**National Quality Forum—Composite Measure Testing (subcriteria 2a2, 2b1-2b6)**

**Measure Number** (*if previously endorsed*)**:** 0964

**Composite Measure Title**: CathPCI: Therapy with aspiririn, P2Y12 inhibitor, and statin at discharge composite following PCI

**Date of Submission**: 8/1/2018

**Composite Construction:**

Two or more individual performance measure scores combined into one score

All-or-none measures (e.g., all essential care processes received or outcomes experienced by each patient)

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| **Instructions: Please contact NQF staff before you begin.**   * If a component measure is submitted as an individual performance measure, the non-composite measure testing form must also be completed and attached to the individual measure submission. * Measures must be tested for all the data sources and levels of analyses that are specified. ***If there is more than one set of data specifications or more than one level of analysis, contact NQF staff*** about how to present all the testing information in one form. * **Sections 1, 2a2, 2b1, 2b2, and 2b4 must be completed.** * **For composites with outcome and resource use measures**, section **2b3** also must be completed. * If specified for **multiple data sources/sets of specificaitons** (e.g., claims and EHRs), section **2b5** also must be completed. * Respond to all questions as instructed with answers immediately following the question. All information on testing to demonstrate meeting the subcriteria for reliability (2a2) and validity (2b1-2b6) and composites (2c) must be in this form. An appendix for *supplemental* materials may be submitted, but there is no guarantee it will be reviewed. * If you are unable to check a box, please highlight or shade the box for your response. * Maximum of 25 pages (*incuding questions/instructions;* minimum font size 11 pt; do not change margins). ***Contact NQF staff if more pages are needed.*** * Contact NQF staff regarding questions. Check for resources at [Submitting Standards webpage](http://www.qualityforum.org/Measuring_Performance/Submitting_Standards.aspx). * For information on the most updated guidance on how to address social risk factors variables and testing in this form refer to the release notes for version 7.1 of the Measure Testing Attachment. and the 2017 Measure Evaluation Criteria and Guidance. |

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| **Note:** The information provided in this form is intended to aid the Standing Committee and other stakeholders in understanding to what degree the testing results for this measure meet NQF’s evaluation criteria for testing.  **2a2.** **Reliability testing** [**10**](#Note10) demonstrates the measure data elements are repeatable, producing the same results a high proportion of the time when assessed in the same population in the same time period and/or that the measure score is precise. For **instrument-based measures** (including **PRO-PMs**) **and composite performance measures**, reliability should be demonstrated for the computed performance score.  **2b1.** **Validity testing** [**11**](#Note11) demonstrates that the measure data elements are correct and/or the measure score correctly reflects the quality of care provided, adequately identifying differences in quality. For **instrument based measures (including** **PRO-PMs) and composite performance measures**, validity should be demonstrated for the computed performance score.    **2b2.** Exclusions are supported by the clinical evidence and are of sufficient frequency to warrant inclusion in the specifications of the measure; [**12**](#Note12)  **AND**  If patient preference (e.g., informed decision-making) is a basis for exclusion, there must be evidence that the exclusion impacts performance on the measure; in such cases, the measure must be specified so that the information about patient preference and the effect on the measure is transparent (e.g., numerator category computed separately, denominator exclusion category computed separately). [**13**](#Note13)  **2b3.** **For outcome measures and other measures when indicated** (e.g., resource use):   * **an evidence-based risk-adjustment strategy** (e.g., risk models, risk stratification) is specified; is based on patient factors (including clinical and social risk factors) that influence the measured outcome and are present at start of care; [**14**](#Note14)**,**[**15**](#Note15) and has demonstrated adequate discrimination and calibration   **OR**   * rationale/data support no risk adjustment/ stratification.   **2b4.** Data analysis of computed measure scores demonstrates that methods for scoring and analysis of the specified measure allow for **identification of statistically significant and practically/clinically meaningful** [**16**](#Note16) **differences in performance**;  **OR**  there is evidence of overall less-than-optimal performance.  **2b5.** **If multiple data sources/methods are specified, there is demonstration they produce comparable results**.  **2b6.** Analyses identify the extent and distribution of **missing data** (or nonresponse) and demonstrate that performance results are not biased due to systematic missing data (or differences between responders and nonresponses) and how the specified handling of missing data minimizes bias.  **2c. For composite performance measures, empirical analyses support the composite construction approach and demonstrate that:**  **2c1.** the component measures fit the quality construct and add value to the overall composite while achieving the related objective of parsimony to the extent possible; and  **2c2**.the aggregation and weighting rules are consistent with the quality construct and rationale while achieving the related objective of simplicity to the extent possible.  (*if not conducted or results not adequate, justification must be submitted and accepted)*  **Notes**  **10.** Reliability testing applies to both the data elements and computed measure score. Examples of reliability testing for data elements include, but are not limited to: inter-rater/abstractor or intra-rater/abstractor studies; internal consistency for multi-item scales; test-retest for survey items. Reliability testing of the measure score addresses precision of measurement (e.g., signal-to-noise).  **11.** Validity testing applies to both the data elements and computed measure score. Validity testing of data elements typically analyzes agreement with another authoritative source of the same information. Examples of validity testing of the measure score include, but are not limited to: testing hypotheses that the measures scores indicate quality of care, e.g., measure scores are different for groups known to have differences in quality assessed by another valid quality measure or method; correlation of measure scores with another valid indicator of quality for the specific topic; or relationship to conceptually related measures (e.g., scores on process measures to scores on outcome measures). Face validity of the measure score as a quality indicator may be adequate if accomplished through a systematic and transparent process, by identified experts, and explicitly addresses whether performance scores resulting from the measure as specified can be used to distinguish good from poor quality. The degree of consensus and any areas of disagreement must be provided/discussed.  **12.** Examples of evidence that an exclusion distorts measure results include, but are not limited to: frequency of occurrence, variability of exclusions across providers, and sensitivity analyses with and without the exclusion.  **13.** Patient preference is not a clinical exception to eligibility and can be influenced by provider interventions.  **14.** Risk factors that influence outcomes should not be specified as exclusions.  **15.** With large enough sample sizes, small differences that are statistically significant may or may not be practically or clinically meaningful. The substantive question may be, for example, whether a statistically significant difference of one percentage point in the percentage of patients who received smoking cessation counseling (e.g., 74 percent v. 75 percent) is clinically meaningful; or whether a statistically significant difference of $25 in cost for an episode of care (e.g., $5,000 v. $5,025) is practically meaningful. Measures with overall less-than-optimal performance may not demonstrate much variability across providers. |

**1. DATA/SAMPLE USED FOR ALL TESTING OF THIS MEASURE**

*Often the same data are used for all aspects of measure testing. In an effort to eliminate duplication, the first five questions apply to all measure testing. If there are differences by aspect of testing,(e.g., reliability vs. validity) be sure to indicate the specific differences in question 1.7.*

**1.1. What type of data was used for testing**? (*Check all the sources of data identified in the measure specifications and data used for testing the measure*. *Testing must be provided for all the sources of data specified and intended for measure implementation.* ***If different data sources are used for different components in the composite, indicate the component after the checkbox. If different data sources are used for the numerator and denominator, indicate N [numerator] or D [denominator] after the checkbox.***)

|  |  |
| --- | --- |
| **Measure Specified to Use Data From:**  **(*must be consistent with data sources entered in S.17*)** | **Measure Tested with Data From:** |
| abstracted from paper record | abstracted from paper record |
| claims | claims |
| registry | registry |
| abstracted from electronic health record | abstracted from electronic health record |
| eMeasure (HQMF) implemented in EHRs | eMeasure (HQMF) implemented in EHRs |
| other: American Hospital Association | other: American Hospital Association |

**1.2. If an existing dataset was used, identify the specific dataset** (*the dataset used for testing must be consistent with the measure specifications for target population and healthcare entities being measured; e.g., Medicare Part A claims, Medicaid claims, other commercial insurance, nursing home MDS, home health OASIS, clinical registry*).

