based measure 4e.2 **Costs to implement the measure** (*costs of data collection, fees associated with proprietary measures*)**:** NA-administrative claims-based measure that does not add data collection burden to hospitals or providers 4e.3 **Evidence for costs:** N/A 4e.4 **Business case documentation:** N/A	**4e** C☒ P☐ M☐ N☐
TAP/Workgroup: What are the strengths and weaknesses in relation to the sub-criteria **for** *Feasibility*? 4a - measures constructed with administrative data -- expect high feasibility;' 4d -however as AMI diagnostic criteria are changing, the coding may not reflect current clinical definitions	**4**
Steering Committee: Overall, to what extent was the criterion, *Feasibility***, met?**	**4**

Rationale: The Committee asked the developer to clarify that the measure could be applied to other than Medicare populations.	**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:** Recommend as part of a composite	**Y**☒ **N**☐ **A**☐

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner)
Co.1 Organization
Centers for Medicare and Medicaid Services | 7500 Security Blvd., MS S3-02-01 | Baltimore | Maryland | 21244

Co.2 Point of Contact
Shaheen | Halim, Ph.D. | Shaheen.Halim@cms.hhs.gov | 410-786-0641

Measure Developer If different from Measure Steward
Co.3 Organization
Brandeis University | 415 South Street | Waltham | Massachusetts | 02454

Co.4 Point of Contact
Christopher | Tompkins, Ph.D. | Tompkins@brandeis.edu | 778-736-3913

Co.5 Submitter If different from Measure Steward POC
Marian Ryan | Ryan, PhD | mryan@brandeis.edu | 949-290-7697- |Brandeis University

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.
Technical Expert Panel
Lisa Latts, MD, MBA -WellPoint
Julie Bynum, MD, MPH -Dartmouth Medical School
Joanne Lynn, MD -DC Department of Health – Chronic Disease and Cancer Community Health Administration
Anthony Armada, MHA, MBA -Henry Ford Hospital

Role:
The Technical Expert Panel assisted our workgroup developing measures by providing input to:
· Supplement, and provide texture, to the knowledge gathered through the literature review prior to measure development;
· Discussing existing measures and providing input as to next steps for CMS to adopt, adapt, and/or develop measures of care coordination relevant to the hospital setting; and
· Reviewing and providing input on draft measures and measure development testing.

Workgroup
Kristine Martin Anderson, MBA -Booz Allen Hamilton
James Burgess, PhD-Boston University
Sandra Lesikar, PhD-Booz Allen Hamilton
Timothy Martin, PhD-Brandeis University
Sue Lee, MS - Brandeis University

Marian Ryan, Ph.D.Candidate-Brandeis University Role: The workgroup participated in development of measures, review of interim results during development, and reviewing NQF submission forms.
Ad.2 If adapted, provide name of original measure: 30-Day Post-hospital HF Discharge Emergency Department Rate **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:** **Ad.7 Month and Year of most recent revision:** **Ad.8 What is your frequency for review/update of this measure?** Every two years **Ad.9 When is the next scheduled review/update for this measure?**
Ad.10 Copyright statement/disclaimers: N/A
Ad.11 -13 Additional Information web page URL or attachment: Attachment NQF HF ED Visit Rate Measure Support (Sci Accept) - 28Sep2009.doc
Date of Submission (*MM/DD/YY*)**:** 04/14/2010

Heart Failure 30-Day Post-Hospital Discharge ED Visit Rate

Supporting Material for Scientific Acceptability

Brandeis University

1. Introduction

This document elaborates and supports the statements on scientific acceptability in Brandeis University's September 18, 2009 submission of a measure titled "30-Day Post-Hospital Heart Failure Discharge ED Visit Rate" to the National Quality Forum's Consensus Development Project on Proposed Patient Outcomes Measures (Phase I) in response to its call for candidate standards.

1.1. Data Sample

All data used for the analyses described in this document are from the Dartmouth Atlas 20% sample of Medicare Carrier Claim files for 2003-2007. Data from 2003 are used only for pre-admission information about patients admitted during 2004, and are not included directly in any of the analysis presented. December 2007 is used only for information about the 30-day post-discharge period; there are no December 2007 index admissions in the results presented here. These data were processed in accordance with the measure definitions described in the submission. All resulting index admissions were used in the model for testing and estimation and are reflected in the results presented in section 2 on Risk Adjustment. Scores and their analysis discussed in sections 3 and 4 were analyzed only for hospitals having 10 or more index admissions in 2006. Table 1 summarizes the number of resulting hospitals and index admissions with a primary diagnosis of heart failure and the rate of a 30-day post-discharge ED visit following these admissions.

1.2. Measure Methods

The proposed measure uses three years of data, updated annually (i.e., rolling average) in order to increase the signal-to-noise ratio relative to simple annual calculations. This supporting analysis provides one-year and three-year computations to show what is gained in exchange for the loss of 'currentness' resulting from the three-year approach.

Table 1: Count of Heart Failure Index Admissions and 30-Day ED Visit Rate, By Year

	All Hospitals			Hospitals With 10+ Index Admissions in 2006		
	Number of Index Admissions	30-Day ED Visit Rate	Number of Hospitals	Number of Index Admissions	30-Day ED Visit Rate	Number of Hospitals
Year						
2004	98,137	0.078	4,589	85,464	0.077	2,466
2005	94,443	0.082	4,541	83,214	0.079	2,497
2006	85,882	0.081	4,410	77,743	0.079	2,505
2007	71,128	0.084	4,317	63,520	0.082	2,497

Analysis to-date has considered observed-to-expected (O/E) ratios as well as the proposed predicted-to-expected (P/E) ratios. Results of both approaches are documented below. The O/E rate for three years is a weighted average of three one-year rates, with weights of 0.5 for the most recent year, 0.3 for the prior year and 0.2 for the first year. The P/E rate for three years is computed using the results of the HGLM model estimated for three years. Other approaches will be investigated during the provisional period.

2. Risk Adjustment Strategy (Measure evaluation criterion 2e)

2.1. Method

The risk adjustment strategy is one of indirect adjustment, with predicted and expected 30-day post-discharge ED visit rates calculated for each hospital using a hierarchical logistic regression model. The statistical model is that of the Hospital 30-Day Heart Failure Readmission Measure Methodology prepared for CMS by the Yale University/Yale-New Haven Hospital Center for Outcomes Research and Evaluation (YNHH-CORE, 2008), with the level 1 demographic and condition covariates from that methodology and each hospital in our data as a level 2 unit. We are using the fixed covariates selected by YNHH-CORE for readmission following a heart failure stay.

2.2. Analysis

2.2.1. YNHH-CORE tested and validated their selected covariates using a generalized linear model (GLM) with a logistic link function. We assessed the application of that model to the 30-day post-discharge ED visit outcome measure using this model and our index admissions for 2004-6. To assess the potential for substantial improvement from modification of the selected covariates for this different outcome, we also assessed a "naïve" alternate model using age, sex, history of CABG and all 167 DxCG CCs present in our data.

Table 2 summarizes the performance of both the proposed model and the alternate model using all CCs. Neither model has very strong predictive ability. The alternate model performs marginally better, but the improvement was judged not sufficient to justify further development at this time using comorbidies, at least as represented by CCs. Future research might be directed at whether ED use by recently discharged heart failure patients is in fact related to comorbidities or other important, measurable clinical characteristics,. and if so, how to measure them better.

Table 2: Heart Failure 30-Day ED Visit Rate -- GLM Model (covariates only) Performance (2004-6)

Statistic		**Proposed Model (YNHH-CORE)**	**Alternate Model (All CCs)** [2]
Actual Rate		0.080	.080
Max. Re-scaled R^2		0.002	0.004
Predictive Ability (Lowest Decile, Highest Decile) [1]		0.070 - 0.095	0.065 - 0.102
c-statistic		0.528	0.539
Residuals Lack of Fit (Pearson Residual Fall %)	<-2 [-2, 0) [0, 2) [2+	- 92.0 - 8.0	- 92.0 - 8.0
Model Wald chi-squared (number of covariates)		220 (37)	439 (170)

[1] Average actual rate within indicated decile when ranked by estimated probability.
[2] Age, sex, history of CABG and 167 CCs (17 CCs were not observed in the data).

Table 3 lists the covariates of the proposed model with their incidence among the heart failure index admissions for 2004-6 and results of the GLM logistic estimates using those admissions.

2.2.2. The measure is specified to be computed annually, using the most recent three years of data. Testing was done with both one year of data, and three. Table 4 gives parameter estimates for the fixed covariates in the HGLM model using data for one year, 2006, and table 5 for three years, 2004-6.

Table 3: Heart Failure 30-Day ED Visit Rate -- GLM (2004-6) -- Proposed Covariates and Statistics

