NATIONAL QUALITY FORUM
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# Memo

**June 29-30, 2021**

**To**: Consensus Standards Approval Committee (CSAC)

**From**: Neurology Project Team

**Re**: Neurology Fall 2020 Measure

## CSAC Action Required

The CSAC will review recommendations from the Neurology project at its June 29-30, 2021 meeting and vote on whether to uphold the recommendations from the Committee.

This memo includes a summary of the project, measure recommendations, themes identified and responses to the public and member comments and the and the results from the NQF member expression of support. The following documents accompany this memo:

- **Neurology Fall 2020, Draft Report**. The draft report has been updated to reflect the changes made following the Standing Committee's discussion of public and member comments. The complete draft report and supplemental materials are available on the project webpage.
- **Comment Table**. This table list nine comments received during the post-meeting comment period.

## Background

In 2017, the Global Burden of Disease study found the three most burdensome neurological conditions in the United States (U.S.) regarding absolute numbers of disability-adjusted life years (DALY):

1. Stroke (3.58 million DALYs)
2. Alzheimer's and other dementias (2.55 million DALYs)
3. Migraine headache (2.40 million DALYs)

Additionally, stroke is the fifth leading cause of death in the U.S., leading to 146,383 deaths in 2017. It is a condition which has historically had few treatments, yet today, treatments including intravenous and intra-arterial thrombolysis, clot retrieval, and other technologies have revolutionized care. Stroke prevalence increases with advanced age and reveals disparities among different racial/ethnic groups (e.g., stroke is more common among Blacks as compared to Whites) and among people with lower socioeconomic status and with fair or poor perceived health status. Stroke is also the leading cause of long-term serious disability in the U.S.

The 21-member Neurology Standing Committee has been charged with overseeing the NQF Neurology measure portfolio. The Standing Committee evaluates both newly submitted and previously endorsed measures against NQF's measure evaluation criteria, identifies gaps in the measurement portfolio, provides feedback on how the portfolio should evolve, and serves on any ad hoc or expedited projects in its designated topic areas.

During the February 5, 2021 and February 24, 2021 web meetings, the Neurology Standing Committee evaluated one new measure during the fall 2020 cycle related to stroke care, specifically a measure of risk-adjusted inpatient mortality for stroke. The risk adjustment is based on the National Institutes of Health (NIH) Stroke Scale, which is used to assess stroke severity upon hospital arrival.

The Standing Committee did not recommend the following measure:

- **#3596** Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity [Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (Yale CORE)/Centers for Medicare & Medicaid Services (CMS)]

## Draft Report

The Neurology fall 2020 draft report presents the results of the evaluation of the one measure considered under the Consensus Development Process (CDP). The measure was not recommended for endorsement.

The measure was evaluated against the 2019 version of the measure evaluation criteria.

| | Maintenance | New | Total |
|---|---|---|---|
| Measures under consideration | 0 | 1 | 1 |
| Measures not recommended for endorsement | 0 | 1 | 1 |
| Reasons for not recommending | Importance – 1<br>Scientific Acceptability -0<br>Use - 0<br>Overall - 0<br>Competing Measure – 0 | Importance – 1<br>Scientific Acceptability -0<br>Use - 0<br>Overall - 0<br>Competing Measure – 0 | |

## CSAC Action Required

Pursuant to the CDP, the CSAC is asked to not consider endorsement of one candidate consensus measure.

### Measures Not Recommended for Endorsement

(See Appendix B for the Standing Committee's votes and rationale)

- #3596 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity (Yale CORE/CMS)

## Comments and Their Disposition

NQF received nine comments from nine organizations (including four member organizations) and individuals pertaining to the draft report.

A table of comments submitted during the comment period, with the responses to each comment and the actions taken by the Standing Committee, is posted to the Neurology project webpage.

## Comment Themes and Committee Responses

The Standing Committee reviewed all of the submitted comments and developer responses. The Standing Committee members focused their discussion on topic areas with the most significant and recurring issues.

### *Measure-Specific Comments*

### 3596 Hospital-30 Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity

Public Comment: We are a comprehensive stroke center, offering care to a mixed rural and small city population, with a large uninsured and underserved population. Risk stratifying measures of mortality would be a step in the right direction. One important measure would be to look at comorbidities identified after admission, as patients often come in without any prior medical care, with diabetes, hypertension, heart failure, but without diagnoses for any of this, because of lack of prior medical care.

Functional outcomes would also be a welcome addition to outcomes grading. However, follow up outcomes vary, with patients from more disadvantaged settings having difficulties with follow up including loss of phone access, fear of being called for bill collection, loss of follow up while indigent care is established. We would suggest moving to the risk adjusting mortality model and keeping the conversation going regarding outcomes.

**Standing Committee Response:**

Thank you for your comments. The Standing Committee has reviewed and discussed them during the Post-Comment Meeting.

**Measure Steward/Developer Response:**

Thank you for your comments in support of endorsing measure #3596. We appreciate your suggestions for evaluating comorbidities identified after admission. Our technical specifications and risk variable selection strategies are outlined in our methodology report. Yale-CORE is committed to continued re-evaluation activities to ensure the reliability and validity of our measures and our risk adjustment approaches.

Notably, this measure adjusts for select clinical comorbidities reported in administrative claims within the preceding 12 months leading up to the index admission, as well as at the index admission. Secondary diagnoses on the index claim of chronic conditions like diabetes, hypertension, heart failure, etc. would be adjusted for within the risk model. For example, if a patient arrives with a principal discharge diagnosis of acute ischemic stroke but a secondary discharge diagnosis of heart failure, the measure will adjust for heart failure. However, secondary diagnoses that could be consequences of care and are only on the index claim (and not in the prior 12 months) would not be adjusted for in the risk model. Please refer to the submission form for further details.

We acknowledge and agree with your suggestion to measure alternative outcomes, including functional outcomes, as well as limitations of follow-up methods. At this time, CMS is currently limited by the data available within administrative claims but is continuously moving toward improved quality measurement and is actively evaluating the availability and validity of

variables, such as functional status, through electronic health records and other data sources.
Proposed Committee Response:

Thank you for your comment and for the developer's response to the themes identified in the comment. The Committee will review the comment at the post-comment web meeting on May 25, 2021.

Public comment: *[abridged comment]* The AHA/ASA agrees with the Standing Committee that measuring 30-day mortality in isolation has potential unintended consequences, such as incentivizing efforts to prolong life through invasive interventions without considering functional outcomes. We also agree that it may not be the best approach to measuring the quality of stroke care or of driving improvement. However, reporting 30-day mortality inaccurately can also lead to serious adverse consequences for hospitals and for patients. The AHA/ASA has and will continue to strongly advocate that 30-day mortality should be balanced with measures such as functional status or healthy days at home. However, it is undeniable that mortality is also an outcome that is important to all patients and their families. As such, we expect that CMS is very likely to continue reporting it, even if the measure is imperfect. It is therefore critical that risk-adjusted mortality be reported as accurately as possible.

The standing committee and commenters also expressed concerns about the reliability of the measure and the impact of missing data, given that the uptake of the new ICD-10 codes is still not universal. CMS has indicated that initially they will impute the NIHSS when it is missing, which we acknowledge is a suboptimal approach, however, it is reasonable as a starting point. Once missingness rates decline, they can revise their approach. We would suggest that the standing committee consider revisiting this issue when the measure undergoes maintenance of endorsement after it has been in widespread use for a period of time.

**Standing Committee Response:**

Thank you for your comments. The Standing Committee has reviewed and discussed them during the Post-Comment Meeting.

**Measure Steward/Developer Response:**

Thank you for supporting the NQF endorsement of measure #3596. We agree with the commenter that "Measure 3596 will incentivize hospitals to routinely document the NIHSS, as required by good clinical practice and evidence-based guidelines and would appropriately penalize those who do not. This alone would represent a tremendous advance in the quality of stroke care."

Public Comment: The Federation of American Hospitals (FAH) remains concerned with the less than desirable reliability threshold at the minimum sample size. In addition, FAH agrees with the Standing Committee's concerns that mortality may not be the best outcome to track in this population, rather measures that ensure that treatment decisions are aligned with patient preferences and emphasize improved functional outcomes would be more appropriate.

**Standing Committee Response:**

Thank you for your comments. The Standing Committee has reviewed and discussed them during the Post-Comment Meeting.

**Measure Steward/Developer Response:**

Thank you for your comments. The reliability of this measure is consistent with other measures endorsed by NQF, and the Scientific Methods Panel voted to pass the measure on both reliability and validity. Variation in volume can impact reliability. However, consistent with CMS's other mortality and readmission outcome measures, measure scores would only be assigned and publicly reported for hospitals with at least 25 cases. This ensures quality information be available for most hospitals while maintaining reliable measure scores.

The results presented in our testing attachment show that the reliability of the measure score is sufficient, based on current standards. We used signal-to-noise approach described by Adams and colleagues (2010) to calculate the facility-level reliability. The median signal-to-noise reliability score was 0.75, ranging from 0.24 to 0.95. The 25th and 75th percentiles were 0.59 and 0.83, respectively. We also report confidence intervals for measure results that account for volume.

As stated in previous responses, we agree with the committee that other outcomes beyond functional status should be considered to more holistically measure stroke outcomes. To your concern that measuring mortality in isolation could lead to unintended consequences, we agree that stroke mortality is not the only outcome that should be assessed; other outcomes, such as functional status, should be explored as well. However, measuring functional status in isolation could similarly lead to unintended consequences in which death is perversely incentivized over life with impairments, despite patient care preferences.

At this time, CMS is currently limited by the data available within administrative claims but is continuously moving toward improved quality measurement and is actively evaluating the availability and validity of variables, such as functional status, through electronic health records and other data sources. We continue to believe mortality is an important outcome from the patients' perspective and an important piece of the quality picture. Further, we believe that this revised stroke measure that adjusts for stroke severity provides incremental improvements in accurately measure stroke mortality performance compared to the measure currently in publicly reporting.

1 Adams J, Mehrota, A, Thoman J, McGlynn, E. (2010). Physician cost profiling – reliability and risk of misclassification. NEJM, 362(11): 1014-1021.

Public Comment: BJC HealthCare ("BJC") is comprised of fourteen acute care hospitals, a large multi-specialty physician practice, and post-acute, corporate, and behavioral health services, with a service area spanning the St. Louis metropolitan region, as well as parts of mid and southeastern Missouri and southwest Illinois.

BJC appreciates the opportunity to comment on Measure #3596, Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity.

BJC supports the updated version of the Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization measure to include the initial NIH Stroke Scale, a validated measure of stroke severity in its risk adjustment model. We fully support the additional commentary and support of this metric offered by the American Heart Association, and American Stroke

Association. We also offer the following comments regarding measure implementation and future quality metrics:

- CMS will need to ensure 100% compliance with NIHSS documentation by all stroke centers. If not, severe stroke patients that are transferred to higher acuity centers from lower acuity centers, may lack of the adequate risk adjustment. This could paint a very inaccurate picture of stroke care and suggest the best care is mainly given at smaller centers and worst care at larger centers.

- NIHSS scores documented earlier in the stay may not be as accurate as those documented after evaluation and initial recovery. CMS should be careful of the timing of NIHSS assessment and use later documentation to abstract the appropriate value.

- Stroke severity alone outperforms all other variables in models predicting stroke mortality, even when these other variables are combined.

- BJC historically has always supported more robust and clinically relevant risk adjustment in the CMS outcome measures. We have also advocated for inclusion of adjustment for social determinants of health in risk-adjusted outcome measures and encourage CMS to continue to evaluate the inclusion of these variables in their metrics, in addition to the clinically relevant indicators such as the NIHSS score.

- There are some concerns from the literature that measuring mortality in isolation could lead to unintended consequences of prolonging life through invasive interventions without considering functional outcomes. We would urge CMS to be cognizant of this concern and to consider the development of metrics that look at functional outcomes in addition to mortality and continue to promote advance care planning.

In summary, BJC supports the use of new ICD-10 codes for initial NIHSS, represents a significant improvement over the measure that is currently reported. We strongly urge the Standing Committee to vote to endorse it to relieve providers of some of the regulatory burden associated with public programs.

**Standing Committee Response:**

Thank you for your comments. The Standing Committee has reviewed and discussed them during the Post-Comment Meeting.

**Measure Steward/Developer Response:**

Thank you for BJC's comments supporting the endorsement and use of measure #3596. We appreciate your feedback on the implementation of this measure and offer the following additional points for your consideration.

We agree that it is important for all hospitals to consistently report the NIH Stroke Scale within administrative claims, a Class I guideline according to the American Heart Association/American Stroke Association (AHA/ASA). Notably, hospital reporting of the NIH Stroke Scale has increased considerably since ICD-10 implementation in 2016.

In response to your concern regarding adequate risk adjustment for transferred patients, please note that the outcome (mortality) is attributed to the admitting hospital.

Thank you for the suggestion to ensure NIH Stroke Scale score documentation and compliance. The aim of the measure is to identify the first NIH Stroke Scale and will be implemented with the following logic for multiple NIH Stroke Scale scores:

- If there are multiple NIH Stroke Scale scores, use the scores coded as present on admission (POA) for risk adjustment
- If there are multiple NIH Stroke Scale scores with more than one coded as POA, randomly select one POA score to use for risk adjustment
- If there are multiple NIH Stroke Scale scores and none of them are coded as POA, randomly select one score to use for risk adjustment

As to your concern about social risk factors, while there is a conceptual pathway by which patients with social risk factors (SRFs) could experience worse outcomes, the empiric evidence does not support risk adjustment at the hospital level.

As presented in the testing attachment of the NQF submission for this measure, our main empiric finding is that adjusting for social risk has little impact on measure scores – mean changes in measure scores are small, and correlations between measure scores calculated with and without adjustment for social risk are near 1.

In additional analyses we have shown that there is little correlation between measure scores and hospitals' proportion of patients with social risk (dual-eligible and low AHRQ SES) across all hospitals, and in the fifth quintile we see no significant association.

The decision to not include social risk factors in the risk model is consistent with recommendations from ASPE that quality measures should not be adjusted for social risk factors[1]. Given these empiric findings, ASPE's latest recommendations, and the fact that this is a hospital quality measure, CMS chose to not include these two social risk factors in the final risk model at this time.

We agree that stroke mortality is not the only outcome that should be assessed and that other outcomes, such as functional status, should be explored. However, measuring functional status in isolation could similarly lead to negative unintended consequences in which death is perversely incentivized over life with impairments, despite patient care preferences. At this time, CMS is currently limited by the data available within administrative claims but is continuously moving toward improved quality measurement and is actively evaluating the availability and validity of variables, such as functional status, through electronic health records and other data sources. We continue to believe mortality is an important outcome from the patients' perspective and an important piece of the quality picture. Further, we believe that this revised stroke measure that adjusts for stroke severity provides incremental improvements in accurately measuring stroke mortality performance compared to the measure currently in publicly reporting, which lacks adjustment for stoke severity.

1 Department of Health and Human Services, Office of the Assistant Secretary of Planning and Evaluation (ASPE). (2020) Second Report to Congress: Social Risk Factors and Performance in Medicare's Value-based Purchasing Programs. Retrieved from: https://aspe.hhs.gov/system/files/pdf/263676/Social-Risk-in-Medicare%E2%80%99s-VBP-2nd-Report.pdf. Accessed July 2, 2020.

## NQF Member Expression of Support

Throughout the 16-week continuous public commenting period, NQF members had the opportunity to express their support ("support" or "do not support") for the measure submitted for endorsement consideration to inform the Standing Committee's recommendations. One NQF member provided their expressions of support: See Appendix C.