We used a clinical registry, namely the American College of Cardiology National Cardiovascular Data Registry’s CathPCI Registry. This is a national quality improvement registry in which over 1500 hospitals participate. Some states and healthcare systems mandate participation in the registry. Rigorous quality standards are applied to the data and both quarterly and ad hoc performance reports are generated for participating sites to track and improve their performance.

**1.3. What are the dates of the data used in testing**? 01/2015-12/2016

Discharges between January 2015 to December 2016 were used. Hospital information about the proportion of patients with a primary payer source of Medicaid are derived from American Hospital Association 2010 data.

**1.4. What levels of analysis** **were tested**? (*testing must be provided for all the levels specified and intended for measure implementation, e.g., individual clinician, hospital, health plan*)

|  |  |
| --- | --- |
| **Measure Specified to Measure Performance of:**  **(*must be consistent with levels entered in item S.20*)** | **Measure Tested at Level of:** |
| individual clinician | individual clinician |
| group/practice | group/practice |
| hospital/facility/agency | hospital/facility/agency |
| health plan | health plan |
| other: Click here to describe | other: Click here to describe |

**1.5. How many and which measured entities were included in the testing and analysis (by level of analysis and data source)**? (*identify the number and descriptive characteristics of measured entities included in the analysis (e.g., size, location, type); if a sample was used, describe how entities were selected for inclusion in the sample*)

The overall measured entities, following the application of exclusion criteria, are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 1: Entities Evaluated by Level of Analysis** | | | |
| **Level of Analysis** | **Variable** | **Data Source** | **Number** |
| Patient | Patient Hospital Stay | NCDR CathPCI Registry | 1,386,383 |
| Hospital | Facilities | NCDR CathPCI Registry | 1633 |

**1.6. How many and which patients were included in the testing and analysis (by level of analysis and data source)**? (*identify the number and descriptive characteristics of patients included in the analysis (e.g., age, sex, race, diagnosis); if a sample was used, describe how patients were selected for inclusion in the sample*)

For all the descriptive statistics, we used data collected by the CathPCI Registry between January 2015 and December 2016. Descriptive statistics about the patients included in this dataset are provided below (Table 2):

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2: Selected Characteristics by Calendar Year** | | | | | | | | | | | | | | |
|  |  | | |  | |  | |  |  | |  | |  | |
| **Description** | **Total** | | | | | **Year** | | | | | | | **P** | |
| **2015** | | | **2016** | | | |
| **#** | | | **%** | | **#** | | **%** | **#** | | **%** | |
|  |  | | |  | |  | |  |  | |  | |  | |
| ALL | 1,386,383 | | | 100.00 | | 682,385 | | 100.00 | 703,998 | | 100.00 | |  | |
| **Age>65** |  | | |  | |  | |  |  | |  | | 0.0000 | |
| No | 642,720 | | | 46.36 | | 319,872 | | 46.88 | 322,848 | | 45.86 | |  | |
| Yes | 743,663 | | | 53.64 | | 362,513 | | 53.12 | 381,150 | | 54.14 | |  | |
| **Sex** |  | | |  | |  | |  |  | |  | | 0.1300 | |
| Male | 955,318 | | | 68.91 | | 469,800 | | 68.85 | 485,518 | | 68.97 | |  | |
| Female | 431,065 | | | 31.09 | | 212,585 | | 31.15 | 218,480 | | 31.03 | |  | |
| **Race** |  | | |  | |  | |  |  | |  | | 0.0000 | |
| Hispanic | 84,349 | | | 6.08 | | 40,550 | | 5.94 | 43,799 | | 6.22 | |  | |
| White non-Hispanic | 1,124,342 | | | 81.10 | | 554,961 | | 81.33 | 569,381 | | 80.88 | |  | |
| Black non-Hispanic | 118,374 | | | 8.54 | | 58,512 | | 8.57 | 59,862 | | 8.50 | |  | |
| Other | 59,318 | | | 4.28 | | 28,362 | | 4.16 | 30,956 | | 4.40 | |  | |
| **Insurance** |  | | |  | |  | |  |  | |  | | 0.0000 | |
| Medicare | 744,534 | | | 53.70 | | 363,056 | | 53.20 | 381,478 | | 54.19 | |  | |
| Medicaid or not private | 103,128 | | | 7.44 | | 50,685 | | 7.43 | 52,443 | | 7.45 | |  | |
| Private | 475,450 | | | 34.29 | | 236,654 | | 34.68 | 238,796 | | 33.92 | |  | |
| None | 63,271 | | | 4.56 | | 31,990 | | 4.69 | 31,281 | | 4.44 | |  | |
| **Composite Measure Performance** | |  |  | |  | |  | | |  | |  | | 0.0000 |
| Not Meeting | | 73,620 | 5.31 | | 38877 | | 5.70 | | | 34743 | | 4.94 | |  |
| Meeting | | 1,312,763 | 94.69 | | 643,508 | | 94.30 | | | 669,255 | | 95.06 | |  |

**1.7. If there are differences in the data or sample used for different aspects of testing (e.g., reliability, validity, exclusions, risk adjustment), identify how the data or sample are different for each aspect of testing reported below**.

The datasets, dates, number of measured entities, and number of admissions for all forms of reliability and validity testing were from an uninterrupted 2-year period: 01/2015-12/2016

**1.8 What were the social risk factors that were available and analyzed?** For example, patient-reported data (e.g., income, education, language), proxy variables when social risk data are not collected from each patient (e.g. census tract), or patient community characteristics (e.g. percent vacant housing, crime rate) which do not have to be a proxy for patient-level data.

We attributed social risk factors at the hospital-level for the purposes of this analysis. We used Medicaid insurance status as an economic indicator of social risk. We also examined race/ethnicity, age, and sex to determine if there were differences in these demographic indicators of social risk.