Effect	Mean, Std. Dev., or Proportion	Estimate	Standard Error	Std. Est.	Odds Ratio Estimate	OR 95% CI
Intercept	.	-2.470	0.026	_	.	
Age-65 (years above 65, continuous)	15.5392	-0.002	0.001	-0.0073	0.998	0.996 - 1.000
Age - Std. Dev.	7.9536	.	.	.	.	
Sex (Male)	0.4329	-0.009	0.007	_	0.981	0.953 - 1.010
History of CABG	0.1727	0.009	0.020	0.0018	1.009	0.970 - 1.049
CC 80 Congestive heart failure	0.3756	-0.036	0.015	-0.0095	0.965	0.937 - 0.994
CC 81, 82 Acute coronary syndrome	0.0476	-0.029	0.033	-0.0035	0.971	0.910 - 1.036
CC 92, 93 Arrhythmias	0.4886	-0.021	0.014	-0.0057	0.980	0.952 - 1.008
CC 79 Cardio-respiratory failure and shock	0.0731	-0.028	0.029	-0.0039	0.972	0.918 - 1.029
CC 86 Valvular and rheumatic heart disease	0.2349	-0.024	0.017	-0.0056	0.976	0.944 - 1.010
CC 104-106 Vascular or circulatory disease	0.1289	0.024	0.021	0.0045	1.025	0.984 - 1.067
CC 83, 84 Chronic atherosclerosis	0.4920	-0.005	0.015	-0.0013	0.995	0.966 - 1.025
CC 94 Other and unspecified heart disease	0.0239	0.004	0.046	0.0003	1.004	0.917 - 1.098
CC 67-69, 100-102, 177, 178 Hemiplegia, paraplegia, paralysis, functional disability	0.0148	-0.143	0.061	-0.0096	0.867	0.769 - 0.977
CC 95, 96 Stroke	0.0042	-0.070	0.112	-0.0025	0.932	0.749 - 1.161
CC 131 Renal failure	0.2445	0.097	0.017	0.0222	1.102	1.065 - 1.141
CC 108 COPD	0.3195	0.049	0.015	0.0125	1.050	1.019 - 1.082
CC 15-20, 119, 120 Diabetes and DM complications	0.3476	0.041	0.015	0.0107	1.041	1.011 - 1.073
CC 22, 23 Disorders of fluid/electrolyte/acid-base	0.1995	-0.030	0.018	-0.0066	0.971	0.937 - 1.005
CC 136 Other urinary tract disorders	0.1088	0.061	0.022	0.0110	1.063	1.019 - 1.109
CC 148, 149 Decubitus ulcer or chronic skin ulcer	0.0318	0.005	0.040	0.0005	1.005	0.929 - 1.088
CC 36 Other gastrointestinal disorders	0.1363	0.071	0.020	0.0133	1.073	1.031 - 1.116
CC 34 Peptic ulcer, hemorrhage, other specified gastrointestinal disorders	0.0310	-0.014	0.041	-0.0014	0.986	0.910 - 1.067
CC 44 Severe hematological disorders	0.0111	0.088	0.064	0.0051	1.092	0.963 - 1.238
CC 132 Nephritis	0.0135	-0.013	0.058	-0.0008	0.987	0.881 - 1.106
CC 49, 50 Dementia and senility	0.0821	0.107	0.026	0.0161	1.113	1.059 - 1.170
CC 7 Metastatic cancer and acute leukemia	0.0085	-0.076	0.085	-0.0037	0.927	0.785 - 1.094
CC 8-12 Cancer	0.0376	-0.022	0.038	-0.0023	0.978	0.907 - 1.055
CC 25-30 Liver and biliary disease	0.0165	0.039	0.054	0.0027	1.040	0.935 - 1.157
CC 129, 130 End-stage renal disease or dialysis	0.0157	0.315	0.051	0.0211	1.370	1.239 - 1.515
CC 110 Asthma	0.0182	0.106	0.050	0.0078	1.111	1.007 - 1.227
CC 47 Iron deficiency and other/unspecified anemias and blood disease	0.1874	0.028	0.018	0.0060	1.028	0.992 - 1.065
CC 111-113 Pneumonia	0.0997	-0.042	0.025	-0.0068	0.959	0.913 - 1.006
CC 51-53 Drug/alcohol abuse/dependence/psychosis	0.0382	0.072	0.036	0.0077	1.075	1.002 - 1.154
CC 54-56 Major pysch disorders	0.0114	0.093	0.063	0.0054	1.097	0.970 - 1.241
CC 58 Depression	0.0436	0.006	0.034	0.0007	1.006	0.942 - 1.076
CC 60 Other psychiatric disorders	0.0197	0.216	0.046	0.0166	1.241	1.134 - 1.359
CC 109 Fibrosis of lung and other chronic lung disorders	0.0267	-0.045	0.045	-0.0040	0.956	0.876 - 1.043
CC 21 Protein-calorie malnutrition	0.0182	-0.033	0.054	-0.0024	0.967	0.869 - 1.076

Table 4: Heart Failure 30-Day ED Visit Rate -- HGLM Parameter Estimates, 2006

Effect	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-2.495	0.049	-51.30	<.0001
Sex (Male)	-0.031	0.026	-1.19	0.2350
Age-65 (years above 65, continuous)	0.001	0.002	0.52	0.6034
History of CABG	0.026	0.035	0.76	0.4500
CC 80 Congestive heart failure	-0.063	0.026	-2.42	0.0157
CC 81, 82 Acute coronary syndrome	-0.029	0.059	-0.50	0.6166
CC 92, 93 Arrhythmias	-0.001	0.025	-0.03	0.9775
CC 79 Cardio-respiratory failure and shock	0.077	0.046	1.69	0.0912
CC 86 Valvular and rheumatic heart disease	-0.032	0.030	-1.09	0.2771
CC 104-106 Vascular or circulatory disease	0.054	0.036	1.48	0.1383
CC 83, 84 Chronic atherosclerosis	0.014	0.027	0.53	0.5948
CC 94 Other and unspecified heart disease	0.020	0.081	0.25	0.8018
CC 67-69, 100-102, 177, 178 Hemiplegia, paraplegia, paralysis, functional disability	-0.161	0.113	-1.42	0.1543
CC 95, 96 Stroke	0.119	0.180	0.66	0.5111
CC 131 Renal failure	0.074	0.028	2.69	0.0070
CC 108 COPD	0.026	0.027	0.99	0.3231
CC 15-20, 119, 120 Diabetes and DM complications	0.058	0.027	2.16	0.0308
CC 22, 23 Disorders of fluid/electrolyte/acid-base	-0.037	0.031	-1.18	0.2378
CC 136 Other urinary tract disorders	0.095	0.045	2.11	0.0349
CC 148, 149 Decubitus ulcer or chronic skin ulcer	0.109	0.067	1.63	0.1032
CC 36 Other gastrointestinal disorders	0.025	0.036	0.69	0.4914
CC 34 Peptic ulcer, hemorrhage, other specified gastrointestinal disorders	0.084	0.069	1.22	0.2225
CC 44 Severe hematological disorders	0.271	0.105	2.59	0.0097
CC 132 Nephritis	-0.029	0.112	-0.26	0.7964
CC 49, 50 Dementia and senility	0.067	0.045	1.51	0.1322
CC 7 Metastatic cancer and acute leukemia	0.005	0.147	0.04	0.9707
CC 8-12 Cancer	-0.074	0.068	-1.09	0.2753
CC 25-30 Liver and biliary disease	0.087	0.093	0.93	0.3506
CC 129, 130 End-stage renal disease or dialysis	0.172	0.089	1.93	0.0538
CC 110 Asthma	0.058	0.089	0.64	0.5197
CC 47 Iron deficiency and other/unspecified anemias and blood disease	0.082	0.031	2.61	0.0090
CC 111-113 Pneumonia	-0.069	0.039	-1.77	0.0768
CC 51-53 Drug/alcohol abuse/dependence/psychosis	0.098	0.063	1.56	0.1177
CC 54-56 Major pysch disorders	0.132	0.109	1.21	0.2252
CC 58 Depression	0.022	0.060	0.36	0.7153
CC 60 Other psychiatric disorders	0.094	0.085	1.11	0.2687
CC 109 Fibrosis of lung and other chronic lung disorders	-0.033	0.076	-0.43	0.6668
CC 21 Protein-calorie malnutrition	-0.079	0.094	-0.84	0.4000

Table 5: Heart Failure 30-Day ED Visit Rate -- HGLM Parameter Estimates, 2004 - 2006

Effect	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-2.455	0.027	-89.91	<.0001
Sex (Male)	-0.019	0.015	-1.29	0.1980
Age-65 (years above 65, continuous)	-0.001	0.001	-0.99	0.3211
History of CABG	0.018	0.020	0.91	0.3630
CC 80 Congestive heart failure	-0.031	0.015	-2.08	0.0372
CC 81, 82 Acute coronary syndrome	-0.030	0.033	-0.91	0.3637
CC 92, 93 Arrhythmias	-0.013	0.014	-0.92	0.3554
CC 79 Cardio-respiratory failure and shock	-0.034	0.029	-1.20	0.2314
CC 86 Valvular and rheumatic heart disease	-0.020	0.017	-1.16	0.2468
CC 104-106 Vascular or circulatory disease	0.022	0.020	1.08	0.2798
CC 83, 84 Chronic atherosclerosis	0.003	0.015	0.19	0.8480
CC 94 Other and unspecified heart disease	-0.015	0.045	-0.33	0.7405
CC 67-69, 100-102, 177, 178 Hemiplegia, paraplegia, paralysis, functional disability	-0.141	0.060	-2.35	0.0188
CC 95, 96 Stroke	-0.081	0.110	-0.74	0.4606
CC 131 Renal failure	0.097	0.017	5.65	<.0001
CC 108 COPD	0.050	0.015	3.32	0.0009
CC 15-20, 119, 120 Diabetes and DM complications	0.038	0.015	2.53	0.0115
CC 22, 23 Disorders of fluid/electrolyte/acid-base	-0.033	0.018	-1.89	0.0594
CC 136 Other urinary tract disorders	0.056	0.021	2.64	0.0082
CC 148, 149 Decubitus ulcer or chronic skin ulcer	0.014	0.040	0.35	0.7261
CC 36 Other gastrointestinal disorders	0.063	0.020	3.15	0.0017
CC 34 Peptic ulcer, hemorrhage, other specified gastrointestinal disorders	-0.003	0.040	-0.08	0.9374
CC 44 Severe hematological disorders	0.101	0.063	1.60	0.1094
CC 132 Nephritis	-0.007	0.057	-0.12	0.9042
CC 49, 50 Dementia and senility	0.105	0.025	4.18	<.0001
CC 7 Metastatic cancer and acute leukemia	-0.062	0.083	-0.75	0.4557
CC 8-12 Cancer	-0.013	0.038	-0.34	0.7360
CC 25-30 Liver and biliary disease	0.046	0.053	0.86	0.3921
CC 129, 130 End-stage renal disease or dialysis	0.334	0.051	6.60	<.0001
CC 110 Asthma	0.111	0.050	2.24	0.0251
CC 47 Iron deficiency and other/unspecified anemias and blood disease	0.026	0.018	1.43	0.1516
CC 111-113 Pneumonia	-0.048	0.024	-1.98	0.0477
CC 51-53 Drug/alcohol abuse/dependence/psychosis	0.063	0.035	1.79	0.0738
CC 54-56 Major pysch disorders	0.102	0.062	1.64	0.1003
CC 58 Depression	0.004	0.033	0.12	0.9009
CC 60 Other psychiatric disorders	0.210	0.045	4.61	<.0001
CC 109 Fibrosis of lung and other chronic lung disorders	-0.049	0.044	-1.12	0.2639
CC 21 Protein-calorie malnutrition	-0.033	0.054	-0.62	0.5339

3. Identification of Meaningful Differences in Performance (Measure evaluation criterion 2f)

The between-hospital variance and intra-class correlation coefficients from both the one- and three-year versions of the HGLM indicate the existence of significant differences among hospitals in the rate at which their heart failure patients receive at least one ED visit within the month following discharge. Table 6 summarizes these statistics for 2006. Results using data from other years were consistent.

Table 6: Heart Failure 30-Day ED Visit Rate -- Variation Among Hospitals

Statistic	One-Year (2006)	Three-Year (2004-6)
Between-Hospital Variance (SE)	0.122 (0.015)	0.101 (0.007)
Residual Variance (SE)	0.933 (0.005)	0.957 (0.003)
Intra-Class Correlation	0.116	0.095

The final score will be a percentile ranking of a risk-standardized rate. For purposes of analysis, risk standardized rates were computed using (a) observed-to-expected (O/E) rates and (b) predicted-to-expected (P/E) rates, each for one-year and three-year time periods. The O/E rate for three years is a weighted average of three one-year rates, with weights of 0.5 for the most recent year, 0.3 for the prior year and 0.2 for the first year. The P/E rate for three years is computed using the results of the HGLM model estimated for three years. Table 7 summarizes the distribution of the underlying actual, predicted and respective risk-standardized rates computed using each of the time periods. The distribution is of hospital-level rates, for the 2,505 hospitals having 10 or more index admissions in 2006 Table 8 breaks these rates down by hospital heart failure volume (quartile of index admissions in 2006). These data are illustrated by histograms in the Appendix.

