TO: Neurology Standing Committee

FR: NQF Staff

RE: Post-Comment Call to Discuss Public and Member Comments

DA: June 17, 2016

Purpose of the Call

The Neurology Standing Committee will meet via conference call on Thursday, June 23, 2016 from 2:00-4:00pm ET. The purpose of this call is to:

- Review and discuss comments received during the post-evaluation public and member comment period.
- Re-vote on four measures that did not reach consensus on a recommendation by the Committee and vote on two measures.
- Provide input on proposed responses to the post-evaluation comments.
- Determine whether reconsideration of any measures or other courses of action is warranted.

NQF staff has drafted responses to the comments. Committee members should review all comments and draft responses prior to the call.

Standing Committee Actions

1. Review this briefing memo and Draft Report.
2. Review and consider the full text of all comments received and the proposed responses to the post-evaluation comments (see Comment Table).
3. Be prepared to provide feedback and input on proposed post-evaluation comment responses.

Conference Call Information

Please use the following information to access the conference call line and webinar:
Speaker dial-in #: (877) 296-0829 (*NO CONFERENCE CODE REQUIRED)*
Public dial-in #: (844) 676-8561 (*NO CONFERENCE CODE REQUIRED)*
Web Link: http://nqf.commpartners.com/se/Meetings/AttendMeeting.aspx?meeting.id=784375
Registration Link: http://nqf.commpartners.com/se/Rd/Rg.aspx?784375

Background

Prior to the April 2016 in-person meeting, the Neurology portfolio had 15 endorsed measures; 11 stroke measures, three for dementia, and one measure for epilepsy. This NQF project aimed to evaluate additional performance measures that will help guide quality of care and treatment of neurological conditions. The 23-member Neurology Standing Committee met for a 2-day in-person meeting to evaluate a total of 26 measures: 14 new measures and 12 measures undergoing maintenance review. Nine measures were recommended for endorsement and one measure was recommended for approval for trial use. Four measures were recommended for inactive endorsement with reserve status and six measures were not recommended for endorsement. The Committee did not reach consensus on four measures and the vote was deferred for two measures.

Comments Received

NQF solicits comments on measures undergoing review in various ways and at various times throughout the evaluation process. First, NQF solicits comments on endorsed measures on an ongoing basis through the Quality Positioning System (QPS). Second, NQF solicits member and public comments prior to the evaluation of the measures via an online tool located on the project webpage. Third, NQF opens a 30-day comment period to both members and the public after measures have been evaluated by the full committee and once a report of the proceedings has been drafted.

Pre-evaluation comments

The pre-evaluation comment period was open from February 23 to March 7, 2016 for all 26 measures under review. A total of three pre-evaluation comments were received and were generally in favor of endorsement and harmonization of measures within the portfolio. All of these pre-evaluation comments were provided to the Committee prior to their initial deliberations held during the workgroups calls.

Post-evaluation comments

The Draft Report went out for Public and Member comment May 12 to June 13. During this commenting period, NQF received 16 comments from five member organizations and one public organization. Comments asked for clarification on the draft report, were supportive of the Committee's recommendations, or required developer responses. Other comments spoke to gaps in the Neurology portfolio or asked that the Committee reach consensus on measures where consensus was not reached.

Additional Comments not included in the Comment Table were submitted by:

Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation

In order to facilitate discussion, the majority of the post-evaluation comments have been categorized into major topic areas or themes. Where possible, NQF staff has proposed draft responses for the Committee to consider. Although all comments and proposed responses are subject to discussion, we will not necessarily discuss each comment and response on the post-comment call. Instead, we will spend the majority of the time considering the major topics and/or those measures with the most significant issues that arose from the comments. Note that the organization of the comments into major topic areas is not an attempt to limit Committee discussion.

We have included all of the comments that we received (both pre- and post-evaluation) in the Comment Table. This comment table contains the commenter's name, comment, associated measure, topic (if applicable), and—for the post-evaluation comments—draft responses for the Committee's consideration. Please refer to this comment table to view and consider the individual comments received and the proposed responses to each.