## Appendix A: CSAC Checklist

The table below lists the key considerations to inform the CSAC's review of the measure submitted for endorsement consideration.

| Key Consideration | Yes/No | Notes |
|---|---|---|
| Were there any process concerns raised during the CDP project? If so, briefly explain. | No | * |
| Did the Standing Committee receive requests for reconsideration? If so, briefly explain. | No | * |
| Did the Standing Committee overturn any of the Scientific Methods Panel's ratings of Scientific Acceptability? If so, state the measure and why the measure was overturned. | No | * |
| If a recommended measure is a related and/or competing measure, was a rationale provided for the Standing Committee's recommendation? If not, briefly explain. | N/A | * |
| Were any measurement gap areas addressed? If so, identify the areas. | No | * |
| Are there additional concerns that require CSAC discussion? If so, briefly explain. | No | * |

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## Appendix B: NQF Measure Not Recommended for Endorsement

The table below lists the Committee's vote and rationale for measures not recommended for endorsement.

Legend: H = High; M = Moderate; L = Low; I = Insufficient

| Measure | Voting Results | Standing Committee Rationale |
|---|---|---|
| **NQF #3596**: Hospital-30 Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization | **Evidence**<br>Measure Evaluation Vote:<br>Pass – 9, No Pass – 8 (CNR)<br>Post-Comment Vote:<br>Pass – 3, No Pass – 11<br><br>**Gap**<br>H-2; M-10; L-3; I-2<br><br>**Reliability**<br>SMP voted to pass on reliability:<br>H-3, M-5, L-0, I-0<br>Vote to accept SMP's vote:<br>Yes – 15, No – 2<br><br>**Validity**<br>SMP voted to pass on validity<br>H-1, M-5, L-1, I-0<br>Vote to accept SMP's vote:<br>Yes – 11, No – 6<br><br>**Feasibility**<br>H-4, M-9, L-2, I-0<br><br>**Use**<br>Pass – 14, No Pass – 1<br><br>**Usability**<br>H-1, M-12, L-1, I-1 | Evidence was CNR during the measure evaluation meeting in February and discussion and voting on the subsequent criteria occurred. During the post-comment meeting, the Standing Committee discussed and revoted on evidence. Evidence did not pass and the measure is therefore not recommended for endorsement by the Neurology Standing Committee. |

## Appendix C: NQF Member Expression of Support Results

One NQF member provided their expressions of support. The results of the measure are provided below.

**NQF #3596: Hospital-30 Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization**

| Member Council | Support | Do Not Support | Total |
|---|---|---|---|
| Health Professional | 1 | 0 | 1 |

# Appendix D: Details of Measure Evaluation

**Rating Scale: H**=High; **M**=Moderate; **L**=Low; **I**=Insufficient; **NA**=Not Applicable; **Y**=Yes; **N**=No

Vote totals may differ between measure criteria and between measures as Standing Committee members often have to join calls late or leave calls early. NQF ensures that quorum is maintained for all live voting. All voting outcomes are calculated using the number of Standing Committee members present during the meeting for that vote as the denominator. Denominator vote counts may vary throughout the criteria due to intermittent Standing Committee attendance fluctuation. The vote totals reflect members present and eligible to vote at the time of the vote.

Quorum (15 out of 22 Standing Committee members for the Measure Evaluation meetings and 14 out of 21 Standing Committee members for the Post-Comment meeting) was met and maintained for the entirety of both meetings. Please note one Standing Committee member resigned from the Standing Committee between the Measure Evaluation and Post-Comment meetings.

## NQF #3596 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity

Submission |

**Description**: The measure estimates the hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of acute ischemic stroke. The outcome is all-cause 30-day mortality, defined as death from any cause within 30 days of the index admission date, including in-hospital death, for stroke patients. This is a re-specified measure with a cohort and outcome that is harmonized with the CMS's current publicly reported claims-based stroke mortality measure and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity upon admission in the risk-adjustment model. This measure uses Medicare fee-for-service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.
**Numerator Statement**: The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission for Medicare FFS patients aged 65 years and older with a principal discharge diagnosis of acute ischemic stroke.
**Denominator Statement**: The cohort includes inpatient admissions to all non-federal, short-term, acute care or critical access hospitals for Medicare FFS patients aged 65 years and older with a principal discharge diagnosis of acute ischemic stroke.
Additional details are provided in S.7 Denominator Details.
**Exclusions**: The mortality measure excludes index admissions for patients in the following categories:

1. With inconsistent or unknown vital status or other unreliable data;
2. Enrolled in the Medicare hospice program at any time in the 12 months prior to the index admission, including the first day of the index admission
3. Discharged against medical advice (AMA)

For patients with more than one admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.
**Adjustment/Stratification**: Statistical risk model
**Level of Analysis:** Facility
**Setting of Care:** Inpatient/Hospital
**Type of Measure**: Outcome
**Data Source**: Claims, Enrollment Data, Other, Registry Data
**Measure Steward**: Centers for Medicare & Medicaid Services
**STANDING COMMITTEE MEETING [02/05/2021 and 02/24/2021]**
**1. Importance to Measure and Report: The measure did not pass the Importance criteria.**
(1a. Evidence: 1b. Performance Gap)
1a. Evidence: **Total Votes: 17; Y-9, N-8 (Consensus Not Reach)**

Post-Comment Vote: **Total Votes: 14; Y-3**; **N-11 (Did Not Pass)**

1b. Performance Gap: **Total Votes: 17; H-2**; **M-10**; **L-3**; **I-2**

**Rationale**:

- The Standing Committee discussed two concepts related to evidence: whether in-hospital stroke mortality is an appropriate measure of quality and whether there is evidence that one or more clinical actions can be performed to change stroke mortality.
- In the measure submission, the developer described considerable literature linking post-stroke mortality rates to hospital organizational factors, such as the provider's response to complications, speediness of delivery of care, organization of care, coordinated transitions to the outpatient environment, antihypertensive and anticoagulant therapies, and appropriate imaging.
- This information included that hospitals participating in quality improvement registries, such as Get With The Guidelines (GWTG), had lower in-hospital mortality rates among stroke patients than hospitals not participating in similar programs (Fonarow et al, 2014).
- In another example, patients being treated at hospitals participating in the GWTG quality improvement registry for stroke were significantly more likely to receive multiple evidence-based care interventions, such as tissue plasminogen activator (tPA) administration and evaluation by a neurologist (Howard et al, 2018).
- During their discussion, the Standing Committee agreed that hospitals could have an impact on stroke mortality.
- However, several members of the Standing Committee were concerned that stroke mortality was not a quality measure that would drive healthcare improvement and could lead to unintended consequences. This is because the major focus of in-hospital care in stroke is functional improvement of stroke symptoms and that measuring mortality in isolation could lead to unintended consequences of prolonging life through invasive interventions without considering functional outcomes.
- During the initial measure evaluation meetings, the Standing Committee was consensus not reached for evidence. Due to the consensus not reached vote, the Standing Committee continued to discuss and vote on the subsequent criteria, outlined below. However, since the Standing Committee did not pass the measure on the evidence criterion, the measure is not recommended for endorsement.
- For performance gap, the developer used Medicare Fee-for-Service administrative claims data from October 2016 to June 2019 using hospitals where the NIH Stroke Scale was coded for 60% of the claims. In 329 hospitals, the mean risk standardized mortality rate (RSMR) was 14.63% with a range of 10.05% to 17.83% and an interquartile range of 13.82% to 15.52%.

**2. Scientific Acceptability of Measure Properties:**

(2a. Reliability precise specifications, testing; 2b. Validity testing, threats to validity

2a. Reliability: **Total Votes: 8; H-3**; **M-5**; **L-0**; **I-0** 2b. Validity: **Total Votes: 7; H-1**; **M-5**; **L-1**; **I-0**

**Rationale**:

- The measure was reviewed by the SMP and given moderate ratings for both reliability and validity.
- Reliability testing was conducted at the measure score level using Medicare Parts A and B claims as well as the Medicare Enrollment Database (EDB).
- Signal-to-noise ratio testing was performed for all hospitals and those hospitals that meet the minimum case count of at least 25 cases for public reporting.
- The reliability score was 0.72; however, the scores had a wide range from 0.01 -- meaning that it was unreliable at some hospitals, to 0.95 -- meaning that it was very reliable at others in the testing sample.
- The 25th and 75th percentiles were 0.51 and 0.83, respectively. Using the threshold of at least 25 cases, which will be used for public reporting, the median reliability score was 0.75, yet it still had a large range from 0.24 to 0.95, and the 25th and 75th percentiles were 0.59 and 0.83, respectively.
- Data element validity was conducted, in which the developer compared scores of the Medicare claims with the scores from the GWTG-Stroke registry data and compared the scores using a sample size of 29,936 stroke hospitalizations. When comparing NIH Stroke scores to GWTG-Stroke Registry and administrative claims data, 93% were in five points of each other, and 84% of the data were within two points. The Pearson correlation coefficient between the two scores is 0.993 and weighed Kappa was 0.842.
- For construct validity, the developer assessed the measure score correlation with the Overall Hospital Star Ratings Mortality measure Group score. The overall correlation was 0.422.

- The Standing Committee voted to accept the SMP's vote for reliability and validity based upon the above results. The votes above reflect the SMP members' vote. The Standing Committee voted to accept the SMP's vote for reliability Yes – 15, No – 2 (Denominator: 17) and for validity Yes – 11, No – 6 (Denominator: 17).

**3. Feasibility: Total Votes: 15; H-4; M-9; L-2; I-0**

*(3a. Data generated during care; 3b. Electronic sources; and 3c. Data collection can be implemented (eMeasure feasibility assessment of data elements and logic)*

**Rationale**:

- The data used for this measure appear in electronic claims data.
- However, a limitation of measure feasibility is that the NIH stroke score data are not kept in a national database for all non-federal acute-care hospitals. Therefore, the feasibility of this measure depends on hospital's measuring of NIH stroke scores and including those data in the claims. Collecting NIH Stroke Scale (NIHSS) information is a class I recommendation from AHA/ASA. Based on all acute-care hospitals from October 2016 to June 2019, NIHSS data were available in 37% of admissions for acute ischemic stroke. This increased from 13% in October 2016 to 55.6% in May 2019, demonstrating increased availability of these data.

**4. Use and Usability**

*(4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)*

4a. Use: **Total Votes: 15; Pass-14; No Pass-1 4**b. Usability*:* **Total Votes: 15; H-1; M-12; L-1; I-1**

**Rationale**:

- The measure is currently not in use.
- The developer plans to use this updated measure to replace the currently reported *Hospital 30-Day Mortality Following Acute Ischemic Stroke Hospitalization* measure. The earlier measure does not risk-adjust for stroke severity, so the new measure was created to account for those factors.
- The developer compared the median hospital RSMR for stroke from 2013-2016 to 2016-2019. The median hospital RSMR in the 2013-2016 data set was 14.5% and the median hospital RSMR in the 2016-2019 combined data set was 13.6% based on 520,432 admissions from 4,254 hospitals. This demonstrates improvement of this measure over time.

**5. Related and Competing Measures**

- This measure is related to the following measures:
  - #0467 Acute Stroke Mortality Rate (IQI 17)
  - #3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality
  - #3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality
- Since the measure did not pass on evidence, related and competing measures were not discussed by the Standing Committee.

**6. Standing Committee Recommendation for Endorsement**: Not Applicable

The evidence criterion underwent a revote during the post-comment meeting and did not pass.

**7. Public and Member Comment**

- Two comments were submitted before the evaluation meeting and both expressed concerns about the minimum measure score reliability results being 0.24 using a minimum case number of 25 patients when measures should reach a minimum acceptable threshold of at least 0.7 for reliability
- Nine comments were submitted after the evaluation meeting. Multiple commentors expressed concern about measuring mortality in isolation could have potential unintended consequences and suggested that mortality measurement could be balanced with measuring improved functional status or that treatment decisions aligned with patient preferences. Additionally, multiple commentors also approved of using the NIH Stroke Scale for risk adjustment as it is an important prognostic factor for individual patients as well as a predictor of hospital-level performance on 30-day mortality. Comments were also received that expressed concerns regarding the threshold minimum sample size and the impact of missing data. Most commentors also expressed their support of the measure and thought that the inclusion of the NIH Stroke Scale for risk adjustment was an improvement over the current measure being used by CMS.

**8. Consensus Standards Approval Committee (CSAC) Endorsement Decision: Yes-X; No-X (June 29-30, 2021: Endorsed or Not Endorsed)**

The CSAC upheld [or did not uphold] the Standing Committee's decision to recommended [or not recommend] the measure for endorsement.

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# Neurology
# Fall 2020 Review Cycle

CSAC Review

*June 29, 2021*
*June 30, 2021*

*Funded by the Centers for Medicare & Medicaid Services under contract HHSM-500-2017-00060I Task Order HHSM-500-T0001.*

# Standing Committee Recommendations

- 1 measure reviewed for fall 2020
  - 1 measure reviewed by the SMP
- 1 measure not recommended for endorsement
  - NQF 3596: Hospital 30-day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity (Yale CORE/CMS) (New)

# Public and Member Comment and Member Expressions of Support

- Number of comments received: 9
  - 8 were supportive, 1 was not supportive for #3596
- 1 NQF member expressed support for #3596

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# Questions?

- NQF Project team:
  - Chelsea Lynch, MPH, MSN, RN, CIC, Director
  - Oroma Igwe, MPH, Manager
  - Monika Harvey, MBA, PMP, Project Manager
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NATIONAL QUALITY FORUM
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# Neurology, Fall 2020 Cycle: CDP Report

## DRAFT REPORT FOR CSAC REVIEW
## JUNE 29, 2021

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http://www.qualityforum.org

# Contents

## Executive Summary

According to 2017 data from the Global Burden of Disease study, the three most burdensome United States (U.S.) neurological disorders were stroke, Alzheimer's disease and other dementias, and migraine headache.[4] Data also show that from 1990 to 2017, many neurological disorders appear to be increasing in prevalence, incidence, mortality, and disability-adjusted life years (DALY) due to an increasingly aging population. The Neurology Standing Committee oversees the measurement portfolio used to improve the quality of care for neurological conditions. The National Quality Forum's (NQF) portfolio of measures for this topic includes stroke and dementia. The background and description of NQF's most recent Neurology Standing Committee meeting, as well as previous meetings, are available on NQF's project webpage.

For the fall 2020 cycle, the Neurology Standing Committee evaluated one new measure against NQF's standard evaluation criteria. The Standing Committee did not reach consensus on the measure during the measure evaluation meeting. During the post comment meeting, the Standing Committee did not recommend the following measure:

- **NQF #3596:** Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity [Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE)/Centers for Medicare & Medicaid Services (CMS)]

A brief summary of the measure currently under review is included in the body of the report; detailed summaries of the Standing Committee's discussion and ratings of the criteria for the measure are in Appendix A.

## Introduction

In 2017, the Global Burden of Disease study found the three most burdensome neurological conditions in the U.S. with regard to absolute numbers of disability-adjusted life years (DALY): (1) stroke (3.58 million DALYs), (2) Alzheimer's and other dementias (2.55 million DALYs), and (3) migraine headache (2.40 million DALYs).[4] Additionally, stroke is the fifth leading cause of death in the U.S., leading to 146,383 deaths in 2017.[1] It is a condition which has historically had few treatments, yet today, treatments including intravenous and intra-arterial thrombolysis, clot retrieval, and other technologies have revolutionized care.[2,3]Stroke prevalence increases with advanced age and demonstrates disparities. Specifically, stroke is more common among Blacks as compared to Whites, among people with lower socioeconomic status, and among people with fair or poor perceived health status. Stroke is also the leading cause of long-term serious disability in the U.S.