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**2a2. RELIABILITY TESTING**

***Note****: If accuracy/correctness (validity) of data elements was empirically tested*, *separate reliability testing of data elements is not required – in 2a2.1 check critical data elements; in 2a2.2 enter “see section 2b2 for validity testing of data elements”; and skip 2a2.3 and 2a2.4.*

**2a2.1. What level of reliability testing was conducted**? (*may be one or both levels*)

***Note****: Current guidance for composite measure evaluation states that reliability must be demonstrated for the composite performance measure score.*  
 **Performance measure score** (e.g., *signal-to-noise analysis*)  
  
**2a2.2. Describe the method of reliability testing and what it tests** (*describe the steps―do not just name a method; what type of error does it test; what statistical analysis was used*)

**Split Sample Methodology**

For the performance rates and social risk data, raw rates were calculated and a Pearson correlation coefficient was computed.

**2a2.3. What were the statistical results from reliability testing**? (e*.g., percent agreement and kappa for the critical data elements; distribution of reliability statistics from a signal-to-noise analysis*)

**Split Sample Methodology:**

The split samples were calculated during the same timeframe to mitigate confounding factors based on time differences. The cohort was split into two random samples to compare measure scores. The distribution of hospital performance was similar in the two samples (Tables 4 and 5), and there was an extremely high correlation between hospital performance assessed in the two samples (Pearson correlation coefficient: 0.90270).

**Table 4: Split Sample Composition (i.e. Number/proportion of Patients in each sample by Year)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
| **Description** | **Total** | | **Year** | | | | **P-value** |
| **2015** | | **2016** | |
| **#** | **%** | **#** | **%** | **#** | **%** |
| **Random Splitting Samples** |  |  |  |  |  |  | 0.0831 |
| First | 693881 | 50.05 | 342042 | 50.12 | 351839 | 49.98 |  |
| Second | 692502 | 49.95 | 340343 | 49.88 | 352159 | 50.02 |  |

**Table 5: Distribution of Performance for the Discharge Medication Composite Stratified by the Randomly Split Samples**

|  |  |  |
| --- | --- | --- |
| **Description** | **Randomly Split Samples** | |
| **First (RAND=1)** | **Second (RAND=0)** |
|  |  |
|  |  |  |
| N | 1631 | 1632 |
| Mean | 93.62% | 93.57% |
| Std Deviation | 7.16% | 7.55% |
|  |  |  |
| 100% Max | 100.00% | 100.00% |
| 99% | 100.00% | 100.00% |
| 95% | 100.00% | 100.00% |
| 90% | 99.38% | 99.29% |
| 75% Q3 | 98.07% | 98.12% |
| 50% Median | 95.92% | 95.84% |
| 25% Q1 | 91.70% | 91.68% |
| 10% | 85.05% | 85.01% |
| 5% | 80.00% | 79.80% |
| 1% | 64.86% | 67.71% |
| 0% Min | 25.00% | 0.00% |

**Figure 1. Distribution of Performance for the Discharge Medication Composite Stratified by Randomly Split Samples (Top) and by Split Sample Correlation (Bottom)**





**2a2.4 What is your interpretation of the results in terms of demonstrating reliability**? (i*.e., what do the results mean and what are the norms for the test conducted?*)

**Split Sample Methodology**

The box and whisker plot of the distribution of hospital performance for CathPCI composite measure at discharge shows that hospitals were stratified by randomly split samples. These results show a similar percentage of use of the composite measure at discharge for both samples which demonstrates that this is a very reliable measure. Figure 1 shows a strong positive association between both samples (r=0.90270).

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**2b1. VALIDITY TESTING**

***Note****: Current guidance for composite measure evaluation states that validity should be demonstrated for the composite performance measure score. If not feasible for initial endorsement, acceptable alternatives include assessment of content or face validity of the composite OR demonstration of validity for each component. Empirical validity testing of the composite measure score is expected by the time of endorsement maintenance.*

**2b1.1. What level of validity testing was conducted**?

**Critical data elements** (*data element validity must address ALL critical data elements*)

**Composite performance measure score**

**Empirical validity testing** **Systematic assessment of face validity of performance measure score as an indicator** of quality or resource use (*i.e., is an accurate reflection of performance on quality or resource use and can distinguish good from poor performance*) **NOTE**: Empirical validity testing is expected at time of maintenance review; if not possible, justification is required.

**Validity testing for component measures** *(check all that apply)*

***Note****: applies to ALL component measures, unless already endorsed or are being submitted for individual endorsement.*

**Endorsed (or submitted) as individual performance measures**

**Critical data elements** (*data element validity must address ALL critical data elements*)

**Empirical validity testing of the component measure score(s)**

**Systematic assessment of face validity of component measure score(s) as an indicator** of quality or resource use (*i.e., is an accurate reflection of performance on quality or resource use and can distinguish good from poor performance*)

**2b1.2. For each level of testing checked above, describe the method of validity testing and what it tests** (*describe the steps―do not just name a method; what was tested, e.g., accuracy of data elements compared to authoritative source, relationship to another measure as expected; what statistical analysis was used)*

**Face Validity** **(initial measure testing of this measure):**

Face validity was achieved through having subject matter experts assist in the development of this measure. For this particular topic those individuals who were involved in identifying the key attributes and variables for this process measure were leaders and experts in the field of interventional cardiology. Serial phone calls were held to both define the eligible population. These clinical leaders are noted below.

The NCDR Clinical Subworkgroup was a designated set of experts that oversaw the original NQF application. Prior to submission, this group ensured there is variation in care, disparities data, and that the measure is a true These members included Drs. Jeptha Curtis (Chair), Frederick Masoudi, John Rumsfeld, Issam Moussa, and David Malenka.

The NCDR Scientific Quality and Oversight Committee served as the primary resource for crosscutting scientific and quality of care methodological issues. These members included Drs. Frederick Masoudi (Chair) , David Malenka, Thomas Tsai, Matthew Reynolds, David Shahian, John Windle, Fred Resnic, John Moore, Deepak Bhatt, James Tcheng, Jeptha Curtis, Paul Chan, Matthew Roe, and John Rumsfeld.

Lastly the 16 member NCDR Management Board and 31 member ACCF Board of Trustees reviewed and approved this measure for submission to NQF.

The face/content validity of this measure has been achieved by virtue of the noted expertise of those individuals who developed this measure.

**Empirical Validity (Re-endorsement testing):**

Empirical analysis was tested by determining if hospitals performed similarly on the composite discharge medications measure and 30-day mortality. The testing focused on construct validation which tested the hypothesis that following the provision of discharge medications for patients who underwent a PCI may lead to better short-term outcomes. This was achieved by examining the distribution and correlation of the discharge medications composite score and the 30-day risk-standardized mortality rates (RSMR) for PCI based on indication (STEMI/Shock or NSTEMI/No Shock) from date of procedure to 30-days. We used the NQF-endorsed 30-day PCI mortality measure for STEMI/Shock (NQF#: 0536) and No STEMI/No Shock (NQF#: 0535) to ascertain RSMR rates. For this specific analysis, the study period was Q4 2013 to Q3 2014 as this encompassed the latest NDI-CathPCI linked data available at the time of the analysis.