Table 7: Heart Failure 30-Day ED Visit Rate -- Distribution Among Hospitals of Actual and Risk - Standardized Rates, by Estimation Period

	Mean	P5	P25	Median	P75	P95
One-Year						
• **Actual**	0.084	0.000	0.038	0.077	0.116	0.200
• **Risk Standardized Rate (Using O/E)**	0.083	0.000	0.038	0.075	0.115	0.198
• **Predicted**	0.082	0.065	0.073	0.081	0.089	0.106
• **Risk Standardized Rate (Using P/E)**	0.081	0.064	0.073	0.080	0.089	0.104
Three-Year						
• **Actual**	0.083	0.022	0.053	0.077	0.107	0.165
• **Risk Standardized Rate (Using O/E)**	0.083	0.022	0.052	0.077	0.106	0.165
• **Predicted**	0.082	0.060	0.072	0.080	0.091	0.109
• **Risk Standardized Rate (Using P/E)**	0.081	0.059	0.071	0.079	0.090	0.107

Table 8: Heart Failure 30-Day ED Visit Rate -- Distribution of Hospital-Level Actual and Risk - Standardized Rates, By Volume Quartile

		Mean	P5	P25	Median	P75	P95
One-Year Actual	**Vol. Quartile**						
	Q1: 10 - 15	0.091	0.000	0.000	0.083	0.154	0.267
	Q2: 16 - 23	0.091	0.000	0.048	0.087	0.130	0.211
	Q3: 24 - 38	0.079	0.000	0.037	0.074	0.111	0.184
	Q4: 39 - 232	0.075	0.020	0.045	0.071	0.100	0.154
One-Year Risk Standardized Rate (Using O/E)	**Vol. Quartile**						
	Q1: 10 - 15	0.090	0.000	0.000	0.081	0.146	0.262
	Q2: 16 - 23	0.090	0.000	0.047	0.087	0.130	0.207
	Q3: 24 - 38	0.078	0.000	0.036	0.073	0.111	0.180
	Q4: 39 - 232	0.074	0.019	0.045	0.071	0.099	0.150
One-Year Predicted	**Vol. Quartile**						
	Q1: 10 - 15	0.084	0.071	0.075	0.082	0.089	0.105
	Q2: 16 - 23	0.084	0.069	0.076	0.082	0.091	0.105
	Q3: 24 - 38	0.082	0.065	0.072	0.080	0.089	0.107
	Q4: 39 - 232	0.080	0.061	0.069	0.078	0.089	0.108
One-Year Risk Standardized Rate (Using P/E)	**Vol. Quartile**						
	Q1: 10 - 15	0.082	0.072	0.074	0.081	0.089	0.101
	Q2: 16 - 23	0.083	0.068	0.075	0.082	0.091	0.103
	Q3: 24 - 38	0.081	0.065	0.072	0.079	0.088	0.106
	Q4: 39 - 232	0.079	0.060	0.069	0.077	0.088	0.107
Three-Year Actual	**Vol. Quartile**						
	Q1: 10 - 15	0.091	0.000	0.050	0.085	0.125	0.200
	Q2: 16 - 23	0.089	0.021	0.058	0.084	0.116	0.169
	Q3: 24 - 38	0.078	0.027	0.051	0.074	0.102	0.147
	Q4: 39 - 232	0.075	0.032	0.054	0.072	0.093	0.130
Three-Year Risk Standardized Rate (Using O/E)	**Vol. Quartile**						
	Q1: 10 - 15	0.091	0.000	0.049	0.085	0.123	0.204
	Q2: 16 - 23	0.088	0.021	0.058	0.083	0.115	0.169
	Q3: 24 - 38	0.078	0.025	0.050	0.074	0.101	0.146
	Q4: 39 - 232	0.075	0.032	0.053	0.072	0.092	0.129
Three-Year Predicted	**Vol. Quartile**						
	Q1: 10 - 15	0.085	0.068	0.075	0.083	0.092	0.109
	Q2: 16 - 23	0.084	0.065	0.075	0.083	0.093	0.108
	Q3: 24 - 38	0.081	0.060	0.070	0.078	0.090	0.109
	Q4: 39 - 232	0.079	0.054	0.067	0.077	0.088	0.109
Three-Year Risk Standardized Rate (Using P/E)	**Vol. Quartile**						
	Q1: 10 - 15	0.084	0.067	0.075	0.082	0.091	0.107
	Q2: 16 - 23	0.083	0.064	0.074	0.081	0.091	0.107
	Q3: 24 - 38	0.080	0.059	0.069	0.078	0.089	0.107
	Q4: 39 – 232	0.078	0.054	0.066	0.076	0.087	0.107

4. Reliability Testing (Measure evaluation criterion 2b)

   Reliability was assessed by correlating the one-year measures for 2007 with both the one-year measures for 2006 and the three-year measures ending with 2006. In each case, both Pearson and Spearman correlations were calculated, the latter being less susceptible to outliers. As an additional assessment, measures were grouped in quintiles and weighted kappa statistics were computed. The results are in Table 9. All values are significant ($p<.001$). Correlation statistics between the three-year average ending in 2007 and the three-year average ending in 2006 are not calculated because the two measures share two years of data in common.

Table 9: Heart Failure 30-Day ED Visit Rate -- Reliability When Comparing Across Years

Statistic	One-Year (2006)		Three-Year (2004-6)	
	Obs./Exp. Ratio	Pred./Exp. Ratio	Obs./Exp. Ratio	Pred./Exp. Ratio
Correlation Coefficients				
• **Pearson**	0.140	0.165	0.166	0.202
• **Spearman**	0.108	0.143	0.149	0.194
Kappa Statistic				
• **Weighted Kappa**	0.089	0.084	0.103	0.124
• **95% CI – Lower**	0.061	0.056	0.075	0.096
• **95% CI -- Upper**	0.118	0.112	0.132	0.152

Reference

Yale University/Yale-New Haven Hospital Center for Outcomes Research and Evaluation (YNHH-CORE). “Hospital 30-Day Heart Failure Readmission Measure Methodology”. Prepared for Centers for Medicare & Medicaid Services (CMS), April 23, 2008.

Appendix
Histograms of Hospital 30-Day Heart Failure ED Visit Rate Distributions

Figure 1: Distribution of Hospital Actual (unadjusted) 30-Day Heart Failure ED Visit Rates (One-Year – 2006)

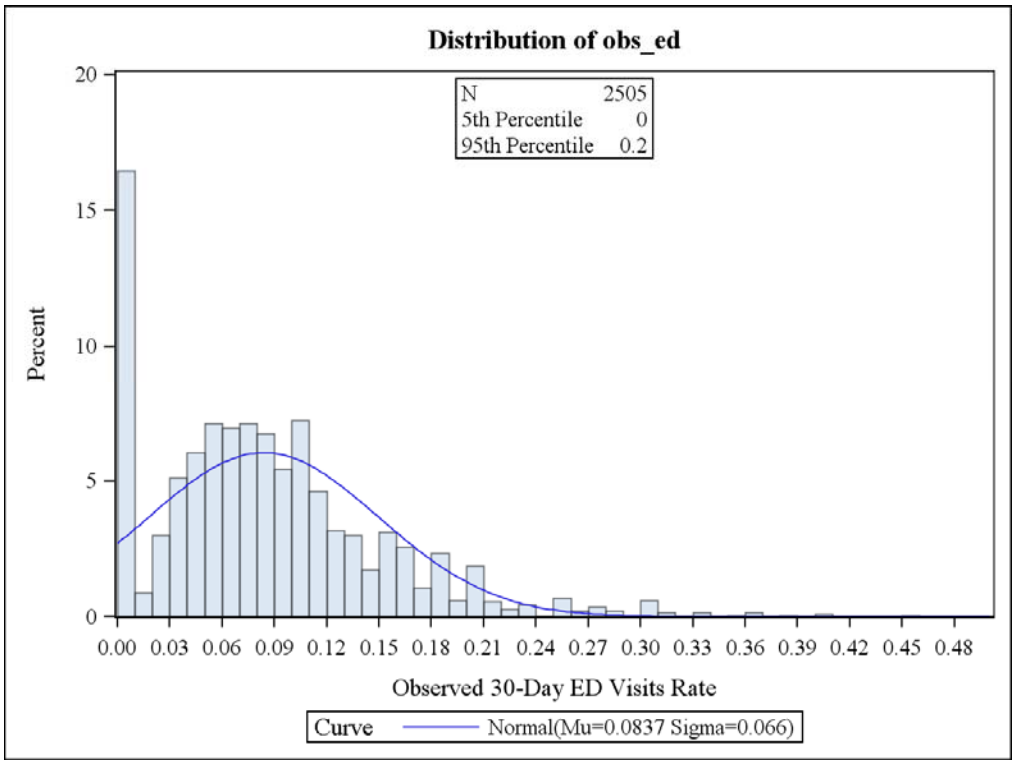


Figure 2: Distribution of Hospital Actual (unadjusted) 30-Day Heart Failure ED Visit Rates (One-Year – 2006) -- By Hospital HF Volume Quartile

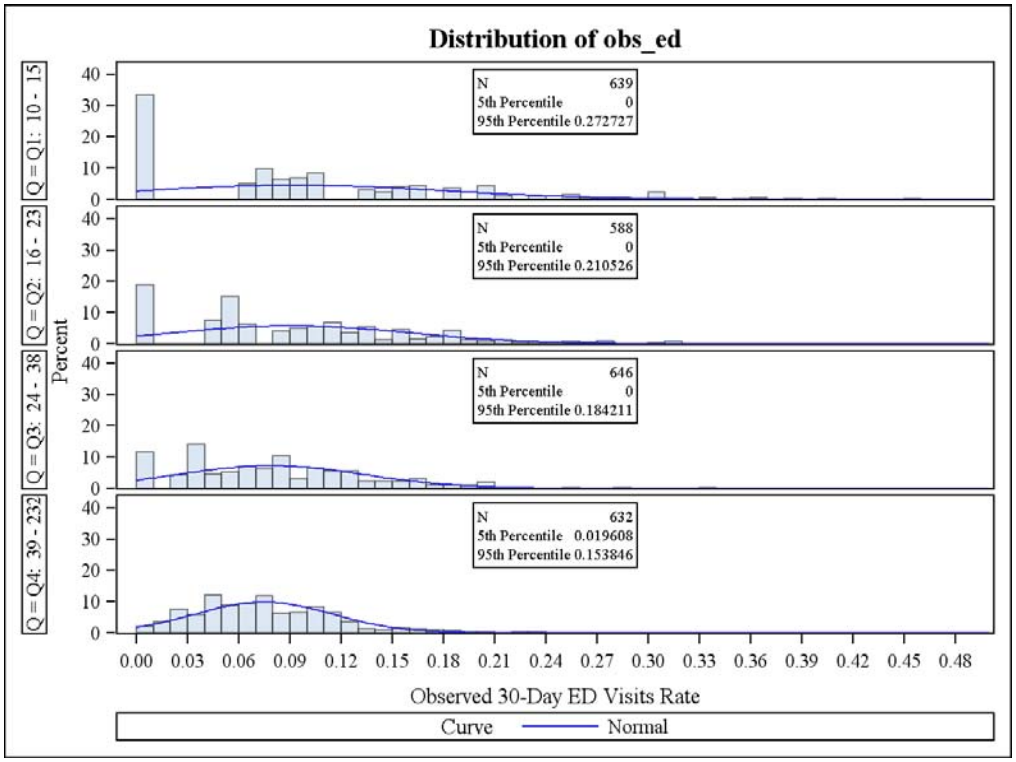


Figure 3: Distribution of Hospital Risk Adjusted 30-Day Heart Failure ED Visit Rates (Using P/E Method, One-Year – 2006)