For the fall 2020 cycle, the NQF Neurology project focused on a new measure related to stroke care, specifically a measure of risk-adjusted inpatient mortality for stroke. The risk adjustment is based on the National Institutes of Health (NIH) Stroke Scale, which is used to assess stroke severity upon hospital arrival.

## NQF Portfolio of Performance Measures for Neurology Conditions

The Neurology Standing Committee (Appendix C) oversees NQF's portfolio of Neurology measures (Appendix B), which includes measures for stroke and dementia. This portfolio contains 12 measures: 9 process measures and three outcome and resource use measures (see Table 1 below). There are no composite measures in the portfolio.

**Table 1. NQF Neurology Portfolio of Measures**

| Measures | Process | Outcome/Resource Use | Composite |
|---|---|---|---|
| **Dementia** | 0 | 0 | 0 |
| **Stroke** | 9* | 3 | 0 |
| **Total** | 9 | 3 | 0 |

*Six of these measures are currently NQF-endorsed with reserve status.

## Neurology Measure Evaluation

On February 5, 2021, and February 24, 2021, the Neurology Standing Committee evaluated one new measure against NQF's standard measure evaluation criteria.

**Table 2. Neurology Measure Evaluation Summary**

| Measures | Maintenance | New | Total |
|---|---|---|---|
| Measure under review | 0 | 1 | 1 |
| Measure not recommended for endorsement | 0 | 1 | 1 |

| Measures | Maintenance | New | Total |
|---|---|---|---|
| Reasons for not recommending | Importance – 0<br>Scientific Acceptability – 0<br>Feasibility – 0<br>Use – 0<br>Overall Suitability – 0<br>Competing Measure – 0 | Importance – 1<br>Scientific Acceptability – 0<br>Feasibility – 0<br>Use – 0<br>Overall Suitability – 0<br>Competing Measure – 0 | * |

*cell intentionally left blank

## Comments Received Prior to Standing Committee Evaluation

NQF solicits comments on endorsed measures on an ongoing basis through the Quality Positioning System (QPS). In addition, NQF accepts comments for a continuous 16-week period during each evaluation cycle via an online tool located on the project webpage. For this evaluation cycle, the commenting period opened on December 15, 2020, and closed on April 30, 2021. As of February 5, 2021, two comments were submitted and shared with the Standing Committee prior to the measure evaluation meeting(s) (Appendix F).

## Comments Received After Standing Committee Evaluation

The continuous 16-week public commenting period with NQF member support closed on April 30, 2021. Following the Standing Committee's evaluation of the measures under review, NQF received nine comments from nine organizations (including four member organizations) and individuals pertaining to the draft report and to the measure under review. All comments for each measure under review have been summarized in Appendix A.

Throughout the 16-week continuous public commenting period, NQF members had the opportunity to express their support ("support" or "do not support") for each measure submitted for endorsement consideration to inform the Standing Committee's recommendations. One NQF member provided their expression of support.

## Summary of Measure Evaluation

The following brief summary of the measure evaluation highlights the major issues that the Standing Committee considered. Details of the Standing Committee's discussion and ratings of the criteria for each measure are included in Appendix A.

### NQF #3596 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity (YNHHSC/CORE / CMS): Not Recommended

**Description**: The measure estimates the hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of acute ischemic stroke. The outcome is all-cause 30-day mortality, defined as death from any cause within 30 days of the index hospital admission date, including in-hospital death, for stroke patients. This is a re-specified measure

with a cohort and outcome that is harmonized with the current publicly reported claims-based stroke mortality measure from the Centers for Medicare & Medicaid Services (CMS) and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity upon admission in the risk-adjustment model. This measure uses Medicare fee-for-service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.; **Measure Type**: Outcome; **Level of Analysis**: Facility; **Setting of Care**: Inpatient/Hospital; **Data Source**: Claims, Enrollment Data, Other, Registry Data

The Standing Committee did not vote on the recommendation for endorsement because they did not pass the measure on evidence – a must-pass criterion.

The Standing Committee's discussion began with an overview of NQF #3596, its initial submission in year 2016, and a review of the evidence and opportunities for improvement. A major theme of the Standing Committee's discussion this cycle was whether stroke mortality, even when risk-adjusted for the NIH Stroke Scale, represented an appropriate way to assess quality of stroke care. While there was support from several members of the Standing Committee, there were concerns that solely measuring mortality without considering patient preferences or functional outcomes was incomplete and would not drive improvements in care. Specifically, there were concerns that mortality is often not the central goal of hospital-based stroke care and that functional outcomes are more important. Ultimately, the Standing Committee's voting resulted in a "consensus not reached" verdict for the evidence criterion.

The Standing Committee's discussion on performance gap centered on the two-percentage point gap in mortality between the hospitals in the 25$^{th}$ and 75$^{th}$ percentiles and whether this gap is wide enough to warrant national performance measurement. One Standing Committee member pointed out that the data presented a fair number of outliers, suggesting a wider performance gap in those instances. There were no additional discussions regarding performance gap and the Standing Committee voted to pass the measure on the performance gap criterion with a moderate rating.

The Standing Committee then discussed the Scientific Acceptability criteria. During the pre-evaluation commenting period, the Federation of American Hospitals and the American Medical Association expressed concerns about the minimum measure score reliability results being 0.24 using a minimum case number of 25 patients when measures should reach a minimum acceptable threshold of at least 0.7 for reliability. For the reliability criterion, the Standing Committee also expressed concerns about the 25-case hospital exclusion, use of reliability in small hospitals, and whether the reliability with a subset of hospitals can be generalized to a broader set of hospitals. This measure had been evaluated by the Scientific Methods Panel (SMP) and passed with a moderate rating for reliability with no discussion of concerns. The Standing Committee voted to uphold the SMP's decision. Concerning the validity criterion, the Standing Committee expressed concerns about whether the measure might be omitting patient preferences on treatment depending on the race of the patient; they also questioned the accuracy of the NIH Stroke Scale. The measure developer acknowledged that patient preferences are a complicated issue and that survivor bias and access to care factors might be at play. The SMP passed the measure with a moderate rating for validity with no discussion of concerns. The Standing Committee voted to uphold the SMP's decision.

Before evaluating the measure against the feasibility criterion, NQF staff reminded the Standing Committee of the primary question surrounding the feasibility criterion: whether data for those hospitals that are reporting or could report are readily available. The Standing Committee expressed that while the data needed to calculate the measure are contained in electronic claims, not all hospitals

document the NIH Stroke Scale, which would exclude many hospitals from measurement. The Standing Committee shared no additional questions and held no additional discussion on the feasibility criterion, and it passed the measure on feasibility with a moderate rating.

The Standing Committee did not pose any questions or discussion concerning the use of the measure and voted to pass the measure on the use criterion. NQF staff offered clarification to the Standing Committee on the usability criterion and improvement assessment, advising the Standing Committee to focus on identifying evidence of benefits and harms, as provided by the developer. In addition, there were concerns regarding potential unintended consequences. Hospitals may prioritize survival over other outcomes and implement aggressive interventions in patients with little hope of good functional outcomes. This could lead to increased burden on the healthcare system and families. The Standing Committee passed the measure with a moderate rating of the usability criterion. Ultimately, since the Standing Committee did not reach consensus on the evidence criterion during the measure evaluation meeting, the Standing Committee re-voted on the evidence criterion during the post-comment meeting on May 25, 2021.

During the post-comment meeting, the Standing Committee discussed their previous concerns regarding the evidence criterion. A couple of members expressed their support of the measure as mortality is an important measure of quality even if the measure itself is limited by the lack of function outcome measures. Several other Standing Committee members highlighted their previous concerns about the measurement of stroke mortality in isolation not driving better healthcare quality. It was noted by the Standing Committee that while there are multiple actions that could improve stroke mortality (e.g., hemicraniectomy), these interventions may not improve functional outcomes and may not be in the best interest of the patient or consider patient preferences. The Standing Committee revoted on the evidence criterion and the measure did not pass. Since evidence is a must-pass criterion, the measure is not recommended for endorsement.

After the revote on evidence, the Standing Committee considered the nine comments received on the draft report during the 30-day public comment period. Multiple commentors agreed with the Standing Committee's concern about measuring mortality in isolation could have potential unintended consequences and suggested that mortality measurement could be balanced with measuring improved functional status or that treatment decisions aligned with patient preferences. One commentor highlighted that while mortality may not be the ideal measure, it is an easy outcome to measure unlike the Rankin Scale (an assessment of a patient's degree of disability or dependance after a stroke) which is not frequently performed at discharge so would be more difficult to measure. Multiple commentors approved of using the NIH Stroke Scale for risk adjustment as it is an important prognostic factor for individual patients as well as a predictor of hospital-level performance on 30-day mortality.

Additionally, the Standing Committee offered potential considerations the developer could explore for future consideration of the measure. One Standing Committee member recommended a validation study to evaluate stroke care quality that incorporated assessment of patient preferences and function outcomes. Another member suggested evaluating unintended consequences after implementation of the measure in an accountability or public reporting program. The developer expressed their appreciation for the Standing Committee's suggestions and review of the measure but noted these suggestions may not address the Standing Committee's fundamental concerns about measuring stroke mortality.

## References

1. Virani SS, Alonso A, Benjamin EJ, et al. Heart Disease and Stroke Statistics-2020 Update: A Report From the American Heart Association. *Circulation*. 2020;141(9):e139-e596.

2. Mullen MT, Pisapia JM, Tilwa S, et al. Systematic review of outcome after ischemic stroke due to anterior circulation occlusion treated with intravenous, intra-arterial, or combined intravenous+intra-arterial thrombolysis. *Stroke*. 2012;43(9):2350-2355.

3. Albers GW, Marks MP, Lansberg MG, et al. Thrombectomy for Stroke with Selection by Perfusion Imaging. *N Engl J Med*. 2018;378(19):1849-1850.

4. GBD 2017 US Neurological Disorders Collaborators, Feigin VL, Vos T, et al. Burden of Neurological Disorders Across the US From 1990-2017: A Global Burden of Disease Study. *JAMA Neurol*. 2021;78(2):165.

# Appendix A: Details of Measure Evaluation

**Rating Scale: H**=High; **M**=Moderate; **L**=Low; **I**=Insufficient; **NA**=Not Applicable; **Y**=Yes; **N**=No

Vote totals may differ between measure criteria and between measures as Standing Committee members often have to join calls late or leave calls early. NQF ensures that quorum is maintained for all live voting. All voting outcomes are calculated using the number of Standing Committee members present during the meeting for that vote as the denominator. Denominator vote counts may vary throughout the criteria due to intermittent Standing Committee attendance fluctuation. The vote totals reflect members present and eligible to vote at the time of the vote. Quorum (15 out of 22 Standing Committee members for the Measure Evaluation meetings and 14 out of 21 Standing Committee members for the Post-Comment meeting) was met and maintained for the entirety of both meetings. Please note one Standing Committee member resigned from the Standing Committee between the Measure Evaluation and Post-Comment meetings.

## Measure Not Recommended

### NQF #3596 Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Claims-Based Risk Adjustment for Stroke Severity

Submission |

**Description**: The measure estimates the hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of acute ischemic stroke. The outcome is all-cause 30-day mortality, defined as death from any cause within 30 days of the index admission date, including in-hospital death, for stroke patients. This is a re-specified measure with a cohort and outcome that is harmonized with the CMS's current publicly reported claims-based stroke mortality measure and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity upon admission in the risk-adjustment model. This measure uses Medicare fee-for-service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.

**Numerator Statement**: The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke.

**Denominator Statement**: The cohort includes inpatient admissions to all non-federal, short-term, acute care or critical access hospitals for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke.

Additional details are provided in S.7 Denominator Details.

**Exclusions**: The mortality measure excludes index admissions for patients in the following categories:

1. With inconsistent or unknown vital status or other unreliable data;
2. Enrolled in the Medicare hospice program at any time in the 12 months prior to the index admission, including the first day of the index admission
3. Discharged against medical advice (AMA)

For patients with more than one admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

**Adjustment/Stratification**: Statistical risk model

**Level of Analysis:** Facility

**Setting of Care:** Inpatient/Hospital

**Type of Measure**: Outcome

**Data Source**: Claims, Enrollment Data, Other, Registry Data

**Measure Steward**: Centers for Medicare & Medicaid Services

**STANDING COMMITTEE MEETING [02/05/2021 and 02/24/2021]**

**1. Importance to Measure and Report: The measure did not pass the Importance criteria.**

(1a. Evidence: 1b. Performance Gap)

1a. Evidence: **Total Votes: 17; Y-9**; **N-8 (Consensus Not Reached)**

Post-Comment Vote: **Total Votes: 14; Y-3; N-11 (Did Not Pass)**

1b. Performance Gap: **Total Votes: 17; H-2**; **M-10**; **L-3**; **I-2**

Rationale:

- The Standing Committee discussed two concepts related to evidence: whether in-hospital stroke mortality is an appropriate measure of quality and whether there is evidence that one or more clinical actions can be performed to change stroke mortality.
- In the measure submission, the developer described considerable literature linking post-stroke mortality rates to hospital organizational factors, such as the provider's response to complications, speediness of delivery of care, organization of care, coordinated transitions to the outpatient environment, antihypertensive and anticoagulant therapies, and appropriate imaging.
- This information included that hospitals participating in quality improvement registries, such as Get With The Guidelines (GWTG), had lower in-hospital mortality rates among stroke patients than hospitals not participating in similar programs (Fonarow et al, 2014).
- In another example, patients being treated at hospitals participating in the GWTG quality improvement registry for stroke were significantly more likely to receive multiple evidence-based care interventions, such as tissue plasminogen activator (tPA) administration and evaluation by a neurologist (Howard et al, 2018).
- During their discussion, the Standing Committee agreed that hospitals could have an impact on stroke mortality.
- However, several members of the Standing Committee were concerned that stroke mortality was not a quality measure that would drive healthcare improvement and could lead to unintended consequences. This is because the major focus of in-hospital care in stroke is functional improvement of stroke symptoms and that measuring mortality in isolation could lead to unintended consequences of prolonging life through invasive interventions without considering functional outcomes.

- During the initial measure evaluation meetings, the Standing Committee was consensus not reached for evidence. Due to the consensus not reached vote, the Standing Committee continued to discuss and vote on the subsequent criteria, outlined below. However, since the Standing Committee did not pass the measure on the evidence criterion, the measure is not recommended for endorsement.

  For performance gap, the developer used Medicare Fee-for-Service administrative claims data from October 2016 to June 2019 using hospitals where the NIH Stroke Scale was coded for 60% of the claims. In 329 hospitals, the mean risk standardized mortality rate (RSMR) was 14.63% with a range of 10.05% to 17.83% and an interquartile range of 13.82% to 15.52%.