**2b1.3. What were the statistical results from validity testing**? (*e.g., correlation; t-test*)

**Face Validity**

Face validity was achieved through reaching consensus that the measure had strong clinical evidence and was reliable. Specifically, it is known that reducing LDL-c is associated with a decrease in mortality and morbidity for patients with coronary artery disease. Lipid-lowering therapy can reduce the risk of cardiovascular outcomes. Following PCI, both aspirin use and P2Y12 inhibitors, including clopidogrel and prasugrel, reduce the risk of ischemic events. This research demonstrates that this measure contributes to improved intermediate outcomes and important outcomes such as reductions in hospitalizations and mortality rates.

**Empirical Validity**

Below are the results achieved from the empirical validity testing by indication (Table 6):

**Table 6: Distribution of Performance Rate for Discharge Medications Composite Measure and RSMR in the Time Period 2013Q4 to 2014Q3 (N=1633)**

|  |  |
| --- | --- |
| **Description** |  |
| **Discharge Medications Composite** |
| **Performance rate (%)** | **RSMR**  **Performance rate (%)** |
|  |  |  |
| Mean | 95.4% | 8.8% |
| Std Deviation | 8.0% | 1.7% |
|  |  |  |
| 100% Max | 100.0% | 20.1% |
| 99% | 100.0% | 14.0% |
| 95% | 100.0% | 11.8% |
| 90% | 100.0% | 10.9% |
| 75% Q3 | 100.0% | 9.6% |
| 50% Median | 97.7% | 8.5% |
| 25% Q1 | 94.2% | 7.6% |
| 10% | 88.5% | 6.9% |
| 5% | 83.3% | 6.5% |
| 1% | 62.5% | 5.8% |
| 0% Min | 0.0% | 4.5% |

Pearson correlation coefficient between DCM and STEMI/Shock RSMR: -0.07465 (N=1273)

|  |
| --- |
|  |
| **Description** |
|  | **Discharge Medications Composite**  **Performance rate (%)** | **RSMR**  **Performance rate (%)** |
|  |  |  |
| Mean | 91.7% | 1.2% |
| Std Deviation | 8.4% | 0.3% |
|  |  |  |
| 100% Max | 100.0% | 2.6% |
| 99% | 100.0% | 2.1% |
| 95% | 100.0% | 1.7% |
| 90% | 99.1% | 1.5% |
| 75% Q3 | 97.2% | 1.3% |
| 50% Median | 94.0% | 1.1% |
| 25% Q1 | 88.8% | 1.0% |
| 10% | 82.2% | 0.9% |
| 5% | 76.1% | 0.8% |
| 1% | 57.1% | 0.7% |
| 0% Min | 9.5% | 0.5% |

**Pearson correlation coefficient between DCM and NSTEMI/No Shock RSMR: -0.16380 (N=1283)**

**2b1.4. What is your interpretation of the results in terms of demonstrating validity**? (i*.e., what do the results mean and what are the norms for the test conducted?*)

**Face validity**: The individual components have been associated with better outcomes and are accepted quality measures in patient populations.).

**Empirical validity:** The median rate of delivering defect free care for STEMI/Shock and NSTEMI/No Shock was 97.7% (IQR: 94.2% to 100.0%) and 94.0% (IQR: 88.8% to 97.2%), and the median mortality rate at 30 days was 8.5% (IQR: 7.6% to 9.6%) and 1.1% (IQR: 1.0% to 1.3%), respectively (Table 6). There was a similar distribution of hospitals by volume across both measures. The negative correlation coefficient was significant and in the hypothesized direction, such that a higher group of patients receiving discharge medications was associated with lower mortality rates. Yet, the correlation is relatively low for STEMI/Shock (-0.07) and NSTEMI/No Shock (-0.16), which is not surprising when comparing a process of care measure to an outcome measure. The low correlation may be explained by the fact that there are a number of other unmeasured factors that could contribute to 30-day mortality rates beyond whether medications were prescribed at discharge (e.g., unsuccessful procedure, lack of follow-up, poor medication adherence or access to care). Further, the 30-day time period started at the date of the procedure thus the rates also accounted for in-hospital mortality. In sum, the empirical validation demonstrates there is a relationship, albeit statistically a small one, between discharge medications and short-term mortality.

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**2b2. EXCLUSIONS ANALYSIS**

***Note:*** *Applies to the composite performance measure, as well all component measures unless they are already endorsed or are being submitted for individual endorsement.*

**NA**  **no exclusions — *skip to section*** [***2b4***](#section2b4)

**2b2.1. Describe the method of testing exclusions and what it tests** (*describe the steps―do not just name a method; what was tested, e.g., whether exclusions affect overall performance scores; what statistical analysis was used*)

The exclusions for this measure comprised: patients without a PCI during the admission, discharge status of deceased, discharge location of “other acute hospital, hospice, or against medical advice”. With the exception of excluding patients who did not undergo a PCI procedure during the admission, these exclusions were relatively rare and firmly supported by clinical rationale.

**2b2.2. What were the statistical results from testing exclusions**? (*include overall number and percentage of individuals excluded, frequency distribution of exclusions across measured entities, and impact on performance measure scores*)

Table 7 below provides information about how the final sample was derived. Excluding those who died during the hospital stay or were discharged under other circumstances only accounted for 3.5% of hospital stays. It is unlikely that this would impact performance measures in any meaningful way, and these patients ought to be excluded from this measure as it is not possible to ascertain discharge medication status on patients who were not discharged from the index hospital or died during the admission. Those who were “not eligible for the composite measure” included those with contraindications or those individuals enrolled in clinical trial studies.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 7: Exclusions Summary Results** | | | | |
|  |  |  |  |  |
| |  |  |  |  | | --- | --- | --- | --- | | **Exclusions** | **Number of Hospital Stay** | | **Number of Facilities** | | **#** | **#** | | |  |  |  | | | *Initial Sample* | 11,029,164 | 1,763 | | | Discharges not between Jan 2015 and Dec 2016 | - 8,020,033 | 82 | | | *Remaining* | 3,009,131 | 1681 | | | Without PCI during the admission | -1,572,462 | 48 | | | *Remaining* | 1,436,669 | 1633 | | | Discharge Status: not alive | -25,878 | 0 | | | *Remaining* | 1,410,791 | 1633 | | | Discharge Location: Other acute care hospital | -15,574 | 0 | | | *Remaining* | 1,395,217 | 1633 | | | Discharge Location: Hospice | -3,498 | 0 | | | *Remaining* | 1,391,719 | 1633 | | | Discharge Location: Left against medical advice | -4,549 | 0 | | | *Remaining* | 1,387,170 | 1633 | | | Discharge Location: Unknown | -507 | 0 | | | *Remaining* | 1,386,663 | 1633 | | | Not eligible for the composite measure | -280 | 0 | | | **Study Sample** | **1,386,383** | **1633** | | |  |  |  |  |

**2b2.3. What is your interpretation of the results in terms of demonstrating that exclusions are needed to prevent unfair distortion of performance results?** (*i.e., the value outweighs the burden of increased data collection and analysis.*  *Note:* ***If patient preference is an exclusion****, the measure must be specified so that the effect on the performance score is transparent, e.g., scores with and without exclusion*)

Importantly, there are no 'discretionary' exclusions. All exclusions are necessary for the accurate calculation of performance on the composite measure. For example, patients need to survive to discharge to be eligible for the measure. Similarly, it would be inappropriate to calculate the measure among patients discharged to another acute care facility or those who left the hospital against medical advice. In light of the lack of randomized trials designed to evaluate the efficacy of clopidogrel (P2Y12 receptor blockers) in addition to aspirin compared to aspirin alone in STEMI patients treated with primary PCI, we feel no additional patients should be excluded from the composite measure. The value of including these patients and the potential for evaluating their outcomes in our bleeding and mortality measures outweighs the burden of increased data collection and analysis.