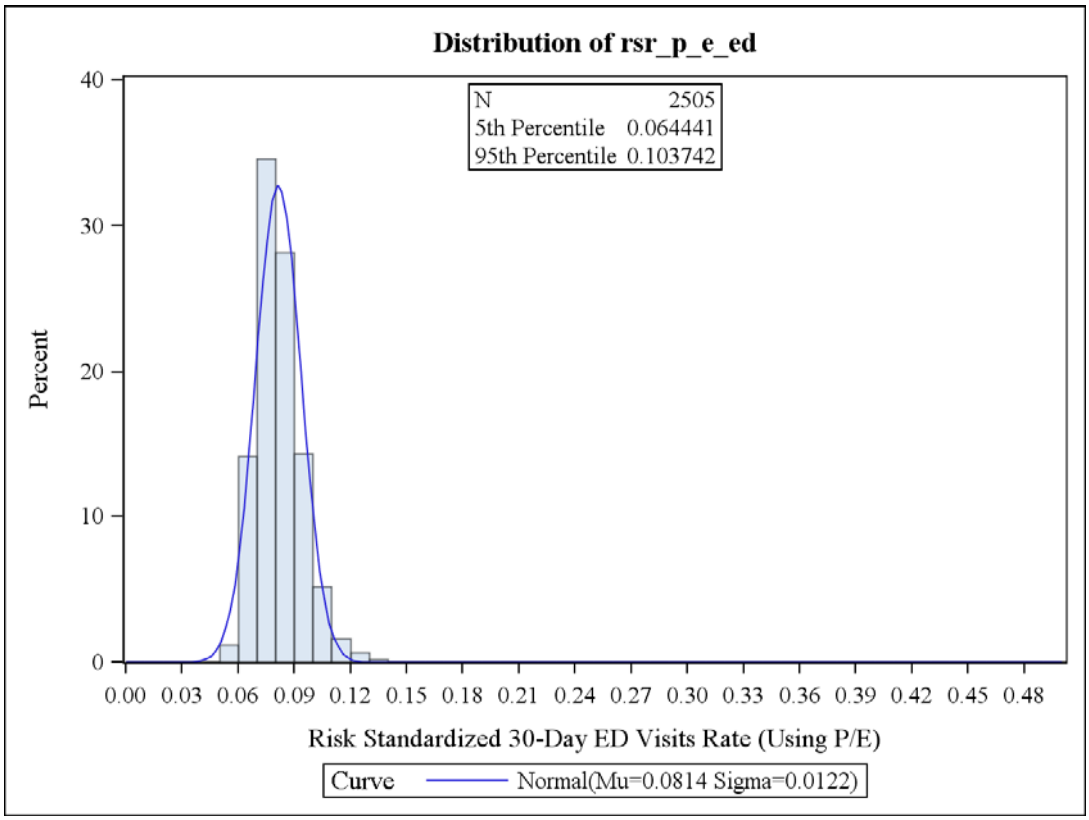


Figure 4: : Distribution of Hospital Risk Adjusted 30-Day Heart Failure ED Visit Rates (Using P/E Method, One-Year – 2006) -- By Hospital HF Volume Quartile

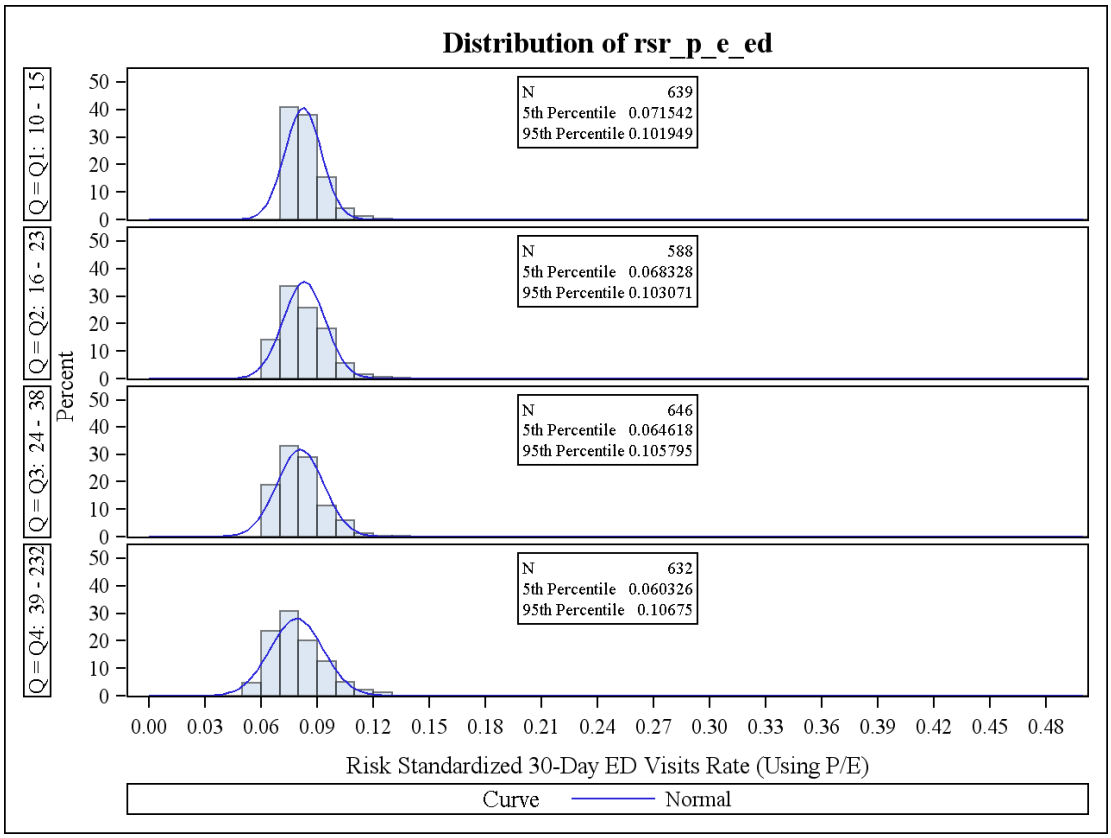


Figure 5: Distribution of Hospital Risk Adjusted 30-Day Heart Failure ED Visit Rates (Using O/E Method, Three-Year – 2004-6)

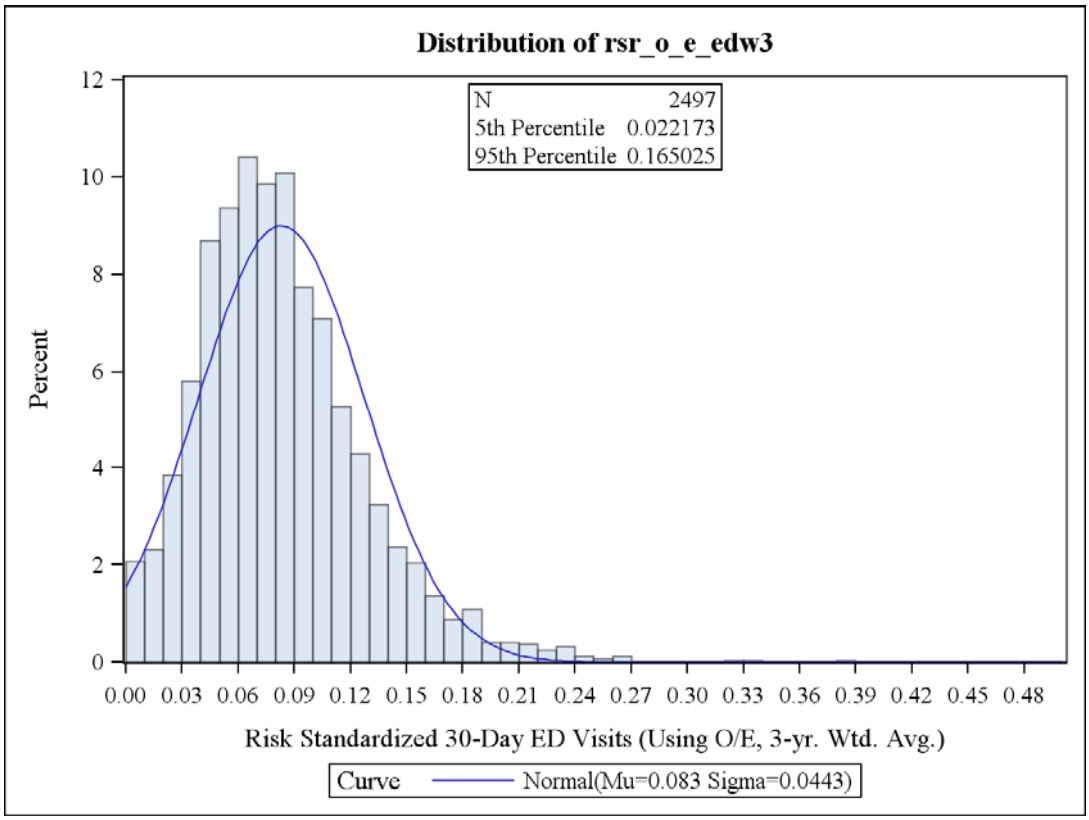


Figure 6: Distribution of Hospital Risk Adjusted 30-Day Heart Failure ED Visit Rates (Using O/E Method, Three-Year – 2004-6) -- By Hospital HF Volume Quartile