**2. Scientific Acceptability of Measure Properties:**

(2a. Reliability - precise specifications, testing; 2b. Validity - testing, threats to validity

2a. Reliability: **Total Votes: 8; H-3**; **M-5**; **L-0**; **I-0** 2b. Validity: **Total Votes: 7; H-1**; **M-5**; **L-1**; **I-0**

**Rationale**:

- The measure was reviewed by the SMP and given moderate ratings for both reliability and validity.
- Reliability testing was conducted at the measure score level using Medicare Parts A and B claims as well as the Medicare Enrollment Database (EDB).
- Signal-to-noise ratio testing was performed for all hospitals and those hospitals that meet the minimum case count of at least 25 cases for public reporting.
- The reliability score was 0.72; however, the scores had a wide range from 0.01 -- meaning that it was unreliable at some hospitals, to 0.95 -- meaning that it was very reliable at others in the testing sample.
- The 25th and 75th percentiles were 0.51 and 0.83, respectively. Using the threshold of at least 25 cases, which will be used for public reporting, the median reliability score was 0.75, yet it still had a large range from 0.24 to 0.95, and the 25th and 75th percentiles were 0.59 and 0.83, respectively.
- Data element validity was conducted, in which the developer compared scores of the Medicare claims with the scores from the GWTG-Stroke registry data and compared the scores using a sample size of 29,936 stroke hospitalizations. When comparing NIH Stroke scores to GWTG-Stroke Registry and administrative claims data, 93% were in five points of each other, and 84% of the data were within two points. The Pearson correlation coefficient between the two scores is 0.993 and weighed Kappa was 0.842.
- For construct validity, the developer assessed the measure score correlation with the Overall Hospital Star Ratings Mortality measure Group score. The overall correlation was 0.422.
- The Standing Committee voted to accept the SMP's vote for reliability and validity based upon the above results. The votes above reflect the SMP members' vote. The Standing Committee voted to accept the SMP's vote for reliability Yes – 15, No – 2 (Denominator: 17) and for validity Yes – 11, No – 6 (Denominator: 17).

**3. Feasibility: Total Votes: 15; H-4; M-9; L-2; I-0**

*(3a. Data generated during care; 3b. Electronic sources; and 3c. Data collection can be implemented (eMeasure feasibility assessment of data elements and logic)*

Rationale:

- The data used for this measure appear in electronic claims data.
- However, a limitation of measure feasibility is that the NIH stroke score data are not kept in a national database for all non-federal acute-care hospitals. Therefore, the feasibility of this measure depends on hospital's measuring of NIH stroke scores and including those data in the claims. Collecting NIH Stroke Scale (NIHSS) information is a class I recommendation from AHA/ASA. Based on all acute-care hospitals from October 2016 to June 2019, NIHSS data were available in 37% of admissions for acute ischemic stroke. This increased from 13% in October 2016 to 55.6% in May 2019, demonstrating increased availability of these data.

**4. Use and Usability**

*(4a. Use; 4a1. Accountability and transparency; 4a2. Feedback on the measure by those being measured and others; 4b. Usability; 4b1. Improvement; 4b2. The benefits to patients outweigh evidence of unintended negative consequences to patients)*

4a. Use: **Total Votes: 15; Pass-14; No Pass-1** 4b. Usability*:* **Total Votes: 15; H-1; M-12; L-1; I-1**

Rationale:

- The measure is currently not in use.

- The developer plans to use this updated measure to replace the currently reported *Hospital 30-Day Mortality Following Acute Ischemic Stroke Hospitalization* measure. The earlier measure does not risk-adjust for stroke severity, so the new measure was created to account for those factors.
- The developer compared the median hospital RSMR for stroke from 2013-2016 to 2016-2019. The median hospital RSMR in the 2013-2016 data set was 14.5% and the median hospital RSMR in the 2016-2019 combined data set was 13.6% based on 520,432 admissions from 4,254 hospitals. This demonstrates improvement of this measure over time.

**5. Related and Competing Measures**

This measure is related to the following measures:

- #0467 Acute Stroke Mortality Rate (IQI 17)
- #3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality
- #3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality

Since the measure did not pass on evidence, related and competing measures were not discussed by the Standing Committee.

**6. Standing Committee Recommendation for Endorsement: Not Applicable**

Rationale:

- The evidence criterion underwent a revote during the post-comment meeting and did not pass.

**7. Public and Member Comment**

- Two comments were submitted before the evaluation meeting and both expressed concerns about the minimum measure score reliability results being 0.24 using a minimum case number of 25 patients when measures should reach a minimum acceptable threshold of at least 0.7 for reliability
- Nine comments were submitted after the evaluation meeting. Multiple commentors expressed concern about measuring mortality in isolation could have potential unintended consequences and suggested that mortality measurement could be balanced with measuring improved functional status or that treatment decisions aligned with patient preferences. Additionally, multiple commentors also approved of using the NIH Stroke Scale for risk adjustment as it is an important prognostic factor for individual patients as well as a predictor of hospital-level performance on 30-day mortality. Comments were also received that expressed concerns regarding the threshold minimum sample size and the impact of missing data. Most commentors also expressed their support of the measure and thought that the inclusion of the NIH Stroke Scale for risk adjustment was an improvement over the current measure being used by CMS.

**8. Consensus Standards Approval Committee (CSAC) Endorsement Decision: Yes-X; No-X (June 29-30, 2021: Endorsed or Not Endorsed)**

The CSAC upheld [or did not uphold] the Standing Committee's decision to not recommend the measure for endorsement.

## Appendix B: Neurology Portfolio—Use in Federal Programs[a]

| NQF # | Title | Federal Programs: Finalized or Implemented as of March 4, 2021 |
|---|---|---|
| 0434e* | STK 01: Venous Thromboembolism (VTE) Prophylaxis | No federal program usage was specified for this measure. |
| 0435e* | STK 02: Discharged on Antithrombotic Therapy | Medicare and Medicaid Electronic Health Record Incentive Program for Hospitals and Critical Access Hospitals and Medicare and Medicaid Promoting Interoperability Program for Eligible Hospitals and Critical Access Hospitals |
| 0436e* | STK 03: Anticoagulation Therapy for Atrial Fibrillation/Flutter | Medicare and Medicaid Electronic Health Record Incentive Program for Hospitals and Critical Access Hospitals and Medicare and Medicaid Promoting Interoperability Program for Eligible Hospitals and Critical Access Hospitals |
| 0437 | STK 04: Thrombolytic Therapy | No federal program usage was specified for this measure. |
| 0437e | STK 04: Thrombolytic Therapy | No federal program usage was specified for this measure. |
| 0438e* | STK 05: Antithrombotic Therapy by End of Hospital Day Two | Medicare and Medicaid Electronic Health Record Incentive Program for Hospitals and Critical-Access Hospitals and Medicare and Medicaid Promoting Interoperability Program for Eligible Hospitals and Critical-Access Hospitals |
| 0439e* | STK 06: Discharged on Statin Medication | Medicare and Medicaid Electronic Health Record Incentive Program for Hospitals and Critical-Access Hospitals and Medicare and Medicaid Promoting Interoperability Program for Eligible Hospitals and Critical-Access Hospitals |
| 0441e* | STK 10: Assessed for Rehabilitation | No federal program usage was specified for this measure. |
| 0467 | Acute Stroke Mortality Rate (IQI 17) | No federal program usage was specified for this measure. |
| 0507 | Diagnostic Imaging: Stenosis Measurement in Carotid Imaging Reports | Merit-Based Incentive Payment System (MIPS) Program |
| 0661 | Head CT or MRI Scan Results for Acute Ischemic Stroke or Hemorrhagic Stroke Patients Who Received Head CT or MRI Scan Interpretation Within 45 Minutes of ED Arrival | Hospital Compare; Hospital Outpatient Quality Reporting |

[a] Per CMS Measures Inventory Tool as of 3/4/2021

| NQF # | Title | Federal Programs: Finalized or Implemented as of March 4, 2021 |
|---|---|---|
| 1952 | Time to Intravenous Thrombolytic Therapy | No federal program usage was specified for this measure. |
| 2863 | CSTK-06: Nimodipine Treatment Administered | No federal program usage was specified for this measure. |
| 2864 | CSTK-01: National Institutes of Health Stroke Scale (NIHSS) Score Performed for Ischemic Stroke Patients | No federal program usage was specified for this measure. |
| 2866 | CSTK-03: Severity Measurement Performed for Subarachnoid Hemorrhage (SAH) and Intracerebral Hemorrhage (ICH) Patients (Overall Rate) | No federal program usage was specified for this measure. |
| 2872e | Dementia: Cognitive Assessment | Merit-Based Incentive Payment System (MIPS) Program |
| 2877e | Hybrid Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Acute Ischemic Stroke Hospitalization With Risk Adjustment for Stroke Severity | No federal program usage was specified for this measure. |

## Appendix C: Neurology Standing Committee and NQF Staff

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# Appendix D: Measure Specifications

## 3596 Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

### STEWARD

Centers for Medicare & Medicaid Services

### DESCRIPTION

The measure estimates the hospital-level, risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of acute ischemic stroke. The outcome is all-cause 30-day mortality, defined as death from any cause within 30 days of the index admission date, including in-hospital death, for stroke patients. This is a re-specified measure with a cohort and outcome that is harmonized with the CMS's current publicly reported claims-based stroke mortality measure and includes the National Institutes of Health (NIH) Stroke Scale as an assessment of stroke severity upon admission in the risk-adjustment model. This measure uses Medicare fee-for-service (FFS) administrative claims for the cohort derivation, outcome, and risk adjustment.

### TYPE

Outcome

### DATA SOURCE

Claims, Enrollment Data, Other, Registry Data For measure specification and testing the data sources were:

Medicare Part A inpatient and Part B outpatient claims: This data source contains claims data for fee-for service inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, as well as inpatient and outpatient physician claims for the 12 months prior to an index admission.

Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission, as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming et al., 1992). The Master Beneficiary Summary File (MBSF) is an annually created file derived from the EDB that contains enrollment information for all Medicare beneficiaries including dual-eligible status. Years 2016-2019 were used.

The American Community Survey (2013-2017): The American Community Survey data is collected annually, and an aggregated 5-years data were used to calculate the Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status (SES) composite index score.

Overall Hospital Quality Star Ratings Mortality Measure Group: This data contains a summary of mortality measures, using October 2019 Hospital Compare data. This data was used to test measure score validity.

American Heart Association/American Stroke Association (AHA/ASA)'s Get With The Guidelines (GWTG)-Stroke Registry: This data contains NIH Stroke Scale scores derived from patient medical records from 2016-2019. This data was used to test data element validity.

References:

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

LEVEL

Facility

SETTING

Inpatient/Hospital

NUMERATOR STATEMENT

The outcome for this measure is 30-day, all-cause mortality. We define mortality as death from any cause within 30 days of the index admission for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke.

NUMERATOR DETAILS

The measure counts deaths for any cause within 30 days of the index acute ischemic stroke admission. As currently specified, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

DENOMINATOR STATEMENT

The cohort includes inpatient admissions to all non-federal, short-term, acute care or critical access hospitals for Medicare FFS patients age 65 years and older with a principal discharge diagnosis of acute ischemic stroke.

Additional details are provided in S.7 Denominator Details.

DENOMINATOR DETAILS

To be included in the measure cohort used in public reporting, patients must meet the following additional inclusion criteria:

1. Principal discharge diagnosis of acute ischemic stroke
2. Enrolled in Part A and Part B Medicare for the 12 months prior to the date of index admission, and Medicare FFS during the index admission
3. Aged 65 or over
4. Not transferred from another acute care facility

A list of ICD-10 codes that define the patient cohort are included in the Data Dictionary.

EXCLUSIONS

The mortality measure excludes index admissions for patients:

1. With inconsistent or unknown vital status or other unreliable data;
2. Enrolled in the Medicare hospice program at any time in the 12 months prior to the index admission, including the first day of the index admission; and
3. Discharged against medical advice (AMA).

For patients with more than one admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort.

### EXCLUSION DETAILS

1. Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years: 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than 'male' or 'female'.

   Rationale: Reliable and consistent data are necessary for valid calculation of the measure.

2. Hospice enrollment in the 12 months prior to or on the index admission is identified using hospice data and the inpatient standard analytic file (SAF).

   Rationale: These patients are likely continuing to seek comfort measures only; thus, mortality is not necessarily an adverse outcome or signal of poor quality care.

3. Discharges against medical advice (AMA) are identified using the discharge disposition indicator in claims data.

   Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

### RISK ADJUSTMENT

Statistical risk model

### STRATIFICATION

N/A

### TYPE SCORE

Rate/proportion better quality = lower score

### ALGORITHM

The measure estimates hospital-level, 30-day, all-cause RSMRs following hospitalization for stroke using hierarchical logistic regression models. In brief, the approach simultaneously models data at the patient and hospital levels to account for variance in patient outcomes within and between hospitals (Normand and Shahian, 2007). At the patient level, it models the log-odds of mortality within 30 days of index admission using age, selected clinical covariates, and a hospital-specific intercept. At the hospital level, it models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of a mortality at the hospital, after accounting for patient risk. The hospital-specific intercepts are given a distribution to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, and a higher ratio indicates higher-than-expected mortality rates or worse quality.

The "predicted" number of deaths (the numerator) is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific intercept on the risk of mortality. The estimated hospital-specific intercept is added to the sum of the estimated

regression coefficients multiplied by the patient characteristics. The results are transformed and summed over all patients attributed to a hospital to get a predicted value. The “expected” number of deaths (the denominator) is obtained in the same manner, but a common intercept using all hospitals in our sample is added in place of the hospital-specific intercept. The results are transformed and summed over all patients in the hospital to get an expected value. To assess hospital performance for each reporting period, we re-estimate the model coefficients using the years of data in that period.

This calculation transforms the ratio of predicted over expected into a rate that is compared to the national observed mortality rate. The hierarchical logistic regression models are described fully in the original methodology report posted on QualityNet [https://qualitynet.org/inpatient/measures/mortality/methodology].

References:

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22(2): 206-226. 146637| 146313

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# Appendix E1: Related and Competing Measures (tabular form)