Indirect evidence of long-term benefit exists from trials PCI-CURE, CREDO, and CURE (Lancet. 2001;358(9281):527, J Am Coll Cardiol. 2006;47(5):939, N Engl J Med. 2001;345(7):494) of patients with non- STEMI in which P2Y12 receptor blockers were continued for 9 to 12 months. At 30 days after PCI, clopidogrel therapy was associated with a significant reduction in the primary endpoint of cardiovascular death, MI, or stroke (3.6 versus 6.2 percent, adjusted odds ratio 0.54, 95% CI 0.35-0.85).

Accordingly, we do not believe additional testing is necessary.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2b3. RISK ADJUSTMENT/STRATIFICATION FOR OUTCOME OR RESOURCE USE MEASURES**  
***Note:***  *Applies to all outcome or resource use component measures, unless already endorsed or are being submitted for individual endorsement.*  
***If not an intermediate or health outcome, or PRO-PM, or resource use measure, skip to section*** [***2b4***](#section2b5)***.***

**2b3.1. What method of controlling for differences in case mix is used?** *(check all that apply)*

**Endorsed (or submitted) as individual performance measures**

**No risk adjustment or stratification**

**Statistical risk model with** Click here to enter number of factors **risk factors**

**Stratification by** Click here to enter number of categories **risk categories**

**Other,** Click here to enter description

**2b3.1.1 If using statistical risk models, provide detailed risk model specifications, including the risk model method, risk factors, coefficients, equations, codes with descriptors, and definitions.**

**2b3.2. If an outcome or resource use component measure is not risk adjusted or stratified, provide rationale and analyses to demonstrate that controlling for differences in patient characteristics (case mix) is not needed to achieve fair comparisons across measured entities**.

N/A

**2b3.3a. Describe the conceptual/clinical and statistical methods and criteria used to select patient factors (clinical factors or social risk factors) used in the statistical risk model or for stratification by risk** (*e.g., potential factors identified in the literature and/or expert panel; regression analysis; statistical significance of p<0.10; correlation of x or higher; patient factors should be present at the start of care*) **Also discuss any “ordering” of risk factor inclusion;** for example, are social risk factors added after all clinical factors?

N/A

**2b3.3b. How was the conceptual model of how social risk impacts this outcome developed? Please check all that apply:**

**Published literature**

**Internal data analysis**

**Other (please describe)**

**2b3.4a. What were the statistical results of the analyses used to select risk factors?**

N/A

**2b3.4b. Describe the analyses and interpretation resulting in the decision to select social risk factors** (e.g. prevalence of the factor across measured entities, empirical association with the outcome, contribution of unique variation in the outcome, assessment of between-unit effects and within-unit effects.) Also describe the impact of adjusting for social risk (or not) on providers at high or low extremes of risk.

N/A

**2b3.5. Describe the method of testing/analysis used to develop and validate the adequacy of the statistical model or stratification approach** (*describe the steps―do not just name a method; what statistical analysis was used*)

*Provide the statistical results from testing the approach to controlling for differences in patient characteristics (case mix) below*.  
***If stratified, skip to*** [***2b3.9***](#question2b49)

***N/A***

**2b3.6. Statistical Risk Model Discrimination Statistics** (*e.g., c-statistic, R-squared*)**:**

N/A

**2b3.7. Statistical Risk Model Calibration Statistics** (*e.g., Hosmer-Lemeshow statistic*):

N/A

**2b3.8. Statistical Risk Model Calibration – Risk decile plots or calibration curves**:

N/A

**2b3.9. Results of Risk Stratification Analysis**:

N/A

**2b3.10. What is your interpretation of the results in terms of demonstrating adequacy of controlling for differences in patient characteristics (case mix)?** (i*.e., what do the results mean and what are the norms for the test conducted*)

**2b3.11.** **Optional Additional Testing for Risk Adjustment** (*not required, but would provide additional support of adequacy of risk model, e.g., testing of risk model in another data set; sensitivity analysis for missing data; other methods that were assessed*)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2b4. IDENTIFICATION OF STATISTICALLY SIGNIFICANT & MEANINGFUL DIFFERENCES IN PERFORMANCE**

***Note:*** *Applies to the composite performance measure.*

**2b4.1. Describe the method for determining if statistically significant and clinically/practically meaningful differences in performance measure scores among the measured entities can be identified** (*describe the steps―do not just name a method; what statistical analysis was used? Do not just repeat the information provided related to performance gap in 1b)*

We examined variation in hospital performance for the composite measure based on overall performance, and stratified by subgroups of sex, age, race/ethnicity, and the proportion of patients who are insured through Medicaid to identify if there were meaningful differences in social risk.

**2b4.2. What were the statistical results from testing the ability to identify statistically significant and/or clinically/practically meaningful differences in performance measure scores across measured entities?** (e.g., *number and percentage of entities with scores that were statistically significantly different from mean or some benchmark, different from expected; how was meaningful difference defined*)

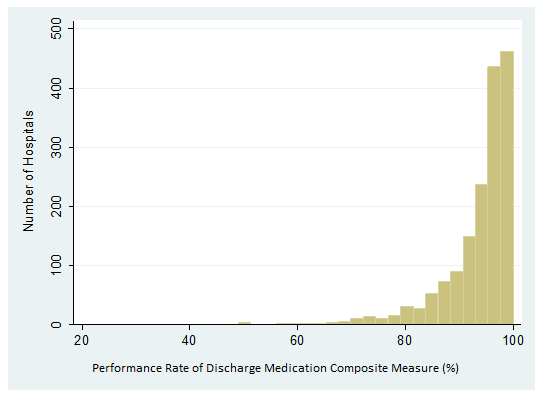
**Overall**

The median rate of performance of the discharge medications composite across all hospitals was 95.8%. There was variation in providing defect free care, ranging from 91.9% to 98.0% for the first and third quartiles of hospitals, respectively (Table 8), and the distribution was right-skewed such that the majority of hospitals scored between 90% to 100% on the discharged medications composite measure (Figure 2).