Comments and their Disposition

Three major themes were identified in the post-evaluation comments, as follows:

1. Consideration of Legacy and eMeasures
2. Gaps in the Neurology portfolio
3. Explanation or Suggestions for Measure Specifications

Theme 1 – Consideration of Legacy and eMeasures

One comment focused on the lack of stroke measures as several long-standing stroke measures were moved to inactive endorsement with reserve status. Additionally, the electronic versions of these measures were not recommended for endorsement by the Committee.

> **Proposed Committee Response:** In their consideration of stroke measures, the Committee believed that placing measures in reserve status would provide an opportunity for the development of other stroke related measures that demonstrated opportunity for improvement. The Committee did not believe that the electronic version of these stroke measures would demonstrate an opportunity for improvement. The Committee would advise the developer community to work towards developing additional measures beyond stroke to address other neurological conditions.

Theme 2 – Gaps in the Neurology Portfolio

Four comments received expressed concern in measurement gaps within the Neurology portfolio. Comments on the Committee's decision not to recommend *#2870 Overuse of Opioid Containing Medications for Primary Headache Disorders* expressed concern about gaps in the portfolio related to inappropriate treatment for patients with headache. Another comment on *#2865 CSTK-02 Modified Rankin Score (mRS) at 90 days* recommended that the "measure be implemented for patient outcomes". One commenter recommended a measure for acute care reflecting conformance to the American Heart Association/American Stroke Association guidelines stating that stroke patients in acute care should be screened for the appropriate rehabilitation setting.

> **Proposed Committee Response:** During their Post-Meeting call on April 22, the Committee was given the opportunity to further discuss gaps within the Neurology portfolio, identifying gaps in (1) best practices for early diagnosis and treatment of neurological diseases (2) measures that provide disparities data on disease and treatment to inform patient care, (3) measures for pediatric patients experiencing stroke mimics that may be given IV tissue plasminogen activator treatment, and (4) patient reported outcomes. The Committee would advise the developer community to work towards developing additional measures for neurological conditions including and beyond stroke. This could include measures addressing inappropriate use of opioid containing medications, and measures that address appropriate assessment and placement of patients following hospitalization.

Theme 3 – Explanation or Suggestion for Measure Specifications

2863 CSTK 06 Nimodipine Treatment Administered

One comment stated overall agreement with the administration of nimodipine for patients with aneurysmal subarachnoid hemorrhage, but stated there was "…no clinical or scientific rationale to continue nimodipine for 21 days in all patients with subarachnoid hemorrhage once they are discharged from the hospital".

> **Developer Response:** Thank you for commenting on The Joint Commission CSTK-06 Nimodipine Treatment Administered measure. Clinical trials have demonstrated the benefit of nimodipine to prevent or limit the severity of cerebral vasospasm for patients with aneurysmal subarachnoid hemorrhage (The American Nimodipine Studies Group, 1992). The recommended course of treatment is 21 days; however, the CSTK-06 Nimodipine Treatment Administered measure captures in the numerator population subarachnoid hemorrhage patients who receive an initial dose of nimodipine within 24 hours of hospital arrival. If nimodipine is discontinued prior to 21 days, there is no impact on the measure rate.

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

One comment expressed overall agreement with mandating a time limit for heat CT and MRI scan, emphasizing the importance of interpreting CT and MRI scan reads as soon as possible as timely interpretation is directly related to patient morbidity and mortality.

> **Developer Response:** Thank you for the comment. CMS agrees performing prompt brain imaging for patients suspected of acute stroke is a critical component of emergency care for accurate diagnosis and treatment. As you noted in your comment, use of a head CT or MRI allows clinicians to differentiate ischemic stroke, hemorrhagic stroke, and mini strokes; these scans also help identify candidates for tPA, which is used to treat ischemic stroke patients (and is contraindicated for treatment of hemorrhagic stroke). The specifications for NQF #0661 align with recommendations made by the American Heart Association/American Stroke Association, which recommend that imaging studies be interpreted within 45 minutes of patient arrival; CMS encourages imaging studies be interpreted as rapidly as possible to ensure timely, appropriate treatment.