## Comparison of NQF #0467, NQF #3502, NQF #3504

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| Steward | Agency for Healthcare Research and Quality | Centers for Medicare & Medicaid Services | Centers for Medicare & Medicaid Services |
| Description | In-hospital deaths per 1,000 hospital discharges with acute stroke as a principal diagnosis for patients ages 18 years and older. Includes metrics for discharges grouped by type of stroke. Excludes obstetric discharges and transfers to another hospital.<br>[NOTE: The software provides the rate per hospital discharge. However, common practice reports the measure as per 1,000 discharges. The user must multiply the rate obtained from the software by 1,000 to report in-hospital deaths per 1,000 hospital discharges.] | The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.<br>Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).<br>Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way | The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.<br>Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).<br>Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure. |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | from results of analyses for a nationally representative hybrid measure.<br>Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).<br>Differences in the measure, data, and testing that reflect limitations in data availability<br>1. Dataset used for development, some testing (see below for differences), and measure results:<br>a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.<br>b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.<br>2. Age of patients in cohort:<br>a. The claims-only measure includes Medicare FFS patients, age 65-94.<br>b. The hybrid measure includes all patients age 50-94 (see later discussion for justification) | Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).<br>Differences in the measure, data, and testing that reflect limitations in data availability<br>1. Dataset used for development, some testing (see below for differences), and measure results:<br>a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.<br>b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.<br>2. Age of patients in cohort:<br>a. The claims-only measure includes Medicare FFS patients, age 65-94.<br>b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)<br>3. External empiric validity testing<br>a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form. |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | 3. External empiric validity testing<br>a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.<br>4. Socioeconomic risk factor analyses<br>a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.<br>5. Exclusion analyses<br>a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.<br>6. Meaningful differences<br>a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure. | 4. Socioeconomic risk factor analyses<br>a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.<br>5. Exclusion analyses<br>a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.<br>6. Meaningful differences<br>a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure.<br>Difference between the two measures when fully harmonized, prior to implementation:<br>1. Risk adjustment:<br>a. The claims-only measure uses administrative claims data only for risk adjustment<br>b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR. |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | Difference between the two measures when fully harmonized, prior to implementation:<br>1. Risk adjustment:<br>a. The claims-only measure uses administrative claims data only for risk adjustment<br>b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR. | |
| Type | Outcome | Outcome | Outcome |
| Data Source | Claims HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD. | Claims, Electronic Health Records, Other Clinical-Hybrid Dataset<br>Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all admissions for adult patients to any of their member hospitals between January 1, 2009 and June 30, 2015 was used for measure development, as described in the attached methodology report).<br>The two data sources listed below were used for testing the claims- | Claims, Enrollment Data, Other Data sources for the Medicare FFS measure:<br>1. Medicare Part A Inpatient: The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission, hospitalized from July 1, 2016-June 30, 2017. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission.<br>2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | based measure; the hybrid testing form includes some testing data from the claims-based measure (for example, for the social risk factor and external validation analyses).<br>HWM claims-only datasets:<br>Medicare Part A Inpatient Claims Data<br>The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. This data was used along with the Medicare Enrollment Database (EDB) for testing the claims-based measure.<br>Medicare Enrollment Database (EDB)<br>This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment. | inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment. |
| Level | Facility | Facility | Facility |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| Setting | Inpatient/Hospital | Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest Home or Custodial Care Services | Inpatient/Hospital |
| Numerator Statement | Overall:<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.<br>Stratum A (Subarachnoid hemorrhage):<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.<br>Stratum B (Intracerebral hemorrhage) :<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.<br>Stratum C (Ischemic stroke):<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator. | The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date. | The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date. |
| Numerator Details | Overall:<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator. | The measure outcome is death from any cause within 30 days of the admission date of the index admission. The numerator is a binary variable (1=yes/0=no) that indicates | The measure outcome is death from any cause within 30 days of the admission date of the index admission, for Medicare FFS patients identified using the Medicare Enrollment Database (EDB). The numerator is a binary variable |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | Stratum A (Subarachnoid hemorrhage):<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.<br>Stratum B (Intracerebral hemorrhage) :<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator.<br>Stratum C (Ischemic stroke):<br>Number of deaths (DISP=20) among cases meeting the inclusion and exclusion rules for the denominator. | whether the patient died within 30 days of the index admission date. | (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date. |
| Denominator Statement | Overall:<br>Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for subarachnoid hemorrhage or a principal ICD-9-CM diagnosis code for intracerebral hemorrhage or a principal ICD-9-CM diagnosis code for ischemic stroke. | The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so | The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | that both will include admissions for patients age 65-94. | |
| Denominator Details | ICD-9-CM Subarachnoid hemorrhage diagnosis codes:<br>430 SUBARACHNOID HEMORRHAGE<br>ICD-9-CM Intracerebral hemorrhage diagnosis codes:<br>431 INTRACEREBRAL HEMORRHAGE<br>4320 NONTRAUM EXTRADURAL HEM<br>4321 SUBDURAL HEMORRHAGE<br>4329 INTRACRANIAL HEMORR NOS<br>ICD-9-CM Ischemic stroke diagnosis codes:<br>43301 BASI ART OCCL W/ INFARCT<br>43311 CAROTD OCCL W/ INFRCT<br>43321 VERTB ART OCCL W/ INFRCT<br>43331 MULT PRECER OCCL W/ INFRCT<br>43381 PRECER OCCL NEC W/ INFRCT<br>43391 PRECER OCCL NOS W/ INFRCT<br>43401 CERE THROMBOSIS W/ INFRCT<br>43411 CERE EMBOLISM W/ INFRCT<br>43491 CEREB OCCL NOS W/ INFRCT<br>Note: For discharges prior to September 30, 2014 (FY2004 or | The index cohort includes all inpatient admissions for patients aged 50-94 years old. (Note: The intention is to fully harmonize the cohort definition with the claims-only measure so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing due to the limited dataset available that included the EHR data elements needed to calculate this measure. Note that the risk model already includes age in years, as a risk variable.)<br>An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:<br>1. Not transferred from another acute care facility<br>Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any “transfer-in” hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).<br>2. Aged between 50 and 94 years | An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:<br>1. Enrolled in Medicare FFS Part A for at least 12 months prior to the date of admission and during the index admission<br>Rationale: Claims data are consistently available only for Medicare FFS beneficiaries. The 12-month prior enrollment criterion ensures a full year of administrative data is available for risk adjustment.<br>2. Not transferred from another acute care facility<br>Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any “transfer-in” hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).<br>3. Aged between 65 and 94 years<br>Rationale: Medicare patients younger than 65 are not included in the measure because they usually qualify for the program due to severe disability and are considered to be clinically distinct from Medicare patients 65 and over. Patients |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | earlier), the following code is included in the overall denominator. This code is not included in any stratum.<br>436 CVA<br>[NOTE: Overall denominator may not match the sum of the strata denominators because the strata may not be mutually exclusive.]<br>Stratum A (Subarachnoid hemorrhage):<br>Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for subarachnoid hemorrhage (see above).<br>Stratum B (Intracerebral hemorrhage) :<br>Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for intracerebral hemorrhage stroke (see above).<br>Stratum C (Ischemic stroke):<br>Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for ischemic stroke (see above). | The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included. The use of a small dataset required that we expand the sample by including admissions from patients ages 50 to 94 years. Note that the measure already adjusts for age.<br>3. Not admitted for primary psychiatric diagnoses<br>Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).<br>4. Not admitted for rehabilitation<br>Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).<br>5. Not enrolled in hospice at the time of, or 12 months prior to, their index admission<br>Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal<br>6. Not enrolled in hospice within two days of admission | over age 94 are not included to avoid holding hospitals responsible for the survival of the very elderly patients, who may be less likely to have survival as a primary goal.<br>Note that the hybrid measure (submitted for NQF endorsement in parallel with the claims-only measure) differs from the claims-only measure in terms of the age range of included admissions; the hybrid measure includes all inpatient admissions for patients aged 50-94 years old. The intention is to fully harmonize the cohort definitions for the two measures, so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing for the hybrid measure due to the limited dataset available that included the EHR data elements needed to calculate the hybrid measure. Note that the risk model already includes age in years, as a risk variable.)<br>4. Not admitted for primary psychiatric diagnoses<br>Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).<br>5. Not admitted for rehabilitation<br>Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.<br>7. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission<br>Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).<br>8. Without any diagnosis of metastatic cancer<br>Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered | data dictionary, HWM Non-Acute Care Inclusion tab).<br>6. Not enrolled in hospice at the time of, or 12 months prior to, their index admission<br>Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal.<br>7. Not enrolled in hospice within two days of admission<br>Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.<br>8. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission<br>Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab). |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).<br>9. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival<br>Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.<br>In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures | 9. Without any diagnosis of metastatic cancer<br>Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).<br>10. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival<br>Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.<br>In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
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| | | that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.<br>The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS | the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.<br>The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS |

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| | | procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.<br>The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.<br>The surgical divisions are: Surgical Cancer (see note below), | procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.<br>The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.<br>The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures. |

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| | | Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.<br>For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.<br>The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.<br>The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary. | For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.<br>The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.<br>The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary. |
| Exclusions | Overall:<br>Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium)<br>• with missing discharge disposition (DISP=missing), | The measure excludes index admissions for patients:<br>1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;<br>2. Discharged against medical advice (AMA);<br>3. With an admission for spinal cord injury (CCS 227), skull and | The measure excludes index admissions for patients:<br>1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;<br>2. Discharged against medical advice (AMA);<br>3. With an admission for spinal cord injury (CCS 227), skull and face |

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| | gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)<br>Stratum A (Subarachnoid hemorrhage):<br>Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium)<br>• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)<br>Stratum B (Intracerebral hemorrhage) :<br>Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium)<br>• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)<br>Stratum C (Ischemic stroke): | face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and<br>4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year. | fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and<br>4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year. |

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| | Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium)<br>• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing) | | |
| Exclusion Details | Overall:<br>Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium)<br>• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)<br>Stratum A (Subarachnoid hemorrhage):<br>Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium) | 1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data.<br>Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.<br>2. Discharged against medical advice (AMA)<br>Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.<br>3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury | 1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data<br>Rationale: The measure does not include stays for patients where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.<br>2. Discharged against medical advice (AMA)<br>Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.<br>3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of |

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|---|---|---|---|
| | • with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)<br>Stratum B (Intracerebral hemorrhage) :<br>Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium)<br>• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)<br>Stratum C (Ischemic stroke):<br>Exclude cases:<br>• transferring to another short-term hospital (DISP=2)<br>• MDC 14 (pregnancy, childbirth, and puerperium)<br>• with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing) | (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240).<br>Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.<br>4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.<br>Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.<br>Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the | head/neck/trunk (CCS 235), and burns (CCS 240)<br>Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.<br>4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.<br>Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.<br>Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored |

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| | | divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions. | the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions. |
| Risk Adjustment | Statistical risk model | Statistical risk model | Statistical risk model |
| Stratification | The indicator is stratified into three groups by the type of stroke:<br>Cases are assigned to strata according to a hierarchy based on mortality, with cases being assigned to the stratum with the highest mortality for which the case qualifies. In the case of Stroke Mortality the current hierarchy is as follows:<br>Strata hierarchy (listed from highest mortality to lowest mortality):<br>1. Stratum B (Intracerebral hemorrhage) | N/A | N/A |

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| | 2. Stratum A (Subarachnoid hemorrhage)<br>3. 3. Stratum C (Ischemic stroke) | | |
| Type Score | Rate/proportion better quality = lower score | Rate/proportion better quality = lower score | Rate/proportion better quality = lower score |
| Algorithm | The indicator is expressed as a rate, defined as outcome of interest / population at risk or numerator / denominator. The AHRQ Quality Indicators (AHRQ QI) software performs six steps to produce the rates. 1) Discharge-level records are flagged to identify the outcome of interest and 2) the population at risk. 3) Calculate observed rates as the sum of the records flagged in the numerator divided by the sum of the records flag in the denominator for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records to compute a predicted value. For indicators that are not risk-adjusted, this is the reference population rate. The expected rate is computed as the sum of the predicted value for each record divided by the number of records flagged in the population at risk for the unit of analysis of interest (i.e., hospital). 5) Calculate risk-adjusted | The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the | The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.<br>Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division |

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| | rate using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate. For indicators that are not risk-adjusted, this is the same as the observed rate. 6) Calculate smoothed rate using an Empirical Bayes shrinkage estimator (W) as the weighted average of the risk-adjusted rate and the reference population rate. The shrinkage estimate reflects a reliability adjustment unique to each indicator. 130177\| 132112\| 138848\| 109921\| 138827 | Markov Chain Monte Carlo (MCMC) technique.<br>Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. | and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same |

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| | | The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.<br>To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.<br>The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. (Note that in the case of the hybrid measure, we are presenting data from 9 of the total 15 divisions due to limitations in availability of electronic health records data). The hospital-wide SMR is then multiplied by the national observed mortality rate to | case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.<br>To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.<br>The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR. 146637\| 144762\| 110639\| 141015\| 110874\| 146313 |

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| | | produce the RSMR. 146637\| 110639\| 141015\| 110874\| 146313 | |
| Submission items | 5.1 Identified measures:<br>0240: Stroke and Stroke Rehabilitation: Venous Thromboembolism (VTE) Prophylaxis for Ischemic Stroke or Intracranial Hemorrhage<br>0241: Stroke and Stroke Rehabilitation: Anticoagulant Therapy Prescribed for Atrial Fibrillation (AF) at Discharge<br>0242: Stroke and Stroke Rehabilitation: Tissue Plasminogen Activator (t-PA) Considered<br>0243: Stroke and Stroke Rehabilitation: Screening for Dysphagia<br>0244: Stroke and Stroke Rehabilitation: Rehabilitation Services Ordered<br>0325: Stroke and Stroke Rehabilitation: Discharged on Antithrombotic Therapy<br>0434: STK-01: Venous Thromboembolism (VTE) Prophylaxis<br>0435: STK 02: Discharged on Antithrombotic Therapy<br>0436: STK-03: Anticoagulation Therapy for Atrial Fibrillation/Flutter | 5.1 Identified measures:<br>N/A<br><br>5.1b. Non-NQF endorsed related and competing measures<br>Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789);<br><br>Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) (NQF #1550);<br><br>Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization (NQF #0468);<br><br>Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization (NQF #1893);<br><br>Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery (NQF #2558); | 5.1 Identified measures:<br>N/A<br><br>5.1b. Non-NQF endorsed related and competing measures<br>Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789);<br><br>Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) (NQF #1550);<br><br>Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization (NQF #0468);<br><br>Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization (NQF #1893);<br><br>Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery (NQF #2558); |

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| | 0437: STK 04: Thrombolytic Therapy<br>0438: STK 05: Antithrombotic Therapy By End of Hospital Day Two<br>0439: STK-06: Discharged on Statin Medication<br>0440: STK-08: Stroke Education<br>0441: STK-10: Assessed for Rehabilitation<br>0442: Functional Communication Measure: Writing<br>0443: Functional Communication Measure: Swallowing<br>0444: Functional Communication Measure: Spoken Language Expression<br>0445: Functional Communication Measure: Spoken Language Comprehension<br>0446: Functional Communication Measure: Reading<br>0448: Functional Communication Measure: Memory<br>0449: Functional Communication Measure: Attention<br>0661: Head CT or MRI Scan Results for Acute Ischemic Stroke or Hemorrhagic Stroke Patients who Received Head CT or MRI Scan Interpretation within 45 minutes of ED Arrival | Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization (NQF #0230);<br><br>Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization (NQF #0229);<br><br>Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization.<br><br>Death Rate in Low Mortality Diagnosis Related Groups (PSI-02) (NQF #0347)<br><br>AHRQ's Mortality for Select Conditions (IQI-90) (NQF #0530)<br><br>5a.1 Are specs completely harmonized? Yes<br><br>5a.2 If not completely harmonized, identify difference, rationale, impact:<br><br>This hybrid HWM measure incorporates patient-level clinical data from the EHR into the risk adjustment model, compared to the | Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization (NQF #0230);<br><br>Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization (NQF #0229);<br><br>Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization.<br><br>Death Rate in Low Mortality Diagnosis Related Groups (PSI-02) (NQF #0347)<br><br>AHRQ's Mortality for Select Conditions (IQI-90) (NQF #0530)<br><br>5a.1 Are specs completely harmonized? Yes<br><br>5a.2 If not completely harmonized, identify difference, rationale, impact:<br><br>This claims-only hospital-wide mortality (HWM) measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital |

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|---|---|---|---|
| | 0705: Proportion of Patients Hospitalized with Stroke that have a Potentially Avoidable Complication (during the Index Stay or in the 30-day Post-Discharge Period)<br><br>5a.1 Are specs completely harmonized? No<br><br>5a.2 If not completely harmonized, identify difference, rationale, impact:<br>All but one of the related endorsed measures are measures of the process of care for patients with stroke. Therefore, these measures have similar target populations but different measure foci. The lone endorsed outcome measure other than this measure includes a wide variety of potentially avoidable complications. Due to the large number of related measures and incomplete specifications currently available online, we are currently contacting measure developers for additional information to assess and promote harmonization when possible. Comparing the denominator criterion for this measure with the denominator criteria for STK measures from The Joint Commission, there are minor differences. The AHRQ | claims-only hospital-wide mortality measure. This hybrid HWM measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure | performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer (with some exceptions), whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include in the HWM measure as many have survival as their primary goal; however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore, are not a reasonable signal of quality. Another difference between the two measures is |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | specification includes all ischemic and hemorrhagic infarcts. The Joint Commission specification adds 433.10 (carotid occlusion without infarct) and 434.00 (cerebral thrombosis without infarct), and it drops intracranial hemorrhagic infarcts without specified subarachnoid or intracerebral hemorrhage (e.g., 432.x). AHRQ believes that these differences are justified, but they comprise less than 5% of the total denominator, which would make harmonization potentially appropriate. The AMA-PCPI measures for Stroke and Stroke Rehabilitation also exclude hemorrhagic infarcts other than intracerebral hemorrhages, and they include selected TIA (435.9) and late effects (438.2, 438.89, 438.9) codes, which would not be appropriate for an inpatient mortality measure.<br><br>5b.1 If competing, why superior or rationale for additive value: NQF Not applicable. | (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer, whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include as many have survival as their primary goal, however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into in order to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into six categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure | the number of divisions or specialty cohorts the patients are divided into, to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into five categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. Hospital-wide mortality captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all |

| Measures | 0467 Acute Stroke Mortality Rate (IQI 17) | 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure | 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure |
|---|---|---|---|
| | | captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. HWM captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.<br><br>5b.1 If competing, why superior or rationale for additive value:<br>There are no competing NQF-endorsed measures. | deaths after 30 days of admission, for all conditions and procedures.<br><br>5b.1 If competing, why superior or rationale for additive value:<br><br>There are no competing NQF-endorsed measures. |

## Appendix E2: Related and Competing Measures (narrative form)

0467 Acute Stroke Mortality Rate (IQI 17)
3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure
3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

*Steward*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Agency for Healthcare Research and Quality

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Centers for Medicare & Medicaid Services

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Centers for Medicare & Medicaid Services

*Description*

**0467 Acute Stroke Mortality Rate (IQI 17)**

In-hospital deaths per 1,000 hospital discharges with acute stroke as a principal diagnosis for patients ages 18 years and older. Includes metrics for discharges grouped by type of stroke. Excludes obstetric discharges and transfers to another hospital.