**Table 8: Distribution of Performance of the Discharge Medications Composite (N=1633)**

|  |  |
| --- | --- |
| **Description** | **Discharge Medications Composite (%)** |
|  |  |
| Mean | 93.58 |
| Std Deviation | 7.16 |
|  |  |
| 100% Max | 100.00 |
| 99% | 100.00 |
| 95% | 99.72 |
| 90% | 99.16 |
| 75% Q3 | 98.02 |
| 50% Median | 95.83 |
| 25% Q1 | 91.87 |
| 10% | 85.24 |
| 5% | 79.89 |
| 1% | 67.57 |
| 0% Min | 25.93 |
|  |  |

**Figure 2: Histogram of Performance of the Discharge Medications Composite**

****

**Subgroups**

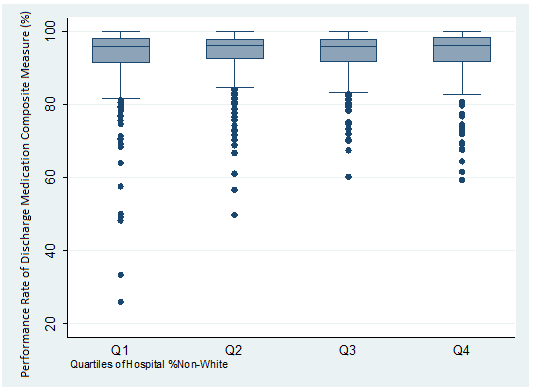
Across stratified analyses based on sex, age, race, and proportion of patients who are insured through Medicaid, we found significant overlap in the distribution of hospital performance, as detailed below.

***Proportion of Non-White***

Hospitals (n=1,633) were stratified into quartiles by the proportion of non-White patients (median: 9.1%, IQR: 3.9% to 19.1%). Hospital performance across quartiles was similar regardless of the proportion of non-White patients treated, with median performance ranging from 95.7% (Q1) to 96.1 (Q4)%, with those hospitals serving a higher proportion of Non-White patients performing slightly better (Table 9, Figure 3).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 9: Distribution of Performance Rate for Discharge Medication Composite Measure at Discharge Stratified by Hospital Quartile Non-White at the Hospital-Level (N=1633)** | | | | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Description** | **% Non-White** | | | | | **Q1** | **Q2** | **Q3** | **Q4** | |  |  |  |  |  | | Mean | 93.0% | 93.9% | 93.7% | 93.7% | | Std Deviation | 8.7% | 6.7% | 6.0% | 7.0% | |  |  |  |  |  | | 100% Max | 100.0% | 100.0% | 100.0% | 100.0% | | 99% | 100.0% | 100.0% | 100.0% | 100.0% | | 95% | 99.7% | 99.5% | 99.5% | 100.0% | | 90% | 99.2% | 99.1% | 98.9% | 99.6% | | 75% Q3 | 98.1% | 97.8% | 97.7% | 98.2% | | 50% Median | 95.7% | 96.0% | 95.8% | 96.1% | | 25% Q1 | 91.3% | 92.4% | 91.8% | 91.6% | | 10% | 83.9% | 86.1% | 85.7% | 85.6% | | 5% | 79.0% | 80.4% | 81.0% | 77.3% | | 1% | 50.0% | 68.8% | 71.9% | 67.7% | | 0% Min | 25.9% | 49.7% | 60.1% | 59.2% | |  |  |  |  |  |

**Figure 3: Distribution of the Performance for Discharge Medication Composite Measure Stratified by Quartiles of Non-White Patients at the Hospital-Level**

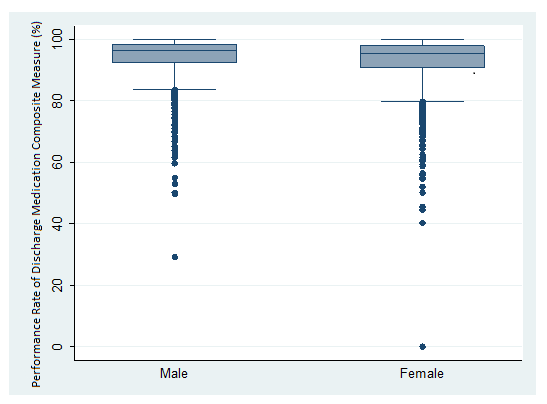
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***Gender***

The median hospital performance among female patients was 95.4% while among male patients it was slightly higher at 96.2% (Table 10, Figure 4).

|  |  |  |
| --- | --- | --- |
| **Table 10: Distribution of Performance rates for Discharge Medication Composite Measure Stratified by Gender at the Hospital-Level (N=1,633)** | | |
| |  |  |  | | --- | --- | --- | | **Description** | **Gender** | | | **Female** | **Male** | |  |  |  | | Mean | 92.7% | 94.0% | | Std Deviation | 8.6% | 6.7% | |  |  |  | | 100% Max | 100.0% | 100.0% | | 99% | 100.0% | 100.0% | | 95% | 100.0% | 99.9% | | 90% | 99.4% | 99.3% | | 75% Q3 | 97.9% | 98.2% | | 50% Median | 95.4% | 96.2% | | 25% Q1 | 90.6% | 92.3% | | 10% | 82.7% | 86.3% | | 5% | 77.2% | 80.4% | | 1% | 58.6% | 68.4% | | 0% Min | 0.0% | 29.2% | |  |  |

**Figure 4: Distribution of the Performance of the Discharge Medication Composite Measure Stratified by Sex at the Hospital-Level**

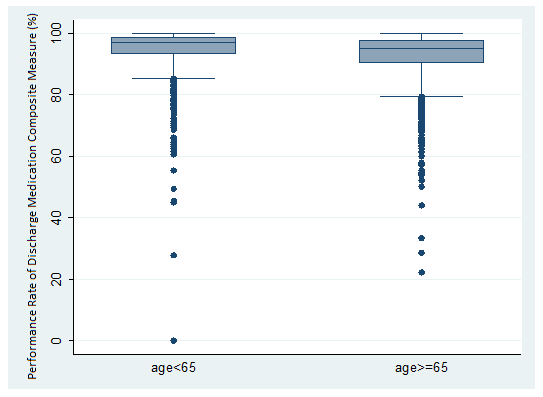
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***Age***

The median hospital performance among patients aged < 65 was 96.8% while that among patients ≥ 65 years of age was 95.1% (Table 11, Figure 5).

|  |  |  |
| --- | --- | --- |
| **Table 11: Distribution of the Performance of the Discharge Medication Composite Measure Stratified by Age at the Hospital-Level (N=1,633)** | | |
| |  |  |  | | --- | --- | --- | | **Description** | **Age Group** | | | **Age > 65** | **Age < 65** | |  |  |  | | Mean | 92.6% | 94.7% | | Std Deviation | 8.0% | 6.8% | |  |  |  | | 100% Max | 100.0% | 100.0% | | 99% | 100.0% | 100.0% | | 95% | 100.0% | 100.0% | | 90% | 99.3% | 99.5% | | 75% Q3 | 97.6% | 98.6% | | 50% Median | 95.1% | 96.8% | | 25% Q1 | 90.3% | 93.2% | | 10% | 83.1% | 87.5% | | 5% | 77.8% | 82.6% | | 1% | 63.3% | 66.0% | | 0% Min | 22.2% | 0.0% | |  |  |