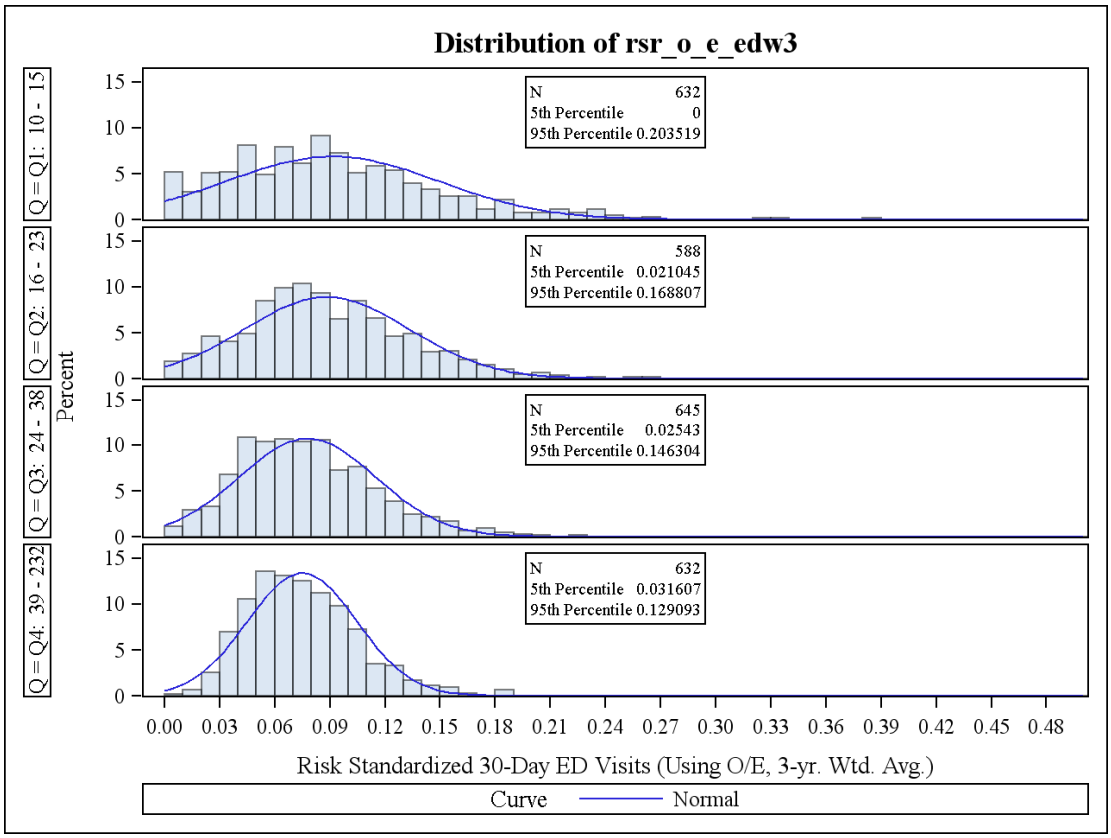


Figure 7: Distribution of Hospital Risk Adjusted 30-Day Heart Failure ED Visit Rates (Using P/E Method, Three-Year – 2004-6)

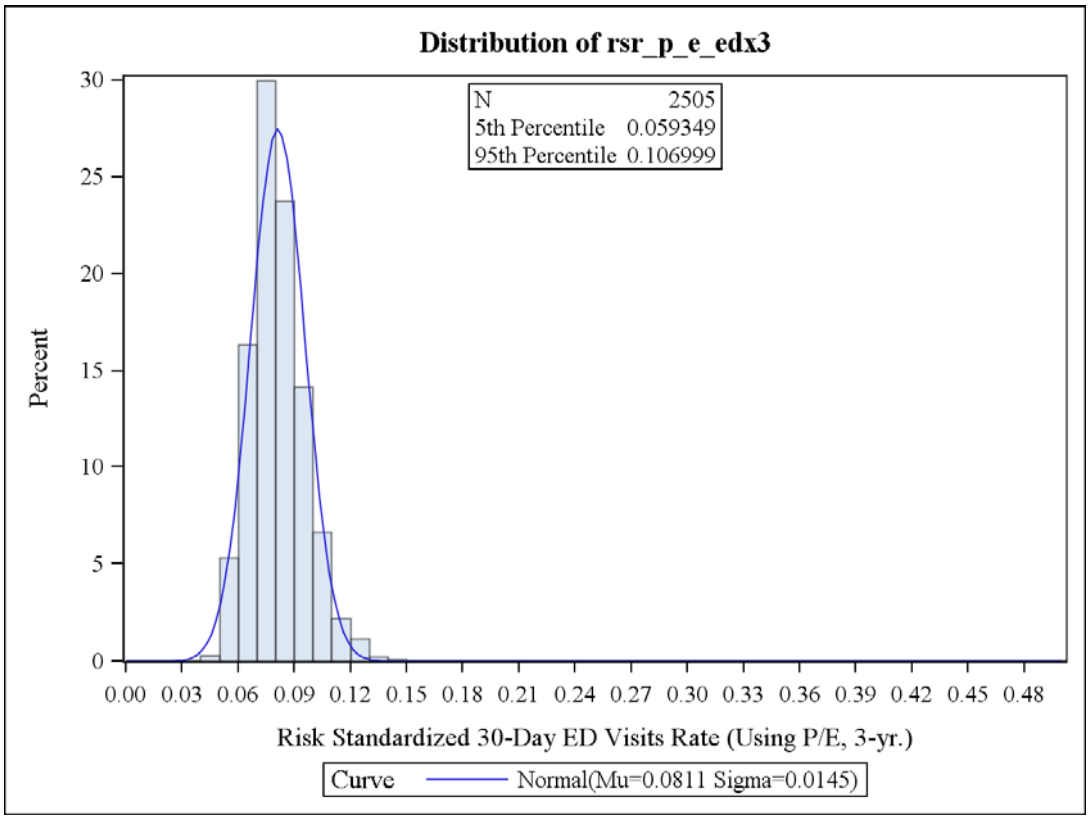
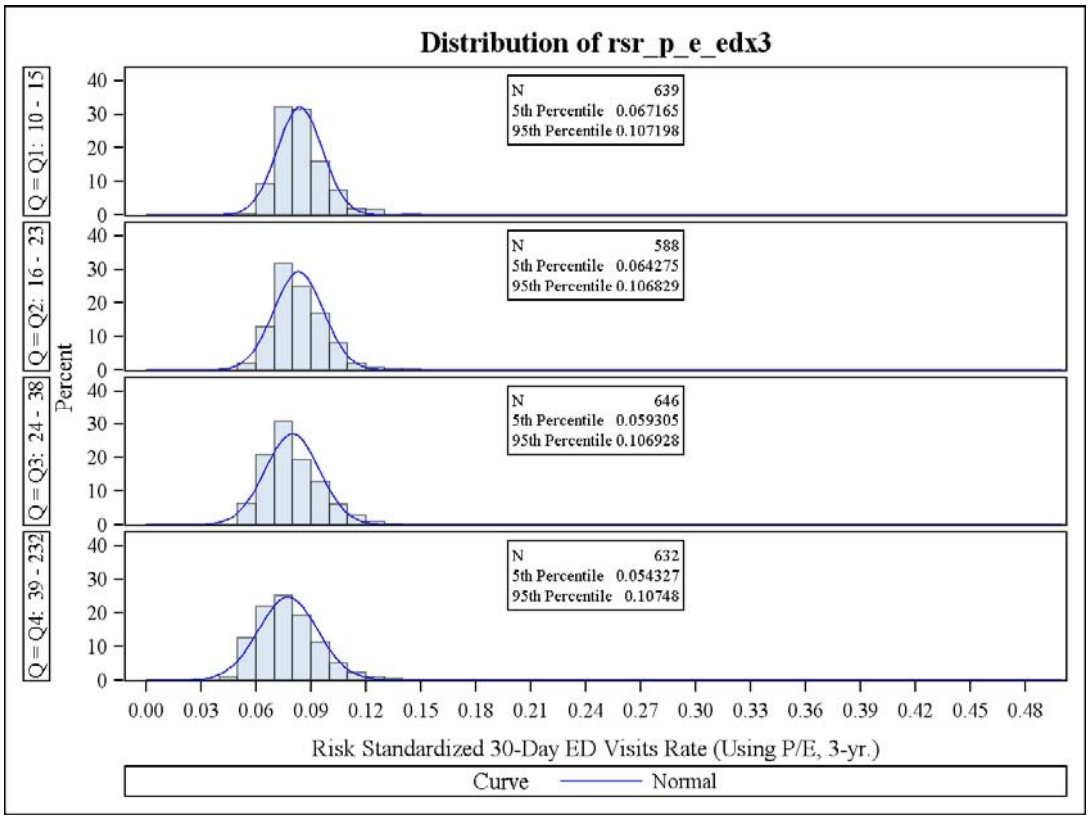


Figure 8: : Distribution of Hospital Risk Adjusted 30-Day Heart Failure ED Visit Rates (Using P/E Method, Three-Year – 2004-6) -- By Hospital HF Volume Quartile



AMI post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2004	78650	CHEST PAIN NOS	263	7.15	263	7.15
2004	4280	CHF NOS	189	5.14	452	12.29
2004	78659	CHEST PAIN NEC	150	4.08	602	16.37
2004	4275	CARDIAC ARREST	128	3.48	730	19.85
2004	5990	URIN TRACT INFECTION NOS	88	2.39	818	22.24
2004	7802	SYNCOPE AND COLLAPSE	75	2.04	893	24.28
2004	7847	EPISTAXIS	62	1.69	955	25.97
2004	78609	RESPIRATORY ABNORM NEC	62	1.69	1,017	27.65
2004	7804	DIZZINESS AND GIDDINESS	57	1.55	1,074	29.20
2004	78820	RETENTION URINE NOS	55	1.50	1,129	30.70
2004	78079	MALAISE AND FATIGUE NEC	49	1.33	1,178	32.03
2004	41401	CRNRY ATHRSCL NATVE VSSL	48	1.31	1,226	33.33
2004	7295	PAIN IN LIMB	44	1.20	1,270	34.53
2004	486	PNEUMONIA, ORGANISM NOS	42	1.14	1,312	35.67
2004	4019	HYPERTENSION NOS	42	1.14	1,354	36.81
2004	25080	DMII OTH NT ST UNCNTRLD	41	1.11	1,395	37.93
2004	78652	PAINFUL RESPIRATION	41	1.11	1,436	39.04
2004	4139	ANGINA PECTORIS NEC/NOS	37	1.01	1,473	40.05
2004	2765	HYPOVOLEMIA	36	0.98	1,509	41.03
2004	41400	COR ATH UNSP VSL NTV/GFT	36	0.98	1,545	42.01
2004	42789	CARDIAC DYSRHYTHMIAS NEC	31	0.84	1,576	42.85
2004	78605	SHORTNESS OF BREATH	31	0.84	1,607	43.69
2004	42731	ATRIAL FIBRILLATION	29	0.79	1,636	44.48
2004	78900	ABDMNAL PAIN UNSPCF SITE	29	0.79	1,665	45.27
2004	920	CONTUSION FACE/SCALP/NCK	28	0.76	1,693	46.03
2004	7851	PALPITATIONS	28	0.76	1,721	46.79
2004	78701	NAUSEA WITH VOMITING	28	0.76	1,749	47.55
2004	4111	INTERMED CORONARY SYND	27	0.73	1,776	48.29
2004	49121	OBS CHR BRONC W(AC) EXAC	26	0.71	1,802	48.99
2004	56400	CONSTIPATION NOS	25	0.68	1,827	49.67
2004	5589	NONINF GASTROENTERIT NEC	24	0.65	1,851	50.33