[NOTE: The software provides the rate per hospital discharge. However, common practice reports the measure as per 1,000 discharges. The user must multiply the rate obtained from the software by 1,000 to report in-hospital deaths per 1,000 hospital discharges.]

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.

Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:
    a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
    b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
2. Age of patients in cohort:
    a. The claims-only measure includes Medicare FFS patients, age 65-94.
    b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
3. External empiric validity testing
    a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
4. Socioeconomic risk factor analyses
    a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
5. Exclusion analyses
    a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
6. Meaningful differences
    a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

1. Risk adjustment:
    a. The claims-only measure uses administrative claims data only for risk adjustment
    b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.

Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:
    a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
    b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.
2. Age of patients in cohort:
    a. The claims-only measure includes Medicare FFS patients, age 65-94.
    b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
3. External empiric validity testing
    a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
4. Socioeconomic risk factor analyses
    a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
5. Exclusion analyses
    a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
6. Meaningful differences
    a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

1. Risk adjustment:
    a. The claims-only measure uses administrative claims data only for risk adjustment
    b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

*Type*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Outcome

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Outcome

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Outcome

*Data Source*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Claims HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD.

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Claims, Electronic Health Records, Other Clinical-Hybrid Dataset

Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all admissions for adult patients to any of their member hospitals between January 1, 2009 and June 30, 2015 was used for measure development, as described in the attached methodology report).

The two data sources listed below were used for testing the claims-based measure; the hybrid testing form includes some testing data from the claims-based measure (for example, for the social risk factor and external validation analyses).

HWM claims-only datasets:

Medicare Part A Inpatient Claims Data

The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. This data was used along with the Medicare Enrollment Database (EDB) for testing the claims-based measure.

Medicare Enrollment Database (EDB)

This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Claims, Enrollment Data, Other Data sources for the Medicare FFS measure:

1. Medicare Part A Inpatient: The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission, hospitalized from July 1, 2016-June 30, 2017. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

*Level*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Facility

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Facility

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Facility

*Setting*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Inpatient/Hospital

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest Home or Custodial Care Services

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Inpatient/Hospital

*Numerator Statement*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

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

Stratum A (Subarachnoid hemorrhage):

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

Stratum B (Intracerebral hemorrhage) :

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

Stratum C (Ischemic stroke):

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

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

*Numerator Details*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

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

Stratum A (Subarachnoid hemorrhage):

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

Stratum B (Intracerebral hemorrhage) :

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

Stratum C (Ischemic stroke):

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

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure outcome is death from any cause within 30 days of the admission date of the index admission. The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure outcome is death from any cause within 30 days of the admission date of the index admission, for Medicare FFS patients identified using the Medicare Enrollment Database (EDB). The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

*Denominator Statement*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for subarachnoid hemorrhage or a principal ICD-9-CM diagnosis code for intracerebral hemorrhage or a principal ICD-9-CM diagnosis code for ischemic stroke.

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so that both will include admissions for patients age 65-94.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.

*Denominator Details*

### 0467 Acute Stroke Mortality Rate (IQI 17)

ICD-9-CM Subarachnoid hemorrhage diagnosis codes:

430 SUBARACHNOID HEMORRHAGE

ICD-9-CM Intracerebral hemorrhage diagnosis codes:

431 INTRACEREBRAL HEMORRHAGE

4320 NONTRAUM EXTRADURAL HEM

4321 SUBDURAL HEMORRHAGE

4329 INTRACRANIAL HEMORR NOS

ICD-9-CM Ischemic stroke diagnosis codes:

43301 BASI ART OCCL W/ INFARCT

43311 CAROTD OCCL W/ INFRCT

43321 VERTB ART OCCL W/ INFRCT

43331 MULT PRECER OCCL W/ INFRCT

43381 PRECER OCCL NEC W/ INFRCT

43391 PRECER OCCL NOS W/ INFRCT

43401 CERE THROMBOSIS W/ INFRCT

43411 CERE EMBOLISM W/ INFRCT

43491 CEREB OCCL NOS W/ INFRCT

Note: For discharges prior to September 30, 2014 (FY2004 or earlier), the following code is included in the overall denominator. This code is not included in any stratum.

436 CVA

[NOTE: Overall denominator may not match the sum of the strata denominators because the strata may not be mutually exclusive.]

Stratum A (Subarachnoid hemorrhage):

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for subarachnoid hemorrhage (see above).

Stratum B (Intracerebral hemorrhage) :

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for intracerebral hemorrhage stroke (see above).

Stratum C (Ischemic stroke):

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for ischemic stroke (see above).

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The index cohort includes all inpatient admissions for patients aged 50-94 years old. (Note: The intention is to fully harmonize the cohort definition with the claims-only measure so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing due to the limited dataset available that included the EHR data elements needed to calculate this measure. Note that the risk model already includes age in years, as a risk variable.)

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Not transferred from another acute care facility

   Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

2. Aged between 50 and 94 years

   The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included. The use of a small dataset required that we expand the sample by including admissions from patients ages 50 to 94 years. Note that the measure already adjusts for age.

3. Not admitted for primary psychiatric diagnoses

   Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

4. Not admitted for rehabilitation

   Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

   Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal

6. Not enrolled in hospice within two days of admission

   Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

7. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

   Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

8. Without any diagnosis of metastatic cancer

Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

9. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Enrolled in Medicare FFS Part A for at least 12 months prior to the date of admission and during the index admission

   Rationale: Claims data are consistently available only for Medicare FFS beneficiaries. The 12-month prior enrollment criterion ensures a full year of administrative data is available for risk adjustment.

2. Not transferred from another acute care facility

   Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any “transfer-in” hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

3. Aged between 65 and 94 years

   Rationale: Medicare patients younger than 65 are not included in the measure because they usually qualify for the program due to severe disability and are considered to be clinically distinct from Medicare patients 65 and over. Patients over age 94 are not included to avoid holding hospitals responsible for the survival of the very elderly patients, who may be less likely to have survival as a primary goal.

   Note that the hybrid measure (submitted for NQF endorsement in parallel with the claims-only measure) differs from the claims-only measure in terms of the age range of included admissions; the hybrid measure includes all inpatient admissions for patients aged 50-94 years old. The intention is to fully harmonize the cohort definitions for the two measures, so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing for the hybrid measure due to the limited dataset available that included the EHR data elements needed to calculate the hybrid measure. Note that the risk model already includes age in years, as a risk variable.)

4. Not admitted for primary psychiatric diagnoses

   Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not admitted for rehabilitation

Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

6. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

   Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal.

7. Not enrolled in hospice within two days of admission

   Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

8. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

   Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

9. Without any diagnosis of metastatic cancer

   Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

10. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

    Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

    In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a “last” admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS’s condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

    The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of

conditions, such as “other bacterial infections”. There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

*Exclusions*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum A (Subarachnoid hemorrhage):

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum B (Intracerebral hemorrhage) :

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum C (Ischemic stroke):

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;
2. Discharged against medical advice (AMA);
3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and
4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;
2. Discharged against medical advice (AMA);
3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and
4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.

*Exclusion Details*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum A (Subarachnoid hemorrhage):

Exclude cases:

- transferring to another short-term hospital (DISP=2)

- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum B (Intracerebral hemorrhage) :

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum C (Ischemic stroke):

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data.

   Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

   Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240).

   Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

   Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

   Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure

development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data

   Rationale: The measure does not include stays for patients where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

   Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240)

   Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

   Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

   Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

*Risk Adjustment*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Statistical risk model

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Statistical risk model

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Statistical risk model

*Stratification*

**0467 Acute Stroke Mortality Rate (IQI 17)**

The indicator is stratified into three groups by the type of stroke:

Cases are assigned to strata according to a hierarchy based on mortality, with cases being assigned to the stratum with the highest mortality for which the case qualifies. In the case of Stroke Mortality the current hierarchy is as follows:

Strata hierarchy (listed from highest mortality to lowest mortality):

1. Stratum B (Intracerebral hemorrhage)
2. Stratum A (Subarachnoid hemorrhage)
3. Stratum C (Ischemic stroke)

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

N/A

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

N/A

*Type Score*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Rate/proportion better quality = lower score

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Rate/proportion better quality = lower score

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Rate/proportion better quality = lower score

*Algorithm*

**0467 Acute Stroke Mortality Rate (IQI 17)**

The indicator is expressed as a rate, defined as outcome of interest / population at risk or numerator / denominator. The AHRQ Quality Indicators (AHRQ QI) software performs six steps to produce the rates. 1) Discharge-level records are flagged to identify the outcome of interest and 2) the population at risk. 3) Calculate observed rates as the sum of the records flagged in the numerator divided by the sum of the records flag in the denominator for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records to compute a predicted value. For indicators that are not risk-adjusted, this is the reference population rate. The expected rate is computed as the sum of the predicted value for each record divided by the number of records flagged in the population at risk for the unit of analysis of interest (i.e., hospital). 5) Calculate risk-adjusted rate using indirect

standardization as the observed rate divided by the expected rate, multiplied by the reference population rate. For indicators that are not risk-adjusted, this is the same as the observed rate. 6) Calculate smoothed rate using an Empirical Bayes shrinkage estimator (W) as the weighted average of the risk-adjusted rate and the reference population rate. The shrinkage estimate reflects a reliability adjustment unique to each indicator. 130177| 132112| 138848| 109921| 138827

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of “predicted” deaths to the number of “expected” deaths at a given hospital. The predicted number of deaths is based on the hospital’s performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation’s performance with that hospital’s case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of “observed” to “expected” used in other types of statistical analyses. It conceptually allows a particular hospital’s performance, given its case mix and service mix, to be compared to an average hospital’s performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. (Note that in the case of the hybrid measure, we are presenting data from 9 of the total 15 divisions due to limitations in availability of electronic health records data). The hospital-wide SMR is then

multiplied by the national observed mortality rate to produce the RSMR. 146637| 110639| 141015| 110874| 146313

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of “predicted” deaths to the number of “expected” deaths at a given hospital. The predicted number of deaths is based on the hospital’s performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation’s performance with that hospital’s case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of “observed” to “expected” used in other types of statistical analyses. It conceptually allows a particular hospital’s performance, given its case mix and service mix, to be compared to an average hospital’s performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR. 146637| 144762| 110639| 141015| 110874| 146313

*Submission items*

**0467 Acute Stroke Mortality Rate (IQI 17)**

5.1 Identified measures:

0240: Stroke and Stroke Rehabilitation: Venous Thromboembolism (VTE) Prophylaxis for Ischemic Stroke or Intracranial Hemorrhage

0241: Stroke and Stroke Rehabilitation: Anticoagulant Therapy Prescribed for Atrial Fibrillation (AF) at Discharge

0242: Stroke and Stroke Rehabilitation: Tissue Plasminogen Activator (t-PA) Considered

0243: Stroke and Stroke Rehabilitation: Screening for Dysphagia

0244: Stroke and Stroke Rehabilitation: Rehabilitation Services Ordered

0325: Stroke and Stroke Rehabilitation: Discharged on Antithrombotic Therapy

0434: STK-01: Venous Thromboembolism (VTE) Prophylaxis

0435: STK 02: Discharged on Antithrombotic Therapy

0436: STK-03: Anticoagulation Therapy for Atrial Fibrillation/Flutter

0437: STK 04: Thrombolytic Therapy

0438: STK 05: Antithrombotic Therapy By End of Hospital Day Two

0439: STK-06: Discharged on Statin Medication

0440: STK-08: Stroke Education

0441: STK-10: Assessed for Rehabilitation

0442: Functional Communication Measure: Writing

0443: Functional Communication Measure: Swallowing

0444: Functional Communication Measure: Spoken Language Expression

0445: Functional Communication Measure: Spoken Language Comprehension

0446: Functional Communication Measure: Reading

0448: Functional Communication Measure: Memory

0449: Functional Communication Measure: Attention

0661: Head CT or MRI Scan Results for Acute Ischemic Stroke or Hemorrhagic Stroke Patients who Received Head CT or MRI Scan Interpretation within 45 minutes of ED Arrival

0705: Proportion of Patients Hospitalized with Stroke that have a Potentially Avoidable Complication (during the Index Stay or in the 30-day Post-Discharge Period)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact:

All but one of the related endorsed measures are measures of the process of care for patients with stroke. Therefore, these measures have similar target populations but different measure foci. The lone endorsed outcome measure other than this measure includes a wide variety of potentially avoidable complications. Due to the large number of related measures and incomplete specifications currently available online, we are currently contacting measure developers for additional information to assess and promote harmonization when possible. Comparing the denominator criterion for this measure with the denominator criteria for STK measures from The Joint Commission, there are minor differences. The AHRQ specification includes all ischemic and hemorrhagic infarcts. The Joint Commission specification adds 433.10 (carotid occlusion without infarct) and 434.00 (cerebral thrombosis without infarct), and it drops intracranial hemorrhagic infarcts without specified subarachnoid or intracerebral hemorrhage (e.g., 432.x). AHRQ believes that these differences are justified, but they comprise less than 5% of the total denominator, which would make harmonization potentially appropriate. The AMA-PCPI

measures for Stroke and Stroke Rehabilitation also exclude hemorrhagic infarcts other than intracerebral hemorrhages, and they include selected TIA (435.9) and late effects (438.2, 438.89, 438.9) codes, which would not be appropriate for an inpatient mortality measure.

5b.1 If competing, why superior or rationale for additive value: NQF

Not applicable.

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

N/A

5.1b. Non-NQF endorsed related and competing measures
Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789);

Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) (NQF #1550);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization (NQF #0468);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization (NQF #1893);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery (NQF #2558);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization (NQF #0230);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization (NQF #0229);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization.

Death Rate in Low Mortality Diagnosis Related Groups (PSI-02) (NQF #0347)

AHRQ's Mortality for Select Conditions (IQI-90) (NQF #0530)

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact:

This hybrid HWM measure incorporates patient-level clinical data from the EHR into the risk adjustment model, compared to the claims-only hospital-wide mortality measure. This hybrid HWM measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different

outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer, whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include as many have survival as their primary goal, however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into in order to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into six categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. HWM captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value:

There are no competing NQF-endorsed measures.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

N/A

5.1b. Non-NQF endorsed related and competing measures
Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789);

Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) (NQF #1550);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization (NQF #0468);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization (NQF #1893);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery (NQF #2558);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization (NQF #0230);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization (NQF #0229);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization.