**Figure 5: Distribution of the Performance for the Discharge Medication Composite Measure Stratified by Age Group at the Hospital-Level**

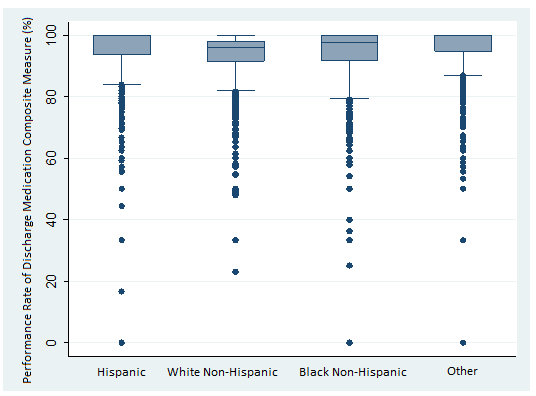
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***Race/Ethnicity***

The distribution of hospital performance was examined among White (non-Hispanic), Hispanic, Black (non- Hispanic), and Other race patients. Hospitals more frequently delivered discharge medications to those of Hispanic ethnicity and Other race (median: 100%) than those of White Non-Hispanic (95.9%) and Black Non-Hispanic (97.5%) race/ethnicity (Table 12, Figure 6).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 12: Distribution of Performance for the Discharge Medication Composite Measure Stratified by Race at the Hospital-Level (N=1,633)**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Description** |  | | | | | **Hispanic** | **White non-Hispanic** | **Black non-Hispanic** | **Other** | |  |  |  |  |  | | Mean | 94.6% | 93.4% | 93.8% | 95.3% | | Std Deviation | 11.2% | 7.4% | 10.4% | 9.7% | |  |  |  |  |  | | 100% Max | 100.0% | 100.0% | 100.0% | 100.0% | | 99% | 100.0% | 100.0% | 100.0% | 100.0% | | 95% | 100.0% | 99.9% | 100.0% | 100.0% | | 90% | 100.0% | 99.2% | 100.0% | 100.0% | | 75% Q3 | 100.0% | 98.0% | 100.0% | 100.0% | | 50% Median | 100.0% | 95.9% | 97.5% | 100.0% | | 25% Q1 | 93.6% | 91.5% | 91.7% | 94.7% | | 10% | 84.6% | 85.0% | 83.3% | 84.6% | | 5% | 75.0% | 79.1% | 75.0% | 75.0% | | 1% | 50.0% | 65.2% | 50.0% | 53.3% | | 0% Min | 0.0% | 23.1% | 0.0% | 0.0% | |

**Figure 6: Distribution of the Discharge Medication Composite Measure Stratified by Race at the Hospital-Level**



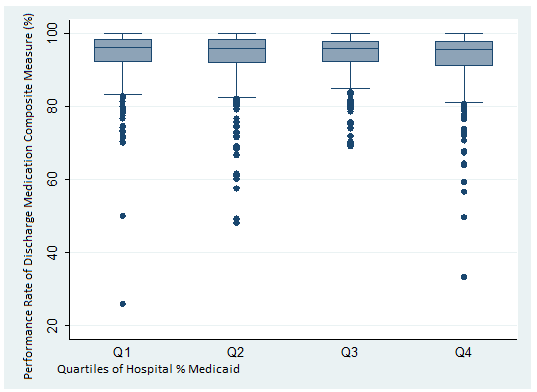
***Insurance***

Hospitals (n=1,633) were stratified into quartiles by their proportion of patients with Medicaid as the primary insurance (median: 9.8%, IQR: 5.9% to 15.1%). Hospital performance was similar across hospitals stratified by quartile based the proportion of patients with Medicaid insurance coverage. Median hospital performance ranged from 95.6% (Quartile 4, highest proportion of Medicaid) to 96.1% (Quartile 1, lowest proportion of Medicaid) (Table 13, Figure 7).

**Table 13: Distribution of Performance for the Discharge Medication Composite Measure Stratified by Quartile of Hospital Percent Medicaid (N=1,633)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | **Medicaid** | | | |
| **Q1** | **Q2** | **Q3** | **Q4** |
|  |  |  |  |  |
| Mean | 93.7% | 93.6% | 94.1% | 93.0% |
| Std Deviation | 7.5% | 7.6% | 5.5% | 7.7% |
|  |  |  |  |  |
| 100% Max | 100.0% | 100.0% | 100.0% | 100.0% |
| 99% | 100.0% | 100.0% | 99.9% | 100.0% |
| 95% | 100.0% | 99.8% | 99.3% | 99.5% |
| 90% | 99.6% | 99.3% | 98.8% | 98.9% |
| 75% Q3 | 98.4% | 98.3% | 97.7% | 97.7% |
| 50% Median | 96.1% | 95.9% | 95.8% | 95.6% |
| 25% Q1 | 92.1% | 92.0% | 92.3% | 91.0% |
| 10% | 85.1% | 84.4% | 87.2% | 84.1% |
| 5% | 79.0% | 79.1% | 80.7% | 79.4% |
| 1% | 70.4% | 61.0% | 74.0% | 63.9% |
| 0% Min | 25.9% | 48.1% | 69.1% | 33.3% |

**Figure 7: Distribution of the Performance for the Discharge Medication Stratified by Quartile of Hospital Percent Medicaid**

****

**2b4.3. What is your interpretation of the results in terms of demonstrating the ability to identify statistically significant and/or clinically/practically meaningful differences in performance across measured entities?** (i*.e., what do the results mean in terms of statistical and meaningful differences?*)

The wide gap in performance rates, along with broad interquartile ranges, across various stratified populations demonstrates that this measure is necessary to improve the quality gap.  
**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2b5. COMPARABILITY OF PERFORMANCE SCORES WHEN MORE THAN ONE SET OF SPECIFICATIONS**

***Note:***  *Applies to all component measures, unless already endorsed or are being submitted for individual endorsement.*

***If only one set of specifications, this section can be skipped.***

**Note***: This item is directed to measures that are risk-adjusted (with or without social risk factors)* ***OR*** *to measures with more than one set of specifications/instructions (e.g., one set of specifications for how to identify and compute the measure from medical record abstraction and a different set of specifications for claims or eMeasures). It does not apply to measures that use more than one source of data in one set of specifications/instructions (e.g., claims data to identify the denominator and medical record abstraction for the numerator).* ***Comparability is not required when comparing performance scores with and without social risk factors in the risk adjustment model. However, if comparability is not demonstrated for measures with more than one set of specifications/instructions, the different specifications (e.g., for medical records vs. claims) should be submitted as separate measures.***

**2b5.1. Describe the method of testing conducted to compare performance scores for the same entities across the different data sources/specifications** (*describe the steps―do not just name a method; what statistical analysis was used*)

N/A

**2b5.2. What were the statistical results from testing comparability of performance scores for the same entities when using different data sources/specifications?** (*e.g., correlation, rank order*)

N/A

**2b5.3. What is your interpretation of the results in terms of the differences in performance measure scores for the same entities across the different data sources/specifications?** (i*.e., what do the results mean and what are the norms for the test conducted?*)

N/A

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2b6. MISSING DATA ANALYSIS AND MINIMIZING BIAS**

***Note:***  *Applies to the overall composite measure.*

**2b6.1. Describe the method of testing conducted to identify the extent and distribution of missing data (or nonresponse) and demonstrate that performance results are not biased** due to systematic missing data (or differences between responders and nonresponders) and how the specified handling of missing data minimizes bias (*describe the steps―do not just name a method; what statistical analysis was used*)

There were no missing data for this measure. Any hospitals with missing data were excluded from the measure as they would not have passed the NCDR data quality review.