2111: Antipsychotic Use in Persons with Dementia

One comment indicated support for efforts to ensure that antipsychotics are appropriately prescribed and monitored, but expressed concern with unintended consequences of prescription of antipsychotics for patients without psychotic disorders, such as those with agitation as a result of dementia and Parkinson's disease.

> **Developer Response:** When constructing the measure specifications for the Antipsychotic Use in Persons with Dementia measure, the goal was to identify the population of patients that are at high-risk of adverse events from the use of antipsychotic medications (i.e., persons with dementia) and to further focus on the sub-population of dementia patients who do NOT have a documented diagnosis for which an antipsychotic is clearly indicated (i.e., we exclude persons who have a diagnosis that identifies them as having psychoses or behavioral disturbances). Thus, the measure identifies the proportion of patients at high risk of antipsychotic-associated adverse events but without a diagnosis code to indicate that an antipsychotic drug is beneficial. Since this is a claims based measure, it is impossible to identify every patient with dementia where antipsychotic medication use is appropriate. Therefore, the intended rate of the measure is not expected to approach zero.
>
> A review of the measure is performed annually to determine if there is new information that supports changes to the measure. This review includes consideration of expanding the list of numerator exclusions using specific ICD codes. The comment to consider excluding persons with dementia who also have severe agitation will be considered during our annual review.

Measures where Consensus Not Reached

The Committee will consider comments received and developer responses in further evaluation of the measures that did not reach consensus on a recommendation by the Committee. During discussion of these measures, please indicate any reasons for concern or unwillingness to recommend the measure as well as any supporting comments.

2876: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

Comments received were from the developer and one comment from a Committee member. See submitted comments linked here.

> **Proposed Committee Response:** During the in-person meeting, the Committee did not reach consensus on validity due to a concern with 17% of data missing for stroke scale scores, exclusions regarding patients without comfort measures, and the final risk adjustment model which did not include race. The Committee reiterated that the concern regarding race as a variable in the risk-adjustment model was less about whether race should be included in the measure and more about whether the race-mortality relationship called the validity of the measure into question. Specifically, the model finds that African-Americans have much lower mortality than whites. The Committee discussed whether this related to higher quality of care or to differences in preferences. African-American patients, on average, have preferences for more aggressive care than whites. As such, the Committee felt it may be that race serves as a partial marker of preferences. Therefore, the Committee felt that by not accounting for race, hospitals that take care of more African-American patients would have a substantial advantage on the model, whereas if race were included in the model they would have a substantial disadvantage. The Committee discussed that these factors could affect the validity of the measure.
>
> **Action Item:** After review of the comments, the Committee will re-vote on the *Validity* criterion.

1814: Counseling for Women of Childbearing Potential with Epilepsy

Comments received were from the developer. No comments were received from any other member or public organization.

> **Developer Comment:** The AAN encourages the Committee to make a decision to re-endorse this measure. The AAN notes the report highlights the Committee's concerns with validity, specifically that testing was conducted at three practices and feasibility of extracting data elements based on exclusions, which may all be documented differently. The AAN worked with Minnesota Community Measurement to test the measure using the NCQA process for validation. The testing report indicated, "The validation process was successful in identifying errors (with subsequent corrections) and verifying the accuracy of the data submitted by medical groups A, B, and C. Finding no significant flaws or errors with the data MNCM is confident the rate calculation and any additional data analysis can be completed using validated and reliable data."
>
> The AAN believes this testing is sufficient to represent the variety of providers whose performance will be measured. The AAN previously submitted this same testing data to CSAC who recommended the measure for continued endorsement noting denominator exceptions should be further specified. The AAN convened a measure work group to update the measure. The work group agreed to further specification and clarification of denominator exclusions. Denominator exclusions are now clearly defined with greater specificity reducing documentation concerns given discreet diagnoses required to meet exclusion requirements. This measure has the opportunity to improve outcomes for women with epilepsy and future potential offspring.
>
> **Action Item:** During the in-person meeting the Committee could not reach consensus on reliability, expressing concern that testing had been performed at three sites. During testing, one facility noted a problem with exclusions; Committee members questioned why the developer did not re-test to determine if the exclusions issue had been corrected. The Committee will re-vote on the *Reliability* criterion.