Death Rate in Low Mortality Diagnosis Related Groups (PSI-02) (NQF #0347)

AHRQ's Mortality for Select Conditions (IQI-90) (NQF #0530)

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact:

This claims-only hospital-wide mortality (HWM) measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer (with some exceptions), whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include in the HWM measure as many have survival as their primary goal; however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore, are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into, to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into five categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. Hospital-wide mortality captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value:

There are no competing NQF-endorsed measures.

0467 Acute Stroke Mortality Rate (IQI 17)

3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

*Steward*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Agency for Healthcare Research and Quality

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Centers for Medicare & Medicaid Services

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Centers for Medicare & Medicaid Services

*Description*

**0467 Acute Stroke Mortality Rate (IQI 17)**

In-hospital deaths per 1,000 hospital discharges with acute stroke as a principal diagnosis for patients ages 18 years and older. Includes metrics for discharges grouped by type of stroke. Excludes obstetric discharges and transfers to another hospital.

[NOTE: The software provides the rate per hospital discharge. However, common practice reports the measure as per 1,000 discharges. The user must multiply the rate obtained from the software by 1,000 to report in-hospital deaths per 1,000 hospital discharges.]

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date for patients who are between the ages of 50 and 94.

Please note that in parallel with the hybrid HWM measure, we are submitting a claims-only HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:
    a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
    b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.

2. Age of patients in cohort:
    a. The claims-only measure includes Medicare FFS patients, age 65-94.
    b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
3. External empiric validity testing
    a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
4. Socioeconomic risk factor analyses
    a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
5. Exclusion analyses
    a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
6. Meaningful differences
    a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

1. Risk adjustment:
    a. The claims-only measure uses administrative claims data only for risk adjustment
    b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates a hospital-level 30-day hospital-wide risk-standardized mortality rate (RSMR), defined as death from any cause within 30 days after the index admission date, for Medicare fee-for-service (FFS) patients who are between the ages of 65 and 94.

Please note that in parallel with the claims-only HWM measure, we are submitting a hybrid HWM measure. Note that ultimately the claims and hybrid measures will be harmonized and use the same exact cohort specifications. The intent is that prior to implementation, the two measures will be exactly the same, with the exception of the additional risk adjustment added by the CCDE in the hybrid measure. This is analogous to the currently endorsed and implemented hybrid hospital-wide readmissions measure (NQF 1789 and NQF 2879e).

Because of the homology between the claims and hybrid HWM measures, there is no reason to suspect that the results of analyses done for the claims-only measure would differ in any significant way from results of analyses for a nationally representative hybrid measure.

Below we highlight the differences between the two measures, including specifications, data used, and testing which reflect limitations of data availability, as well as actual intended differences in the measure (risk adjustment).

Differences in the measure, data, and testing that reflect limitations in data availability

1. Dataset used for development, some testing (see below for differences), and measure results:

a. The claims-only measure uses nation-wide Medicare FFS claims and the enrollment database.
b. The hybrid measure uses an electronic health record (EHR) database from 21 hospitals in the Kaiser Permanente network which includes inpatient claims data information.

2. Age of patients in cohort:
   a. The claims-only measure includes Medicare FFS patients, age 65-94.
   b. The hybrid measure includes all patients age 50-94 (see later discussion for justification)
3. External empiric validity testing
   a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
4. Socioeconomic risk factor analyses
   a. Not possible for the hybrid measure, due to limited data availability. We provide results from the claims-only measure within the hybrid testing form.
5. Exclusion analyses
   a. To be representative of what we expect the impact would be of the measures' exclusions in a nation-wide sample, we provide the results from the claims-only measure.
6. Meaningful differences
   a. To be representative of what we expect the range of performance would be in a nation-wide sample, we provide the distribution results from the claims-only measure.

Difference between the two measures when fully harmonized, prior to implementation:

1. Risk adjustment:
   a. The claims-only measure uses administrative claims data only for risk adjustment
   b. The hybrid measure adds 10 clinical risk variables, derived from a set of core clinical data elements (CCDE) extracted from the EHR.

*Type*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Outcome

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Outcome

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Outcome

*Data Source*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Claims HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD.

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Claims, Electronic Health Records, Other Clinical-Hybrid Dataset

Constructed using Kaiser Permanente Northern California matched administrative claims and electronic health record (EHR) data, admission dates from October 1, 2015 – December 30, 2016. This data source was used for measure testing. (An earlier Kaiser dataset from that included all admissions for adult patients to any of their member hospitals between January 1, 2009 and June 30, 2015 was used for measure development, as described in the attached methodology report).

The two data sources listed below were used for testing the claims-based measure; the hybrid testing form includes some testing data from the claims-based measure (for example, for the social risk factor and external validation analyses).

HWM claims-only datasets:

Medicare Part A Inpatient Claims Data

The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission. This data was used along with the Medicare Enrollment Database (EDB) for testing the claims-based measure.

Medicare Enrollment Database (EDB)

This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Claims, Enrollment Data, Other Data sources for the Medicare FFS measure:

1. Medicare Part A Inpatient: The index dataset contains administrative inpatient hospitalization data for Medicare FFS beneficiaries, aged 65-94 on admission, hospitalized from July 1, 2016-June 30, 2017. The history dataset includes administrative inpatient hospitalization data on each patient for the 12 months prior to the index admission.
2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This data source was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. It was also used to determine hospice enrollment.

*Level*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Facility

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Facility

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Facility

*Setting*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Inpatient/Hospital

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Inpatient/Hospital, Other Home-based primary care and home-based palliative care); Settings include: Home, Boarding home, Domiciliary, Assisted Living Facilities, Rest Home or Custodial Care Services

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Inpatient/Hospital

*Numerator Statement*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

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

Stratum A (Subarachnoid hemorrhage):

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

Stratum B (Intracerebral hemorrhage) :

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

Stratum C (Ischemic stroke):

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

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The outcome for this measure is 30-day, all-cause mortality. Mortality is defined as death from any cause, either during or after admission, within 30 days of the index admission date.

*Numerator Details*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

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

Stratum A (Subarachnoid hemorrhage):

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

Stratum B (Intracerebral hemorrhage) :

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

Stratum C (Ischemic stroke):

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

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure outcome is death from any cause within 30 days of the admission date of the index admission. The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure outcome is death from any cause within 30 days of the admission date of the index admission, for Medicare FFS patients identified using the Medicare Enrollment Database (EDB). The numerator is a binary variable (1=yes/0=no) that indicates whether the patient died within 30 days of the index admission date.

*Denominator Statement*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for subarachnoid hemorrhage or a principal ICD-9-CM diagnosis code for intracerebral hemorrhage or a principal ICD-9-CM diagnosis code for ischemic stroke.

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The cohort includes inpatient admissions for a wide variety of conditions for patients aged between 50 and 94 years old who were discharged from short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details. The age range for this measure differs from that of the claims-only measure due to the limited size of the dataset used for testing. The intent is to harmonize the age range of the hybrid measure with the age range of the claims-only measure, so that both will include admissions for patients age 65-94.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The cohort includes inpatient admissions for a wide variety of conditions for Medicare FFS patients aged between 65 and 94 years old who were admitted to short-term acute care hospitals. If a patient has more than one admission during the measurement year, one admission is randomly selected for inclusion in the measure. Additional details are provided in S.7 Denominator Details.

*Denominator Details*

**0467 Acute Stroke Mortality Rate (IQI 17)**

ICD-9-CM Subarachnoid hemorrhage diagnosis codes:

430 SUBARACHNOID HEMORRHAGE

ICD-9-CM Intracerebral hemorrhage diagnosis codes:

431 INTRACEREBRAL HEMORRHAGE

4320 NONTRAUM EXTRADURAL HEM

4321 SUBDURAL HEMORRHAGE

4329 INTRACRANIAL HEMORR NOS

ICD-9-CM Ischemic stroke diagnosis codes:

43301 BASI ART OCCL W/ INFARCT

43311 CAROTD OCCL W/ INFRCT

43321 VERTB ART OCCL W/ INFRCT

43331 MULT PRECER OCCL W/ INFRCT

43381 PRECER OCCL NEC W/ INFRCT

43391 PRECER OCCL NOS W/ INFRCT

43401 CERE THROMBOSIS W/ INFRCT

43411 CERE EMBOLISM W/ INFRCT

43491 CEREB OCCL NOS W/ INFRCT

Note: For discharges prior to September 30, 2014 (FY2004 or earlier), the following code is included in the overall denominator. This code is not included in any stratum.

436 CVA

[NOTE: Overall denominator may not match the sum of the strata denominators because the strata may not be mutually exclusive.]

Stratum A (Subarachnoid hemorrhage):

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for subarachnoid hemorrhage (see above).

Stratum B (Intracerebral hemorrhage) :

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for intracerebral hemorrhage stroke (see above).

Stratum C (Ischemic stroke):

Discharges, for patients ages 18 years and older, with a principal ICD-9-CM diagnosis code for ischemic stroke (see above).

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The index cohort includes all inpatient admissions for patients aged 50-94 years old. (Note: The intention is to fully harmonize the cohort definition with the claims-only measure so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing due to the limited dataset available that included the EHR data elements needed to calculate this measure. Note that the risk model already includes age in years, as a risk variable.)

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Not transferred from another acute care facility

   Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

2. Aged between 50 and 94 years

   The hybrid measure is intended for the Medicare FFS population but was tested in a limited dataset due to the EHR data elements included. The use of a small dataset required that we expand the sample by including admissions from patients ages 50 to 94 years. Note that the measure already adjusts for age.

3. Not admitted for primary psychiatric diagnoses

Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

4. Not admitted for rehabilitation

   Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

   Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal

6. Not enrolled in hospice within two days of admission

   Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

7. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

   Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

8. Without any diagnosis of metastatic cancer

   Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

9. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

   Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The

decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a "last" admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS's condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as "other bacterial infections". There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

1. Enrolled in Medicare FFS Part A for at least 12 months prior to the date of admission and during the index admission

   Rationale: Claims data are consistently available only for Medicare FFS beneficiaries. The 12-month prior enrollment criterion ensures a full year of administrative data is available for risk adjustment.

2. Not transferred from another acute care facility

   Rationale: Admissions to an acute cate hospital within one day of discharge from another acute care hospital are considered transfers. Transferred patients are included in the measure cohort, but it is the initial hospitalization rather than any "transfer-in" hospitalization(s), that is included as the hospitalization to which the mortality outcome is attributed (the index admission).

3. Aged between 65 and 94 years

   Rationale: Medicare patients younger than 65 are not included in the measure because they usually qualify for the program due to severe disability and are considered to be clinically distinct from Medicare patients 65 and over. Patients over age 94 are not included to avoid holding hospitals responsible for the survival of the very elderly patients, who may be less likely to have survival as a primary goal.

   Note that the hybrid measure (submitted for NQF endorsement in parallel with the claims-only measure) differs from the claims-only measure in terms of the age range of included admissions; the hybrid measure includes all inpatient admissions for patients aged 50-94 years old. The intention is to fully harmonize the cohort definitions for the two measures, so that both measures will capture admissions for patients age 65-94. We deviated from that definition during development and testing for the hybrid measure due to the limited dataset available that included the EHR data elements needed to calculate the hybrid measure. Note that the risk model already includes age in years, as a risk variable.)

4. Not admitted for primary psychiatric diagnoses

   Rationale: Patients admitted for psychiatric treatment are typically cared for in separate psychiatric facilities that are not comparable to short-term acute care hospitals (see data dictionary, HWM Non-Acute Care Inclusion tab).

5. Not admitted for rehabilitation

   Rationale: These admissions are not typically to a short-term acute care hospital and are not for acute care (see data dictionary, HWM Non-Acute Care Inclusion tab).

6. Not enrolled in hospice at the time of, or 12 months prior to, their index admission

   Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal.

7. Not enrolled in hospice within two days of admission

   Rationale: There is not a single, correct approach regarding patients enrolled in hospice during admission or upon discharge – mortality may or may not represent a quality signal for this group of patients and hospice enrollment is inadequate to differentiate this issue. However, for most patients and/or families who had the discussion and agreed to enroll in

hospice within two days of admission, 30-day survival is not likely the primary goal due to their condition and not the quality of care received.

8. Not with a principal diagnosis of cancer and enrolled in hospice during their index admission

   Rationale: Patients admitted primarily for cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. (see data dictionary, HWM Cancer Inclusion tab).

9. Without any diagnosis of metastatic cancer

   Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, for many such patients admitted to the hospital, death may be a clinically reasonable and patient-centered outcome. (see data dictionary, HWM Metastatic Cancer Inclusion tab).

10. Not with a principal discharge diagnosis, or a secondary diagnosis that is present on admission (POA) for a condition which hospitals have limited ability to influence survival

    Rationale: Hospitals have little ability to impact mortality for some conditions. This list of conditions (see data dictionary, HWM ICD-10 Inclusion tab) was determined through independent review, by several clinicians, of conditions associated with high mortality. The decisions were also reviewed with our Technical Expert Panel (TEP) and Technical Work Group. Admissions are not included in the cohort if the patient had a principal diagnosis code that is on this list, or a secondary code with POA that is on the list.

    In addition, for patients with multiple admissions, the measure selects only one admission, at random, for inclusion. There is no practical statistical modeling approach that can account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Random selection ensures that providers are not penalized for a “last” admission during the measurement period; selecting the last admission would not be as accurate a reflection of the risk of death as random selection, as the last admission is inherently associated with a higher mortality risk. Random selection is also used in CMS’s condition-specific mortality measures. Note that random selection reduces the number of admissions, but does not exclude any patients from the measure.

    The cohort is defined using ICD-10 Clinical Modification codes identified in Medicare Part A Inpatient claims data. The measure aggregates the ICD-10 principal diagnosis and all procedure codes of the index admission into clinically coherent groups of conditions and procedures (condition categories or procedure categories) using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications System (CCS). There is a total of 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. Some are aggregates of conditions, such as “other bacterial infections”. There is a total of 231 mutually exclusive procedure categories. Using the AHRQ CCS procedure and condition categories, the measure assigns each index hospitalization to one of 15 mutually exclusive divisions. The divisions were created based upon clinical coherence, consistency of mortality risk, adequate patient and hospital case volume for stable results reporting, and input from clinicians, patients, and patient caregivers on usability.

    The measure first assigns admissions with qualifying AHRQ procedure categories to one of six surgery divisions by identifying a defining surgical procedure. The defining surgical procedure is identified using the following algorithm: 1) if a patient only has one major surgical procedure then that procedure is the defining surgical procedure; 2) if a patient

has more than one major surgical procedure, the first dated procedure performed during the index admission is the defining surgical procedure; 3) if there is more than one major surgical procedure on that earliest date, the procedure with the highest mortality rate is the defining surgical procedure. These divisions include admissions likely cared for by surgical teams.

The surgical divisions are: Surgical Cancer (see note below), Cardiothoracic Surgery, General Surgery, Neurosurgery, Orthopedic Surgery, and Other Surgical Procedures.

For the Surgical Cancer division, any admission that includes a surgical procedure and a principal discharge diagnosis code of cancer is assigned to the Surgical Cancer division. This division and the logic behind it was implemented in response to feedback from our Technical Expert Panel.

The measure then assigns the remaining admissions into one of the nine non-surgical divisions based on the AHRQ diagnostic CCS of the principal discharge diagnosis. The non-surgical divisions are: Cancer, Cardiac, Gastrointestinal, Infectious Disease, Neurology, Orthopedic, Pulmonary, Renal, Other Conditions.