**2b6.2. What is the overall frequency of missing data, the distribution of missing data across providers, and the results from testing related to missing data?** (*e.g.,**results of sensitivity analysis of the effect of various rules for missing data/nonresponse; if no empirical sensitivity analysis, identify the approaches for handling missing data that were considered and pros and cons of each*)

N/A

**2b6.3. What is your interpretation of the results in terms of demonstrating that performance results are not biased** due to systematic missing data (or differences between responders and nonresponders) and how the specified handling of missing data minimizes bias**?** (i*.e., what do the results mean in terms of supporting the selected approach for missing data and what are the norms for the test conducted; if no empirical analysis, provide rationale for the selected approach for missing data*)

N/A

**2c. EMPIRICAL ANALYSIS TO SUPPORT COMPOSITE CONSTRUCTION APPROACH**

***Note:*** *If empirical analyses do not provide adequate results—or are not conducted—justification must be provided and accepted in order to meet the must-pass criterion of Scientific Acceptability of Measure Properties. Each of the following questions has instructions if there is no empirical analysis.*

**2d1. Empirical analysis demonstrating that the component measures fit the quality construct, add value to the overall composite, and achieve the object of parsimony to the extent possible.**

We believe the content and face validity of this measure has been achieved by virtue of the noted expertise of those individuals who developed this measure. The individual components of the composite have already shown to impact clinical outcomes.

The empirical validity analysis demonstrated that the individual component measures fit the overall quality construct by assessing the Pearson correlation of the discharge medications composite measure with its components, including: aspirin, P2Y12 and statins.

**2d1.1 Describe the method used** (*describe the steps―do not just name a method; what statistical analysis was used; if no empirical analysis, provide justification)*

We computed hospital-level measures for the three measure components individually and then correlated the results with the hospital-level composite results using Pearson correlation.

**2d1.2. What were the statistical results obtained from the analysis of the components?** (e.g., *correlations, contribution of each component to the composite score, etc*.; *if no empirical analysis, identify the components that were considered and the pros and cons of each*)

The Pearson correlation coefficients between the discharge composite medication measure and its components were: aspirin (r=0.7774), P2Y12 (r=0.5910) and statin (r=0.9508).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 14: Distribution of Performance of the Discharge Medication Composite Measure and its Components (N=1,633)** | | | | | | | | |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Description** | **Composite Value** | **Aspirin Value** | | **P2Y12 Value** | | **Statin Value** | |  |  |  | |  | |  | | Mean | 93.6% | 98.1% | | 99.0% | | 95.3% | | Std Deviation | 7.2% | 2.9% | | 2.5% | | 5.4% | |  |  |  | |  | |  | | 100% Max | 100.0% | 100.0% | | 100.0% | | 100.0% | | 99% | 100.0% | 100.0% | | 100.0% | | 100.0% | | 95% | 99.7% | 100.0% | | 100.0% | | 99.9% | | 90% | 99.2% | 100.0% | | 100.0% | | 99.5% | | 75% Q3 | 98.0% | 99.7% | | 99.9% | | 98.7% | | 50% Median | 95.8% | 99.0% | | 99.6% | | 97.0% | | 25% Q1 | 91.9% | 97.8% | | 98.9% | | 94.1% | | 10% | 85.2% | 95.3% | | 97.6% | | 89.0% | | 5% | 79.9% | 93.3% | | 96.2% | | 85.1% | | 1% | 67.6% | 85.1% | | 91.5% | | 76.5% | | 0% Min | 25.9% | 50.0% | | 29.2% | | 33.3% | |  |  |  | |  | |  | |  |  | |  | |  |  |  |  | |  |  | | | Pearson Correlation Coefficient between the Composite and its Components | | | | | | | | |  | | | | Aspirin | | | | | 0.7774 | |  | |  | | | | P2Y12 | | | | | 0.5910 | |  | |  | | | | Statin | | | | | 0.9508 | |  | |  | | | |  |  |  |  |  |  |  |  |

**2d1.3. What is your interpretation of the results in terms of demonstrating that the components included in the composite are consistent with the described quality construct and add value to the overall composite?** (i*.e., what do the results mean in terms of supporting inclusion of the components; if no empirical analysis, provide rationale for the components that were selected)*

A correlation coefficient of 0.6 or higher is considered a ‘strong correlation’. The results of the empirical validity testing demonstrate a strong correlation between the discharge medication composite and all of its components.

Reference:

Mukaka, M. M. (2012). Statistics corner: A guide to appropriate use of correlation coefficient in medical research. *Malawi Medical Journal, 24*(3), 69-71.

**2d2. Empirical analysis demonstrating that the aggregations and weighting rules are consistent with the quality construct and achieve the objective of simplicity to the extent possible**

**2d2.1 Describe the method used** (*describe the steps―do not just name a method; what statistical analysis was used; if no empirical analysis, provide justification)*

This is an all-or-none composite, thus no empirical analyses pertinent to aggregations or weighting were conducted. The components mentioned throughout the application are part of the composite measure indicator definition, not the composite of different measures.

**2d2.2. What were the statistical results obtained from the analysis of the aggregation and weighting rules?** (e.g., *results of sensitivity analysis of effect of different aggregations and/or weighting rules; if no empirical analysis, identify the aggregation and weighting rules that were considered and the pros and cons of each*)

This all-or-none composite method indicates that each of the individual measure components were weighed equally. While the overall performance is higher on the ASA and P2Y12 components than the statin component, there is still clinically meaningful variation across hospitals for each component particularly when one considers the fact that the consequences of failing to prescribe DAPT may in fact be more severe in both the short- and mid-term (i.e., stent thrombosis) than failing to prescribe a statin.

**2d2.3. What is your interpretation of the results in terms of demonstrating the aggregation and weighting rules are consistent with the described quality construct?** (i*.e., what do the results mean in terms of supporting the selected rules for aggregation and weighting; if no empirical analysis, provide rationale for the selected rules for aggregation and weighting*)

N/A