0434: STK-01 Venous Thromboembolism

No comments received.

> **Action Item:** During the in-person meeting, the Committee could not reach consensus on opportunity for improvement and requested disparities data**.** The developer submitted one year of disparities data (3rd and 4th quarter 2014, and 1st and 2nd quarter 2015) for the Committee's consideration. After review of this data, the Committee will re-vote on *Opportunity for Improvement* criterion.

2834: STK-04: Thrombolytic Therapy

No comments received.

> **Action Item:** During the in-person meeting the Committee could not reach consensus on reliability and validity. Committee members questioned why Bonnie testing was accepted for reliability. If data element validity is completed (as was done with this measure), then no additional reliability testing is needed, which is in line with NQF policy. The Committee also discussed the unintended consequences of treating patients experiencing stroke mimics. Additional disparities data were requested and provided by the developer. After review of this data, the Committee will re-vote on *Reliability* and *Usability and Use* criteria.

Measures where the Vote was deferred

0439: STK-06 Discharged on Statin Medication

One comment was received urging the Committee to vote on this measure, noting that expansion of the denominator, the measure will continue to show room for improvement.

> **Action Item:** During the in-person meeting, the Committee deferred voting on this measure since the denominator had been expanded to include all ischemic stroke patients. The performance gap data did not reflect the denominator expansion and the Committee requested this data be submitted. The developer provided performance gap data from 4th quarter 2015 and additional disparities data. After review of the comment received and data provided by the developer, the lead discussant(s) and workgroup members will vote on each criterion to reach a recommendation.

2836: STK-06 Discharged on Statin Medication

One comment was received urging the Committee to vote on this measure.

> **Action Item:** During the in-person meeting, the Committee deferred the vote on *#0439 STK-06 Discharged on Statin Medication*, the registry based companion to this eMeasure. Since registry and eMeasures were reviewed in sequence, the vote was also deferred for this measure. After review of the comment received and the information provided by the developer, the lead discussant(s) and workgroup members will vote on each criterion to reach a recommendation.

Supporting Materials Provided by the Developers

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MEMORANDUM

DATE: Wednesday, June 15, 2016

TO: National Quality Forum (NQF) Neurology Standing Committee

FROM: Theodore Long, MD, MHS, Karen Dorsey, MD, PhD, and Susannah Bernheim, MD, MHS, Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation (YNHHSC/CORE)

THROUGH: The Centers for Medicare and Medicaid Services (CMS)
Lein Han, PhD

SUBJECT: Comments on NQF #2876: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity

On April 5, 2016, the National Quality Forum's (NQF) Neurology Standing Committee evaluated NQF #2876: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity for endorsement. Below we respond to critiques raised by the Committee:

1. "The Committee noted that face validity with expert opinion and feedback that the National Institutes of Health Stroke Severity NIHSS score is an important tool speaks to the measure validity."

   We agree that the addition of the NIHSS score is a critical advancement in measurement of mortality following admission for ischemic stroke and improves the validity of the mortality measure.

2. "On the other hand, there were several issues raised on validity. Specifically, the Committee reviewed empiric validity testing of the measure score that compared the performance of the risk models for this measure to a similar stroke mortality measure employing data from Get with the Guidelines. Results displayed a c-statistic of 0.8120 and 0.7939, respectively which showed that both models have a similar discriminating ability to identify the correct patient. A Committee member noted that NIHSS was present in both models suggesting that they we were not comparing unique models."

   Our test of the validity of the risk model demonstrated that a model that includes the NIHSS score and patient comorbidities from claims data produces similar discrimination as does a model that includes NIHSS score and physiologic data (laboratory test results and vital signs) derived from the registry. The purpose of this test was to compare a model that relies on claims data with one that uses data from the medical record which is considered the gold standard data source. The discrimination of the two models was quite good (0.821 and 0.7939) and greater than that of the currently public reported measure which uses claims without the NIHSS score (c-statistic of 0.74 in the most recent 3-year reporting period). We agree that because NIHSS score is a strong predictor of mortality, it is likely responsible for the increased discriminatory power of both models compared with

the currently public reported stroke mortality measure. However, the inclusion of the NIHSS score in both models does not negate their comparison as a test of validity of the claims-based model.