AMI post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2005	78650	CHEST PAIN NOS	264	7.50	264	7.50
2005	4280	CHF NOS	178	5.06	442	12.56
2005	78659	CHEST PAIN NEC	155	4.40	597	16.96
2005	4275	CARDIAC ARREST	116	3.30	713	20.26
2005	5990	URIN TRACT INFECTION NOS	75	2.13	788	22.39
2005	7847	EPISTAXIS	72	2.05	860	24.43
2005	78609	RESPIRATORY ABNORM NEC	64	1.82	924	26.25
2005	7802	SYNCOPE AND COLLAPSE	63	1.79	987	28.04
2005	25080	DMII OTH NT ST UNCNTRLD	57	1.62	1,044	29.66
2005	7295	PAIN IN LIMB	56	1.59	1,100	31.25
2005	7804	DIZZINESS AND GIDDINESS	54	1.53	1,154	32.78
2005	4139	ANGINA PECTORIS NEC/NOS	49	1.39	1,203	34.18
2005	78079	MALAISE AND FATIGUE NEC	49	1.39	1,252	35.57
2005	78605	SHORTNESS OF BREATH	44	1.25	1,296	36.82
2005	78820	RETENTION URINE NOS	41	1.16	1,337	37.98
2005	41401	CRNRY ATHRSCL NATVE VSSL	39	1.11	1,376	39.09
2005	486	PNEUMONIA, ORGANISM NOS	38	1.08	1,414	40.17
2005	56400	CONSTIPATION NOS	38	1.08	1,452	41.25
2005	41400	COR ATH UNSP VSL NTV/GFT	37	1.05	1,489	42.30
2005	78652	PAINFUL RESPIRATION	35	0.99	1,524	43.30
2005	4019	HYPERTENSION NOS	34	0.97	1,558	44.26
2005	4111	INTERMED CORONARY SYND	34	0.97	1,592	45.23
2005	42731	ATRIAL FIBRILLATION	31	0.88	1,623	46.11
2005	42789	CARDIAC DYSRHYTHMIAS NEC	31	0.88	1,654	46.99
2005	2765	HYPOVOLEMIA	28	0.80	1,682	47.78
2005	78900	ABDMNAL PAIN UNSPCF SITE	25	0.71	1,707	48.49
2005	4359	TRANS CEREB ISCHEMIA NOS	24	0.68	1,731	49.18
2005	4589	HYPOTENSION NOS	24	0.68	1,755	49.86
2005	5997	HEMATURIA	24	0.68	1,779	50.54

AMI post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2006	78650	CHEST PAIN NOS	229	7.38	229	7.38
2006	78659	CHEST PAIN NEC	156	5.03	385	12.40
2006	4280	CHF NOS	138	4.45	523	16.85
2006	4275	CARDIAC ARREST	100	3.22	623	20.07
2006	7847	EPISTAXIS	72	2.32	695	22.39
2006	5990	URIN TRACT INFECTION NOS	67	2.16	762	24.55
2006	7802	SYNCOPE AND COLLAPSE	66	2.13	828	26.68
2006	78079	MALAISE AND FATIGUE NEC	65	2.09	893	28.77
2006	78609	RESPIRATORY ABNORM NEC	50	1.61	943	30.38
2006	4139	ANGINA PECTORIS NEC/NOS	42	1.35	985	31.73
2006	78820	RETENTION URINE NOS	42	1.35	1,027	33.09
2006	25080	DMII OTH NT ST UNCNTRLD	39	1.26	1,066	34.34
2006	56400	CONSTIPATION NOS	39	1.26	1,105	35.60
2006	78605	SHORTNESS OF BREATH	38	1.22	1,143	36.82
2006	4019	HYPERTENSION NOS	37	1.19	1,180	38.02
2006	41401	CRNRY ATHRSCL NATVE VSSL	37	1.19	1,217	39.21
2006	7804	DIZZINESS AND GIDDINESS	33	1.06	1,250	40.27
2006	78652	PAINFUL RESPIRATION	33	1.06	1,283	41.33
2006	7295	PAIN IN LIMB	31	1.00	1,314	42.33
2006	27651	DEHYDRATION	31	1.00	1,345	43.33
2006	78900	ABDMNAL PAIN UNSPCF SITE	29	0.93	1,374	44.27
2006	99812	HEMATOMA COMPLIC PROC	28	0.90	1,402	45.17
2006	7851	PALPITATIONS	27	0.87	1,429	46.04
2006	42731	ATRIAL FIBRILLATION	27	0.87	1,456	46.91
2006	486	PNEUMONIA, ORGANISM NOS	24	0.77	1,480	47.68
2006	7823	EDEMA	24	0.77	1,504	48.45
2006	5997	HEMATURIA	22	0.71	1,526	49.16
2006	4111	INTERMED CORONARY SYND	21	0.68	1,547	49.84
2006	5589	NONINF GASTROENTERIT NEC	21	0.68	1,568	50.52

AMI post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2007	78650	CHEST PAIN NOS	218	7.59	218	7.59
2007	78659	CHEST PAIN NEC	138	4.81	356	12.40
2007	4280	CHF NOS	122	4.25	478	16.64
2007	4275	CARDIAC ARREST	89	3.10	567	19.74
2007	5990	URIN TRACT INFECTION NOS	65	2.26	632	22.01
2007	7847	EPISTAXIS	63	2.19	695	24.20
2007	78079	MALAISE AND FATIGUE NEC	60	2.09	755	26.29
2007	7802	SYNCOPE AND COLLAPSE	59	2.05	814	28.34
2007	78609	RESPIRATORY ABNORM NEC	53	1.85	867	30.19
2007	25080	DMII OTH NT ST UNCNTRLD	49	1.71	916	31.89
2007	4019	HYPERTENSION NOS	44	1.53	960	33.43
2007	7804	DIZZINESS AND GIDDINESS	41	1.43	1,001	34.85
2007	41401	CRNRY ATHRSCL NATVE VSSL	37	1.29	1,038	36.14
2007	78820	RETENTION URINE NOS	37	1.29	1,075	37.43
2007	7295	PAIN IN LIMB	35	1.22	1,110	38.65
2007	78605	SHORTNESS OF BREATH	31	1.08	1,141	39.73
2007	78652	PAINFUL RESPIRATION	31	1.08	1,172	40.81
2007	4589	HYPOTENSION NOS	30	1.04	1,202	41.85
2007	4139	ANGINA PECTORIS NEC/NOS	28	0.97	1,230	42.83
2007	56400	CONSTIPATION NOS	27	0.94	1,257	43.77
2007	42731	ATRIAL FIBRILLATION	26	0.91	1,283	44.67
2007	49121	OBS CHR BRONC W(AC) EXAC	26	0.91	1,309	45.58
2007	486	PNEUMONIA, ORGANISM NOS	25	0.87	1,334	46.45
2007	5997	HEMATURIA	24	0.84	1,358	47.28
2007	7851	PALPITATIONS	22	0.77	1,380	48.05
2007	920	CONTUSION FACE/SCALP/NCK	21	0.73	1,401	48.78
2007	41400	COR ATH UNSP VSL NTV/GFT	21	0.73	1,422	49.51
2007	78900	ABDMNAL PAIN UNSPCF SITE	21	0.73	1,443	50.24

HF post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2004	4280	CHF NOS	978	12.67	978	12.67
2004	78650	CHEST PAIN NOS	225	2.91	1,203	15.58
2004	78609	RESPIRATORY ABNORM NEC	216	2.80	1,419	18.38
2004	4275	CARDIAC ARREST	204	2.64	1,623	21.03
2004	5990	URIN TRACT INFECTION NOS	173	2.24	1,796	23.27
2004	78079	MALAISE AND FATIGUE NEC	148	1.92	1,944	25.18
2004	78605	SHORTNESS OF BREATH	148	1.92	2,092	27.10
2004	7847	EPISTAXIS	147	1.90	2,239	29.01
2004	78659	CHEST PAIN NEC	141	1.83	2,380	30.83
2004	7802	SYNCOPE AND COLLAPSE	133	1.72	2,513	32.56
2004	49121	OBS CHR BRONC W(AC) EXAC	129	1.67	2,642	34.23
2004	25080	DMII OTH NT ST UNCNTRLD	104	1.35	2,746	35.57
2004	2765	HYPOVOLEMIA	102	1.32	2,848	36.90
2004	78820	RETENTION URINE NOS	95	1.23	2,943	38.13
2004	56400	CONSTIPATION NOS	94	1.22	3,037	39.34
2004	42731	ATRIAL FIBRILLATION	92	1.19	3,129	40.54
2004	7804	DIZZINESS AND GIDDINESS	90	1.17	3,219	41.70
2004	920	CONTUSION FACE/SCALP/NCK	87	1.13	3,306	42.83
2004	78900	ABDMNAL PAIN UNSPCF SITE	80	1.04	3,386	43.87
2004	486	PNEUMONIA, ORGANISM NOS	67	0.87	3,453	44.73
2004	7823	EDEMA	67	0.87	3,520	45.60
2004	4019	HYPERTENSION NOS	60	0.78	3,580	46.38
2004	78652	PAINFUL RESPIRATION	56	0.73	3,636	47.10
2004	5997	HEMATURIA	53	0.69	3,689	47.79
2004	496	CHR AIRWAY OBSTRUCT NEC	52	0.67	3,741	48.46
2004	7295	PAIN IN LIMB	51	0.66	3,792	49.13
2004	7242	LUMBAGO	46	0.60	3,838	49.72
2004	4589	HYPOTENSION NOS	45	0.58	3,883	50.30

HF post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2005	4280	CHF NOS	868	11.15	868	11.15
2005	78650	CHEST PAIN NOS	244	3.13	1,112	14.29
2005	78609	RESPIRATORY ABNORM NEC	209	2.68	1,321	16.97
2005	4275	CARDIAC ARREST	207	2.66	1,528	19.63
2005	5990	URIN TRACT INFECTION NOS	199	2.56	1,727	22.19
2005	7847	EPISTAXIS	161	2.07	1,888	24.25
2005	78605	SHORTNESS OF BREATH	156	2.00	2,044	26.26
2005	78079	MALAISE AND FATIGUE NEC	149	1.91	2,193	28.17
2005	25080	DMII OTH NT ST UNCNTRLD	139	1.79	2,332	29.96
2005	7802	SYNCOPE AND COLLAPSE	133	1.71	2,465	31.67
2005	49121	OBS CHR BRONC W(AC) EXAC	126	1.62	2,591	33.29
2005	78659	CHEST PAIN NEC	126	1.62	2,717	34.90
2005	56400	CONSTIPATION NOS	101	1.30	2,818	36.20
2005	2765	HYPOVOLEMIA	92	1.18	2,910	37.38
2005	920	CONTUSION FACE/SCALP/NCK	91	1.17	3,001	38.55
2005	42731	ATRIAL FIBRILLATION	91	1.17	3,092	39.72
2005	78820	RETENTION URINE NOS	91	1.17	3,183	40.89
2005	486	PNEUMONIA, ORGANISM NOS	89	1.14	3,272	42.03
2005	7804	DIZZINESS AND GIDDINESS	88	1.13	3,360	43.17
2005	78900	ABDMNAL PAIN UNSPCF SITE	82	1.05	3,442	44.22
2005	4019	HYPERTENSION NOS	79	1.01	3,521	45.23
2005	4589	HYPOTENSION NOS	70	0.90	3,591	46.13
2005	7295	PAIN IN LIMB	65	0.84	3,656	46.97
2005	7823	EDEMA	63	0.81	3,719	47.78
2005	496	CHR AIRWAY OBSTRUCT NEC	61	0.78	3,780	48.56
2005	4660	ACUTE BRONCHITIS	59	0.76	3,839	49.32
2005	8730	OPEN WOUND OF SCALP	56	0.72	3,895	50.04