The full list of the specific diagnosis and procedure AHRQ CCS categories used to define the divisions are attached in the Data Dictionary.

*Exclusions*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum A (Subarachnoid hemorrhage):

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum B (Intracerebral hemorrhage) :

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum C (Ischemic stroke):

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)

- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;
2. Discharged against medical advice (AMA);
3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and
4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

The measure excludes index admissions for patients:

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data;
2. Discharged against medical advice (AMA);
3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240); and
4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions within the measurement year.

*Exclusion Details*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Overall:

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum A (Subarachnoid hemorrhage):

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum B (Intracerebral hemorrhage) :

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)

- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

Stratum C (Ischemic stroke):

Exclude cases:

- transferring to another short-term hospital (DISP=2)
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing discharge disposition (DISP=missing), gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data.

   Rationale: The measure does not include stays for patients where the admission date is after the date of death, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

   Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240).

   Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

   Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

   Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

1. With inconsistent or unknown vital status (from claims data) or other unreliable claims data

Rationale: The measure does not include stays for patients where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive because these are likely errors in the data.

2. Discharged against medical advice (AMA)

   Rationale: Providers did not have the opportunity to deliver full care and prepare the patient for discharge.

3. With an admission for spinal cord injury (CCS 227), skull and face fractures (CCS 228), Intracranial Injury (CCS 233), Crushing injury or internal injury (CCS 234), Open wounds of head/neck/trunk (CCS 235), and burns (CCS 240)

   Rationale: Even though a hospital likely can influence the outcome of some of these conditions, in many cases death events are not a signal of poor quality of care when patients present with these conditions. These conditions are also infrequent events that are unlikely to be uniformly distributed across hospitals.

4. With a principal discharge diagnosis within a CCS with fewer than 100 admissions in that division within the measurement year.

   Rationale: To calculate a stable and precise risk model, there are a minimum number of admissions that are needed. In addition, a minimum number of admissions and/or outcome events are required to inform grouping admissions into larger categories. These admissions present challenges to both accurate risk prediction and coherent risk grouping and are therefore excluded.

   Note: During measure development we analyzed different volume cut-offs (25, 50 and 100). Using cut-off values below 100 resulted in too many CCS codes in some of the divisions (the CCS category codes are used in risk adjustment) which resulted in non-convergence of those division-level risk models. The total number of patients excluded is very small (13,597 or 0.21% of admissions for a cut off of 100). During measure development we also explored the option of pooling low-volume CCS codes (CCS<100 patients) into one group, however, the heterogeneity in mortality rates for the individual ICD-10 codes in those groups would preclude adequate risk adjustment. The TEP supported excluding these admissions.

*Risk Adjustment*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Statistical risk model

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Statistical risk model

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Statistical risk model

*Stratification*

**0467 Acute Stroke Mortality Rate (IQI 17)**

The indicator is stratified into three groups by the type of stroke:

Cases are assigned to strata according to a hierarchy based on mortality, with cases being assigned to the stratum with the highest mortality for which the case qualifies. In the case of Stroke Mortality the current hierarchy is as follows:

Strata hierarchy (listed from highest mortality to lowest mortality):

1. Stratum B (Intracerebral hemorrhage)
2. Stratum A (Subarachnoid hemorrhage)
3. Stratum C (Ischemic stroke)

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

N/A

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

N/A

*Type Score*

**0467 Acute Stroke Mortality Rate (IQI 17)**

Rate/proportion better quality = lower score

**3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Rate/proportion better quality = lower score

**3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure**

Rate/proportion better quality = lower score

*Algorithm*

**0467 Acute Stroke Mortality Rate (IQI 17)**

The indicator is expressed as a rate, defined as outcome of interest / population at risk or numerator / denominator. The AHRQ Quality Indicators (AHRQ QI) software performs six steps to produce the rates. 1) Discharge-level records are flagged to identify the outcome of interest and 2) the population at risk. 3) Calculate observed rates as the sum of the records flagged in the numerator divided by the sum of the records flag in the denominator for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records to compute a predicted value. For indicators that are not risk-adjusted, this is the reference population rate. The expected rate is computed as the sum of the predicted value for each record divided by the number of records flagged in the population at risk for the unit of analysis of interest (i.e., hospital). 5) Calculate risk-adjusted rate using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate. For indicators that are not risk-adjusted, this is the same as the observed rate. 6) Calculate smoothed rate using an Empirical Bayes shrinkage estimator (W) as the weighted average of the risk-adjusted rate and the reference population rate. The shrinkage estimate reflects a reliability adjustment unique to each indicator. 130177| 132112| 138848| 109921| 138827

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of “predicted” deaths to the number of “expected” deaths at a given hospital. The predicted number of deaths is based on the hospital’s performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation’s performance with that hospital’s case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of “observed” to “expected” used in other types of statistical analyses. It conceptually allows a particular hospital’s performance, given its case mix and service mix, to be compared to an average hospital’s performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. (Note that in the case of the hybrid measure, we are presenting data from 9 of the total 15 divisions due to limitations in availability of electronic health records data). The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR. 146637| 110639| 141015| 110874| 146313

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

The measure estimates hospital-level, risk-standardized mortality rates (RSMRs) within 30 days of hospital admission using hierarchical logistical regression models through a Bayesian Markov Chain Monte Carlo (MCMC) procedure. In brief, we used hierarchical

logistic regression to model the log-odds of mortality for each of the 15 service-line divisions. Death within 30 days was modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This model specification accounts for within-hospital correlation of the observed outcomes and models the assumption that underlying differences in quality among the health care facilities being evaluated lead to systematic differences in outcomes. We estimated a separate hierarchical logistic regression model for each service-line division. In order to obtain the variance and interval estimates, we fit the hierarchical model under the Bayesian framework along with the Markov Chain Monte Carlo (MCMC) technique.

Admissions are assigned to one of 15 mutually exclusive divisions (groups of discharge condition categories and procedure categories). For each division and each hospital with patients in that division, the standardized mortality ratio (SMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital. The predicted number of deaths is based on the hospital's performance with its observed case mix and service mix, and is calculated by using the coefficients estimated by regressing the risk factors and the hospital-specific effect on the risk of mortality. The estimated hospital-specific effect for each cohort is added to the sum of the estimated regression coefficients multiplied by patient characteristics. The results are transformed via an inverse logit function and summed over all patients attributed to a hospital to get a predicted value. The expected number of deaths is based on the nation's performance with that hospital's case mix and service mix and is obtained in the same manner, but a common effect using all hospitals in our sample is added in place of the hospital-specific effect. The results are transformed via an inverse logit function and summed over all patients in the hospital to get an expected value. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows a particular hospital's performance, given its case mix and service mix, to be compared to an average hospital's performance with the same case mix and service mix. Thus, a lower ratio indicates lower-than-expected mortality rates or better quality, while a higher ratio indicates higher-than-expected mortality rates or worse quality.

To assess hospital performance for each reporting period, the measure re-estimates the model coefficients using the data in that period.

The division-level SMRs are then pooled for each hospital using an inverse variance-weighted geometric mean to create a hospital-wide composite SMR. The hospital-wide SMR is then multiplied by the national observed mortality rate to produce the RSMR.
146637| 144762| 110639| 141015| 110874| 146313

*Submission items*

**0467 Acute Stroke Mortality Rate (IQI 17)**

5.1 Identified measures:

0240: Stroke and Stroke Rehabilitation: Venous Thromboembolism (VTE) Prophylaxis for Ischemic Stroke or Intracranial Hemorrhage

0241: Stroke and Stroke Rehabilitation: Anticoagulant Therapy Prescribed for Atrial Fibrillation (AF) at Discharge

0242: Stroke and Stroke Rehabilitation: Tissue Plasminogen Activator (t-PA) Considered

0243: Stroke and Stroke Rehabilitation: Screening for Dysphagia

0244: Stroke and Stroke Rehabilitation: Rehabilitation Services Ordered

0325: Stroke and Stroke Rehabilitation: Discharged on Antithrombotic Therapy

0434: STK-01: Venous Thromboembolism (VTE) Prophylaxis

0435: STK 02: Discharged on Antithrombotic Therapy

0436: STK-03: Anticoagulation Therapy for Atrial Fibrillation/Flutter

0437: STK 04: Thrombolytic Therapy

0438: STK 05: Antithrombotic Therapy By End of Hospital Day Two

0439: STK-06: Discharged on Statin Medication

0440: STK-08: Stroke Education

0441: STK-10: Assessed for Rehabilitation

0442: Functional Communication Measure: Writing

0443: Functional Communication Measure: Swallowing

0444: Functional Communication Measure: Spoken Language Expression

0445: Functional Communication Measure: Spoken Language Comprehension

0446: Functional Communication Measure: Reading

0448: Functional Communication Measure: Memory

0449: Functional Communication Measure: Attention

0661: Head CT or MRI Scan Results for Acute Ischemic Stroke or Hemorrhagic Stroke Patients who Received Head CT or MRI Scan Interpretation within 45 minutes of ED Arrival

0705: Proportion of Patients Hospitalized with Stroke that have a Potentially Avoidable Complication (during the Index Stay or in the 30-day Post-Discharge Period)

5a.1 Are specs completely harmonized? No

5a.2 If not completely harmonized, identify difference, rationale, impact:

All but one of the related endorsed measures are measures of the process of care for patients with stroke. Therefore, these measures have similar target populations but different measure foci. The lone endorsed outcome measure other than this measure includes a wide variety of potentially avoidable complications. Due to the large number of related measures and incomplete specifications currently available online, we are currently contacting measure developers for additional information to assess and promote harmonization when possible. Comparing the denominator criterion for this measure with the denominator criteria for STK measures from The Joint Commission, there are minor differences. The AHRQ specification includes all ischemic and hemorrhagic infarcts. The Joint Commission specification adds 433.10 (carotid occlusion without infarct) and 434.00 (cerebral thrombosis without infarct), and it drops intracranial hemorrhagic infarcts without specified subarachnoid or intracerebral hemorrhage (e.g., 432.x). AHRQ believes that these differences are justified, but they comprise less than 5% of the total denominator, which would make harmonization potentially appropriate. The AMA-PCPI measures for Stroke and Stroke Rehabilitation also exclude hemorrhagic infarcts other than intracerebral hemorrhages, and they include selected TIA (435.9) and late effects (438.2, 438.89, 438.9) codes, which would not be appropriate for an inpatient mortality measure.

5b.1 If competing, why superior or rationale for additive value: NQF

Not applicable.

### 3502 Hybrid Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

N/A

5.1b. Non-NQF endorsed related and competing measures
Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789);

Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) (NQF #1550);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization (NQF #0468);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization (NQF #1893);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery (NQF #2558);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization (NQF #0230);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization (NQF #0229);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization.

Death Rate in Low Mortality Diagnosis Related Groups (PSI-02) (NQF #0347)

AHRQ's Mortality for Select Conditions (IQI-90) (NQF #0530)

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact:

This hybrid HWM measure incorporates patient-level clinical data from the EHR into the risk adjustment model, compared to the claims-only hospital-wide mortality measure. This hybrid HWM measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer, whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include as many have survival as their primary goal, however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore are not a reasonable signal of

quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into in order to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into six categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. HWM captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value:

There are no competing NQF-endorsed measures.

### 3504 Claims-Only Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure

5.1 Identified measures:

N/A

5.1b. Non-NQF endorsed related and competing measures
Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789);

Hospital-level risk-standardized complication rate (RSCR) following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) (NQF #1550);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization (NQF #0468);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following chronic obstructive pulmonary disease (COPD) hospitalization (NQF #1893);

Hospital 30-Day, all-cause, risk-standardized mortality rate (RSMR) following coronary artery bypass graft (CABG) Surgery (NQF #2558);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization (NQF #0230);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization (NQF #0229);

Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization.

Death Rate in Low Mortality Diagnosis Related Groups (PSI-02) (NQF #0347)

AHRQ's Mortality for Select Conditions (IQI-90) (NQF #0530)

5a.1 Are specs completely harmonized? Yes

5a.2 If not completely harmonized, identify difference, rationale, impact:

This claims-only hospital-wide mortality (HWM) measure is intended to complement the existing CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789) to allow assessment of trends in hospital performance for both readmission and mortality outcomes, similar to other complementary pairs of readmission and mortality measures for specific conditions and procedures. By measuring mortality outcomes across almost all hospitalized patients, this measure will provide an important additional performance assessment that will complement condition- and procedure-specific or other more narrowly defined mortality measures and allow a greater number of patients and hospitals to be evaluated. This HWM measure captures a similarly broad cohort to the CMS Hospital-Wide All-Cause Risk-Standardized Readmission Measure (NQF #1789), and a broader cohort than those of other CMS condition-specific measures. Because the mortality measure is focused on a different outcome, it differs from the existing CMS Hospital-Wide All-Cause Risk Standardized Readmission Measure (NQF #1789) in a couple of ways. First, this HWM measure includes patients with a principal discharge diagnosis of cancer (with some exceptions), whereas those patients are not included in the readmission measure. Cancer patients are appropriate to include in the HWM measure as many have survival as their primary goal; however due to cancer treatment plans, readmissions are frequently part of the plan and expected and therefore, are not a reasonable signal of quality. Another difference between the two measures is the number of divisions or specialty cohorts the patients are divided into, to more accurately risk adjust for case-mix and service-mix. The readmission measure divides patients into five categories, or "specialty cohorts", while the mortality measure uses 15. This is because the risk of mortality is much more closely related to patient factors than readmission is related to patient factors. PSI-02 (NQF #0357) is another complementary mortality measure, which captures a different patient population and a different outcome compared with the HWM measure submitted with this application. PSI-02 captures patients 18 years of age or older, or obstetric patients, whereas the HWM measure captures patients between the ages of 65 and 94. PSI-02 captures DRGs with less than 0.5% mortality rate, whereas the HWM measure captures all patients within all CCSs, regardless of mortality rate. Hospital-wide mortality captures mortality up to 30 days past admission, where AHRQ PSI-02 only captures in-hospital mortality. IQI 90 (NQF #0530) is another complimentary mortality measure, which is a composite measure of the number of in-hospital deaths for a narrow range of conditions (CHF, stroke, hip fracture, pneumonia, acute myocardial infarction and GI hemorrhage). The HWM measure presented in this application captures all deaths after 30 days of admission, for all conditions and procedures.

5b.1 If competing, why superior or rationale for additive value:

There are no competing NQF-endorsed measures.

## Appendix F: Pre-Evaluation Comments

Comments received as of February 5, 2021.

| Topic | Commenter | Comment |
|---|---|---|
| 3596: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity | Submitted by American Medical Association (AMA) | The American Medical Association (AMA) appreciates the opportunity to comment on #3596, Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity. We are disappointed to see the minimum measure score reliability results of 0.24 using a minimum case number of 25 patients. We believe that measures must meet minimum acceptable thresholds of 0.7 for reliability. We request that the Standing Committee evaluate whether the measure specifications with only a case minimum of 25 patients is acceptable and if the measure meets the reliability criterion. |
| 3596: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity | Submitted by Federation of American Hospitals | The Federation of American Hospitals (FAH) appreciates the opportunity to comment on Measure #3596, Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity. FAH is concerned that even though the median reliability score was 0.7 for hospitals with at least 25 cases, reliability ranged from 0.24 to 0.95 and believes that the developer must increase the minimum sample size to a higher number to produce a minimum reliability threshold of sufficient magnitude (e.g., 0.7 or higher). As a result, the FAH requests that the Standing Committee carefully consider whether the measure as specified meets the reliability criterion. |

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