3. "The Committee also weighed whether the measure was truly assessing quality if patient preferences (e.g., patients with comfort measures are not listed as exclusions) had not been considered. They also noted that if patient preferences are not excluded and the patient dies then the death would count against the hospital. This led to a larger concern of the Committee as to whether the measure is actually measuring facility preferences rather than quality of care."

   The measure currently excludes patients who are admitted to hospice before or on the day of admission (within the first 24 hours). **In addition, the inclusion of the NIHSS score in the measure risk model mitigates the impact of the unequal distribution of patients with the most severe strokes across hospitals**. Although this is not a perfect proxy, these are the patients most likely to face a poor prognosis and elect to receive comfort measures (approximately 3% of stroke patients). We recognize that excluding hospice enrollees in this time window captures a fraction of those who elect to receive comfort measures due to severity of stroke or poor prognosis (one third of the 3%). However, most patients who elect to receive comfort measures do so after the first 24 hours of the admission. Even if the data captured this population perfectly, it is problematic to exclude these patients from the measure because we cannot know whether their decision was due to the severity of the initial stroke and low likelihood of functional recovery or if it was due to poor quality of care delivered after they were admitted to the hospital. Although we agree that it would be ideal to exclude patients for whom avoidance of death is not the desired outcome, it is not feasible to do so perfectly while fully preserving the signal of quality that the measure is deigned to capture. However, the addition of NIHSS better accounts for variation in the proportion of patients with severe stroke, and therefore those most likely to elect for comfort measures across hospitals.

4. "In regard to missing data, 17% of NIHSS stroke scale scores were missing and the Committee voiced concern that facilities may have an incentive to not document the stroke scale score, since multiple imputation could be used to make up for the missing scores."

   Although imputation was used to develop and test the measure, CMS is not proposing to use this approach for calculating results when the measure is implemented. We used imputation to mitigate the impact of the missing NIHSS values in the stroke registry data and to be able to include the full cohort of eligible admissions in the measure. It was our determination that imputation was the most valid way to develop and test the measure's risk model. However, in order to implement the measure hospitals would need to report the NIHSS on all or nearly all of their ischemic stroke patients. We believe this is feasible given the introduction of International Classification of Diseases 10th revision (ICD-10) codes for NIHSS scores scheduled to begin in October 2016. Additionally, studies have demonstrated the feasibility of collection of NIHSS scores by trained research nurses in both hospital and community settings (Dewey 1999). When this has been studied, the total NIHSS scores between neurologists and research nurses have been found to have a high level of agreement (ICC = 0.92 to 0.96) (Dewey 1999). These data demonstrate that both a variety of physician investigators and trained nurses can reliably apply the NIHSS in the context of an actual clinical trial (Goldstein 1997).

5. "The Committee also noted that the SDS factor race was not included in the final risk adjustment model. Although the data presented showed African Americans as having the lowest risk for mortality with an odds ratio of .62, the Committee noted this group also has preferences for more aggressive treatment, which could explain the lower mortality."

   Although differences in mortality rates were observed among Africa-American patients compared with all other racial groups and among patients with low SES indicators compared with all others, these differences were very small in the fully risk-adjusted model. The mean absolute change in hospitals' RSMRs when adding a dual eligibility indicator was 0.00006%. The mean absolute change in hospitals' RSMRs when adding a low SES AHRQ indicator was 0.00009%. The mean absolute change in hospitals' RSMRs when adding a race indicator was -0.00064%. These findings did not support including these variables in the measure's risk model

6. “Finally, the Committee considered additional factors that could vary at the hospital level such as early ‘Do not resuscitate’ orders, which are a larger predictor of mortality than age. The Committee again felt that the measure could be measuring hospital preferences and not quality.”