HF post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2006	4280	CHF NOS	834	11.93	834	11.93
2006	78650	CHEST PAIN NOS	224	3.20	1,058	15.14
2006	4275	CARDIAC ARREST	211	3.02	1,269	18.15
2006	78609	RESPIRATORY ABNORM NEC	208	2.98	1,477	21.13
2006	5990	URIN TRACT INFECTION NOS	187	2.68	1,664	23.81
2006	25080	DMII OTH NT ST UNCNTRLD	144	2.06	1,808	25.87
2006	7847	EPISTAXIS	140	2.00	1,948	27.87
2006	7802	SYNCOPE AND COLLAPSE	131	1.87	2,079	29.74
2006	78079	MALAISE AND FATIGUE NEC	127	1.82	2,206	31.56
2006	78605	SHORTNESS OF BREATH	113	1.62	2,319	33.18
2006	78659	CHEST PAIN NEC	111	1.59	2,430	34.76
2006	78820	RETENTION URINE NOS	96	1.37	2,526	36.14
2006	49121	OBS CHR BRONC W(AC) EXAC	93	1.33	2,619	37.47
2006	27651	DEHYDRATION	88	1.26	2,707	38.73
2006	56400	CONSTIPATION NOS	81	1.16	2,788	39.89
2006	7804	DIZZINESS AND GIDDINESS	80	1.14	2,868	41.03
2006	920	CONTUSION FACE/SCALP/NCK	76	1.09	2,944	42.12
2006	78900	ABDMNAL PAIN UNSPCF SITE	74	1.06	3,018	43.18
2006	42731	ATRIAL FIBRILLATION	69	0.99	3,087	44.16
2006	7823	EDEMA	68	0.97	3,155	45.14
2006	486	PNEUMONIA, ORGANISM NOS	67	0.96	3,222	46.09
2006	4019	HYPERTENSION NOS	57	0.82	3,279	46.91
2006	7295	PAIN IN LIMB	56	0.80	3,335	47.71
2006	5589	NONINF GASTROENTERIT NEC	51	0.73	3,386	48.44
2006	95901	HEAD INJURY NOS	48	0.69	3,434	49.13
2006	496	CHR AIRWAY OBSTRUCT NEC	47	0.67	3,481	49.80
2006	4589	HYPOTENSION NOS	46	0.66	3,527	50.46

HF post-30 OP ED Primary Dx (5-digit)

Year	dgns_cd1	Dx1_Desc	Freq	Pct	Cum Freq	Cum Pct
2007	4280	CHF NOS	675	11.22	675	11.22
2007	78650	CHEST PAIN NOS	183	3.04	858	14.26
2007	78609	RESPIRATORY ABNORM NEC	173	2.88	1,031	17.14
2007	5990	URIN TRACT INFECTION NOS	165	2.74	1,196	19.88
2007	4275	CARDIAC ARREST	153	2.54	1,349	22.43
2007	25080	DMII OTH NT ST UNCNTRLD	125	2.08	1,474	24.51
2007	7847	EPISTAXIS	121	2.01	1,595	26.52
2007	78605	SHORTNESS OF BREATH	111	1.85	1,706	28.36
2007	78079	MALAISE AND FATIGUE NEC	109	1.81	1,815	30.17
2007	78659	CHEST PAIN NEC	94	1.56	1,909	31.74
2007	7802	SYNCOPE AND COLLAPSE	80	1.33	1,989	33.07
2007	42731	ATRIAL FIBRILLATION	80	1.33	2,069	34.40
2007	49121	OBS CHR BRONC W(AC) EXAC	79	1.31	2,148	35.71
2007	27651	DEHYDRATION	78	1.30	2,226	37.01
2007	920	CONTUSION FACE/SCALP/NCK	75	1.25	2,301	38.25
2007	78820	RETENTION URINE NOS	74	1.23	2,375	39.48
2007	7804	DIZZINESS AND GIDDINESS	69	1.15	2,444	40.63
2007	78900	ABDMNAL PAIN UNSPCF SITE	68	1.13	2,512	41.76
2007	56400	CONSTIPATION NOS	66	1.10	2,578	42.86
2007	486	PNEUMONIA, ORGANISM NOS	62	1.03	2,640	43.89
2007	7823	EDEMA	58	0.96	2,698	44.85
2007	7295	PAIN IN LIMB	55	0.91	2,753	45.77
2007	4019	HYPERTENSION NOS	53	0.88	2,806	46.65
2007	95901	HEAD INJURY NOS	52	0.86	2,858	47.51
2007	496	CHR AIRWAY OBSTRUCT NEC	43	0.71	2,901	48.23
2007	4589	HYPOTENSION NOS	43	0.71	2,944	48.94
2007	78097	ALTERED MENTAL STATUS	43	0.71	2,987	49.66
2007	78652	PAINFUL RESPIRATION	40	0.67	3,027	50.32

Selected providers having 2006 AMI Index Admissions with a post-30 OP ED Visit

Year=2006 Provider A

dgns_cd1	Dx1_Description	Freq	Pct	Cum Freq	Cum Pct
2141	LIPOMA SKIN NEC	1	7.69	1	7.69
4139	ANGINA PECTORIS NEC/NOS	1	7.69	2	15.38
41401	CRNRY ATHRSCL NATVE VSSL	1	7.69	3	23.08
4280	CHF NOS	1	7.69	4	30.77
4619	ACUTE SINUSITIS NOS	1	7.69	5	38.46
490	BRONCHITIS NOS	1	7.69	6	46.15
7840	HEADACHE	1	7.69	7	53.85
78650	CHEST PAIN NOS	1	7.69	8	61.54
78900	ABDMNAL PAIN UNSPCF SITE	1	7.69	9	69.23
78902	ABDMNAL PAIN LFT UP QUAD	1	7.69	10	76.92
99674	COMP-OTH VASC DEV/GRAFT	1	7.69	11	84.62
99811	HEMORRHAGE COMPLIC PROC	1	7.69	12	92.31
V583	ATTEN-SURG DRESSNG/SUTUR	1	7.69	13	100

Year=2006 Provider B

dgns_cd1	Dx1_Description	Freq	Pct	Cum Freq	Cum Pct
78650	CHEST PAIN NOS	3	25	3	25
4280	CHF NOS	2	16.67	5	41.67
4239	PERICARDIAL DISEASE NOS	1	8.33	6	50
4589	HYPOTENSION NOS	1	8.33	7	58.33
53081	ESOPHAGEAL REFLUX	1	8.33	8	66.67
6823	CELLULITIS OF ARM	1	8.33	9	75
78609	RESPIRATORY ABNORM NEC	1	8.33	10	83.33
78652	PAINFUL RESPIRATION	1	8.33	11	91.67
78659	CHEST PAIN NEC	1	8.33	12	100

Year=2006 Provider C

dgns_cd1	Dx1_Description	Freq	Pct	Cum Freq	Cum Pct
41401	CRNRY ATHRSCL NATVE VSSL	2	16.67	2	16.67
78650	CHEST PAIN NOS	2	16.67	4	33.33
78659	CHEST PAIN NEC	2	16.67	6	50
3698	VISUAL LOSS, ONE EYE NOS	1	8.33	7	58.33
41091	AMI NOS, INITIAL	1	8.33	8	66.67
4280	CHF NOS	1	8.33	9	75
4359	TRANS CEREB ISCHEMIA NOS	1	8.33	10	83.33
5119	PLEURAL EFFUSION NOS	1	8.33	11	91.67
7820	SKIN SENSATION DISTURB	1	8.33	12	100

Selected providers having 2006 HF Index Admissions with a post-30 OP ED Visit

Year=2006 Provider D

dgns_cd1	Dx1_Description	Freq	Pct	Cum Freq	Cum Pct
4280	CHF NOS	3	17.65	3	17.65
4275	CARDIAC ARREST	2	11.76	5	29.41
78609	RESPIRATORY ABNORM NEC	2	11.76	7	41.18
486	PNEUMONIA, ORGANISM NOS	1	5.88	8	47.06
5990	URIN TRACT INFECTION NOS	1	5.88	9	52.94
7802	SYNCOPE AND COLLAPSE	1	5.88	10	58.82
7804	DIZZINESS AND GIDDINESS	1	5.88	11	64.71
7821	NONSPECIF SKIN ERUPT NEC	1	5.88	12	70.59
87342	OPEN WOUND OF FOREHEAD	1	5.88	13	76.47
920	CONTUSION FACE/SCALP/NCK	1	5.88	14	82.35
92231	BACK CONTUSION	1	5.88	15	88.24
9248	MULTIPLE CONTUSIONS NEC	1	5.88	16	94.12
9778	POISON-MEDICINAL AGT NEC	1	5.88	17	100

Year=2006 Provider E

dgns_cd1	Dx1_Description	Frequency	Percent	Cum Freq	Cum Pct
4280	CHF NOS	3	20	3	20
4241	AORTIC VALVE DISORDER	1	6.67	4	26.67
4254	PRIM CARDIOMYOPATHY NEC	1	6.67	5	33.33
4580	ORTHOSTATIC HYPOTENSION	1	6.67	6	40
4659	ACUTE URI NOS	1	6.67	7	46.67
5990	URIN TRACT INFECTION NOS	1	6.67	8	53.33
71941	JOINT PAIN-SHLDER	1	6.67	9	60
78099	OTHER GENERAL SYMPTOMS	1	6.67	10	66.67
78609	RESPIRATORY ABNORM NEC	1	6.67	11	73.33
78650	CHEST PAIN NOS	1	6.67	12	80
78652	PAINFUL RESPIRATION	1	6.67	13	86.67
99672	COMP-OTH CARDIAC DEVICE	1	6.67	14	93.33
V5881	FIT/ADJ VASCULAR CATHETR	1	6.67	15	100

Year=2006 Provider F

dgns_cd1	Dx1_Description	Freq	Pct	Cum Freq	Cum Pct
25080	DMII OTH NT ST UNCNTRLD	2	14.29	2	14.29
4280	CHF NOS	2	14.29	4	28.57
49121	OBS CHR BRONC W(AC) EXAC	2	14.29	6	42.86
25000	DMII WO CMP NT ST UNCNTR	1	7.14	7	50
5990	URIN TRACT INFECTION NOS	1	7.14	8	57.14
78820	RETENTION URINE NOS	1	7.14	9	64.29
81221	FX HUMERUS SHAFT-CLOSED	1	7.14	10	71.43
8470	SPRAIN OF NECK	1	7.14	11	78.57
9221	CONTUSION OF CHEST WALL	1	7.14	12	85.71
95901	HEAD INJURY NOS	1	7.14	13	92.86
99673	COMP-REN DIALYS DEV/GRFT	1	7.14	14	100

Mean AMI and HF Hospital Measure Scores by Race Quartile													
	Mean Readmission			Mean ED			Mean E&M			Mean Composite		
Race Quartile	**White**	**Black**	**Other***	**White**	**Black**	**Other**	**White**	**Black**	**Other**	**White**	**Black**	**Other**
AMI												
First	0.21	0.20	0.20	0.08	0.09	0.08	0.82	0.81	0.80	0.00	0.00	-0.02
Second	0.20	0.20	0.20	0.08	0.08	0.08	0.82	0.82	0.82	0.01	0.01	0.00
Third	0.20	0.21	0.20	0.08	0.08	0.08	0.82	0.82	0.82	0.00	0.01	0.01
Fourth	0.20	0.21	0.21	0.09	0.08	0.08	0.81	0.81	0.83	0.00	-0.01	0.01
HF												
First	0.22	0.22	0.22	0.08	0.08	0.08	0.80	0.81	0.80	-0.02	0.01	-0.02
Second	0.22	0.22	0.22	0.08	0.08	0.08	0.82	0.82	0.81	0.00	0.01	0.01
Third	0.22	0.22	0.22	0.08	0.08	0.08	0.82	0.82	0.82	0.02	0.01	0.01
Fourth	0.22	0.22	0.22	0.08	0.08	0.08	0.81	0.80	0.82	0.01	-0.02	0.01
* Other = 1 - (White + Black)												
Race Quartile is the ranking of hospitals for each measure by the cross-tab, the first is the lowest quartile and fourth is the highest. The reported rate is the mean within quartile for each race.												

Composite Scores, With Component Scores
Heart Failure
Representative Sample of Hospitals

	Risk Standardized Rates			Contribution to Composite Score			
Composite Score	Readmissions (Pop. Mean: 0.220)	ED Visits (Pop. Mean: 0.081)	E&M Services (Pop. Mean: 0.765)	Readmissions	ED Visits	E&M Services	Number of Index Admissions
0.199	0.190	0.051	0.782	0.120	0.061	0.017	189
0.164	0.206	0.070	0.851	0.056	0.022	0.086	92
0.145	0.201	0.063	0.799	0.075	0.036	0.034	87
0.131	0.205	0.071	0.814	0.060	0.021	0.050	48
0.119	0.214	0.067	0.829	0.026	0.029	0.064	149
0.111	0.217	0.062	0.825	0.012	0.039	0.060	124
0.103	0.208	0.053	0.764	0.049	0.056	-0.001	137
0.096	0.193	0.078	0.744	0.110	0.006	-0.020	168
0.087	0.201	0.070	0.755	0.076	0.021	-0.010	34
0.081	0.207	0.087	0.805	0.052	-0.011	0.041	38
0.075	0.220	0.066	0.810	0.000	0.029	0.046	60
0.069	0.208	0.093	0.811	0.047	-0.024	0.046	136
0.063	0.209	0.068	0.760	0.043	0.025	-0.005	112
0.058	0.218	0.068	0.786	0.009	0.027	0.021	71
0.052	0.208	0.083	0.772	0.048	-0.004	0.008	57
0.047	0.212	0.071	0.758	0.034	0.020	-0.007	130
0.042	0.219	0.072	0.784	0.004	0.019	0.019	84
0.038	0.201	0.084	0.734	0.075	-0.006	-0.031	54
0.033	0.203	0.080	0.727	0.067	0.003	-0.038	51
0.028	0.209	0.072	0.731	0.044	0.018	-0.034	213
0.025	0.212	0.084	0.762	0.032	-0.005	-0.003	151
0.021	0.216	0.091	0.789	0.016	-0.019	0.024	83
0.017	0.217	0.086	0.780	0.012	-0.010	0.015	39
0.013	0.215	0.085	0.766	0.018	-0.007	0.001	42
0.009	0.234	0.064	0.795	-0.056	0.034	0.031	36
0.004	0.218	0.092	0.783	0.008	-0.021	0.018	72
0.001	0.218	0.077	0.751	0.007	0.007	-0.014	44
-0.004	0.227	0.062	0.749	-0.026	0.038	-0.016	201
-0.009	0.208	0.108	0.761	0.049	-0.054	-0.003	28
-0.012	0.230	0.072	0.774	-0.040	0.019	0.009	73
-0.018	0.226	0.081	0.770	-0.023	-0.000	0.006	47
-0.022	0.214	0.087	0.730	0.025	-0.012	-0.035	47
-0.027	0.214	0.092	0.735	0.025	-0.022	-0.030	277
-0.033	0.213	0.106	0.753	0.029	-0.051	-0.011	84
-0.038	0.227	0.070	0.731	-0.027	0.023	-0.034	108
-0.043	0.239	0.052	0.742	-0.077	0.058	-0.023	217
-0.048	0.217	0.079	0.699	0.014	0.004	-0.066	102
-0.054	0.219	0.084	0.711	0.005	-0.006	-0.053	42
-0.060	0.237	0.077	0.763	-0.066	0.008	-0.002	132
-0.068	0.231	0.069	0.716	-0.044	0.025	-0.049	109
-0.075	0.219	0.092	0.705	0.006	-0.022	-0.059	72
-0.082	0.237	0.074	0.733	-0.066	0.015	-0.031	80
-0.090	0.238	0.085	0.752	-0.070	-0.008	-0.012	29
-0.099	0.260	0.049	0.758	-0.158	0.065	-0.006	204
-0.110	0.246	0.070	0.734	-0.102	0.022	-0.031	51
-0.121	0.235	0.085	0.713	-0.062	-0.008	-0.052	112
-0.136	0.240	0.068	0.683	-0.080	0.026	-0.081	243
-0.151	0.232	0.106	0.712	-0.048	-0.051	-0.053	94
-0.182	0.254	0.098	0.750	-0.134	-0.034	-0.015	139
-0.236	0.267	0.085	0.723	-0.187	-0.007	-0.042	54

COLOR KEY
Green: Score in best (dark) or second best (light) quintiles
Red: Sscore in worst (dark) or second worst (light) quintiles

To create the sample, hospitals were first ranked by composite score. Starting with the highest score, the 25th hospital and every 50th hospital after that were selected.

Changes in Rates Sufficient to Move Hospitals to Neighboring Quintile Categories

Supplemental Analysis for NQF Review of Care Transitions Composite Measure

2/23/2010

A question arising from the previous table is how much each hospital's performance on its measures would have to change for the hospital to move to some neighboring quintile category. In order to provide an answer to this question, we selected five hospitals with combination scores in the middle of each of the quintile examples (denoting them as hospitals A, B, C, D, and E) and calculated how much each of their measures would have to alter to move the hospital to another quintile (obviously, hospital A in the top quintile could not move up and hospital E in the bottom quintile could not move down, but otherwise the hospitals could move either up or down, if their performance on a measure or group of measures changed sufficiently).

Table 1 gives the individual measures for the five hospitals selected for illustration.

Table 1: Rates and Quintile Category for Example Hospitals

Hospital	Readmission rate (μ=22.0%)	ED rate (μ=8.1%)	E&M rate (μ=76.5%)	Quintile Category
A	21.4%	6.7%	82.9%	5 star
B	20.8%	8.3%	77.2%	4 star
C	23.4%	6.4%	79.5%	3 star
D	22.7%	7.0%	73.1%	2 star
E	24.6%	7.0%	73.4%	1 star

We should note that the quintile categories of these example hospitals do not align with any individual measure, including the readmission rate which has the highest weight and makes the largest individual contribution. Each hospital's combined overall score and resulting quintile category is a function of all individual measures and not overly dependent on any single one. Even the E&M measure, which has a weight only ¼ as large as the readmission rate makes an important contribution to the overall score, no doubt due to its large variation.

Change in Readmission Rate

Table 2 lists each hospital's observed readmission rate and indicates how much of a change in rate would be needed to move the hospital into an adjacent quintile. The table indicates that reasonably small changes in readmission rates by hospitals (i.e., from .4% to 1.0%) would facilitate a move into a higher or lower quintile category. Of the eight example scenarios, only one - hospital B's lowering its readmission rate by .7% to 20.1% - would result in a readmission rate outside the current range formed by all five hospitals. This indicates how sensitive the quintile ranking might be to an individual measure and

how a reasonably small change might be enough to move the hospital either up or down one ranking.

Table 2: Changes in Readmission Rate Sufficient to Move Hospitals

Hospital	Readmission rate (μ=22.0%)	Current Category	Change to move up to higher quintile	Change to move down to lower quintile
A	21.4%	5 star	--	1.0%
B	20.8%	4 star	-0.7%	0.6%
C	23.4%	3 star	-0.4%	0.7%
D	22.7%	2 star	-0.6%	0.8%
E	24.6%	1 star	-1.0%	--

Change in Emergency Department Rate

Table 3 similarly lists each hospital's observed rate of ambulatory visits to emergency departments and the changes needed to move hospitals to another quintile. The table shows that the changes in ED visit rates prompting such moves would have to be significantly larger (i.e. from .8% to 2.0%), and that in many cases the resulting ED rates would be outside the current range of 6.4% to 8.3%. Due to their lower values and a corresponding smaller variation, the ED measures produce a smaller, albeit still important impact on quintile rankings.

Table 3: Changes in Emergency Department Rate Sufficient to Move Hospitals

Hospital	Emergency Department rate (μ=8.1%)	Current Category	Change to move up to higher quintile	Change to move down to lower quintile
A	6.7%	5 star	--	1.9%
B	8.3%	4 star	-1.3%	1.3%
C	6.4%	3 star	-0.8%	1.2%
D	7.0%	2 star	-1.2%	1.6%
E	7.0%	1 star	-2.0%	--

Change in E&M Rate

Table 4 lists the change in E&M rates needed to move our five example hospitals to neighboring quintiles. It should be noted that because of the way the overall measure is constructed, the sign on the needed changes will be reversed from what they were for ED and readmission rates. Table 4 indicates that changes in E&M rates leading to quintile moves are larger still from any seen before (i.e. from 1.7% to 4.0%). However, because of the large variation in original E&M rates, the resulting rates would still, for the most part, lie within the original range of rates (the one exception is the rate hospital D would need to move it down into the lowest quintile). Obviously, such hypothetical rates would

be feasible and we may conclude that combined, overall scores will be sensitive to their E&M component.

Table 4: Changes in E&M Rate Sufficient to Move Hospitals

Hospital	E&M rate (μ=76.5%)	Current Category	Change to move up to higher quintile	Change to move down to lower quintile
A	82.9%	5 star	--	-3.9%
B	77.2%	4 star	2.6%	-2.5%
C	79.5%	3 star	1.7%	-2.4%
D	73.1%	2 star	2.4%	-3.2%
E	73.4%	1 star	4.0%	--