   As stated above, we do not believe that the current limitations in identifying patient care preferences invalidate the measure. We do currently exclude patients enrolled in hospice before or on the first day of admission. This exclusion captures a proportion of patients who elect to have life-saving interventions withheld during the admission. However, it remains conceptually problematic to exclude patients who enroll in hospice or convert to comfort measure or DNR after the first 24 hours of the admission. This is due to the difficulty in knowing if that decision is a result of stroke severity and poor prognosis or of poor care. We do believe that the addition of NIHSS score to the measure risk model better adjusts for variation in the proportion of patients with severe strokes and that these are the patients most likely to have care withheld or withdrawn by request.

Additional Information of Evidence for the Measure

Post-stroke mortality rates have been shown to be influenced by several critical aspects of care. These aspects of care include hospital interventions such as establishing processes of care associated with reduced mortality, delivering care in a timely manner, and achieving primary stroke center certification. Each of these hospital interventions has been shown to be associated with decreased post-stroke mortality risk.

There are several processes of care that have been independently associated with reduction in in-hospital mortality, discharge to hospice, or discharge to a skilled nursing facility (Bravata 2010). These include treating all episodes of hypoxia with supplemental oxygen, completing a swallowing evaluations, and maintaining DVT prophylaxis. In the study by Bravata et al., although treating all episodes of hypoxia with supplemental oxygen was found to have a significant impact (adjusted odds ratio of combined outcome, 0.26; 95% CI, 0.09-0.73), less than half of the patients studied had every episode of hypoxia treated with oxygen, indicating the opportunity for improvement. In terms of other process-based hospital interventions that have been shown to be associated with decreased post-stroke mortality risk, patients seen by neurologists (alone or with a generalist) have been shown to have had a 10% and 16% lower risk of 30-day mortality, respectively, compared to those seen by a generalist only (Smith 2006).

The speediness of delivery of care has also been found to be associated with substantially lower mortality rates for post-stroke patients (Ingeman 2008). In the study by Ingeman et al., six quality of care criteria were associated with lower 30- and 90-day mortality rates. Nearly all of these quality criteria were based on the timely delivery of care, which is within the control of hospitals: early admission to a stroke unit; early initiation of antiplatelet; early initiation of oral anticoagulant therapy; early assessment by physiotherapist; and early assessment by occupational therapist. The authors found that there was an indication of an inverse dose-response relationship between the number of quality of care criteria met and mortality.

Primary stroke centers have also been found to have lower risk-standardized mortality rates compared to noncertified hospitals (Lichtman 2011). The mortality rates of hospitals with Joint Commission certified primary stroke center status were lower than in noncertified hospitals (10.7% vs 11.0%), and almost half of primary stroke center hospitals had mortality rates lower than the national average compared with 19% of noncertified hospitals.

The evidence in the literature around post-stroke care clearly shows that hospital interventions such as optimal treatment with oxygen and timely delivery of care are associated with reductions in mortality. However, the literature also shows that these interventions are inconsistently applied, and that there is an opportunity for improvement in these interventions to reduce post-stroke mortality.

References

1. Bravata DM, Wells CK, Lo AC, et al. Processes of care associated with acute stroke outcomes. Arch Intern Med. 2010;170(9):804-10.
2. Dewey HM, Donnan GA, Freeman EJ, et al. Interrater reliability of the National Institutes of Health Stroke Scale: rating by neurologists and nurses in a community-based stroke incidence study. Cerebrovasc Dis. 1999;9(6):323-7.

3. Goldstein LB, Samsa GP. Reliability of the National Institutes of Health Stroke Scale. Extension to non-neurologists in the context of a clinical trial. Stroke. 1997;28(2):307-10.
4. Ingeman A, Pedersen L, Hundborg HH, et al. Quality of care and mortality among patients with stroke: a nationwide follow-up study. Med Care. 2008;46(1):63-9.
5. Lichtman JH, Jones SB, Wang Y, Watanabe E, Leifheit-limson E, Goldstein LB. Outcomes after ischemic stroke for hospitals with and without Joint Commission-certified primary stroke centers. Neurology. 2011;76(23):1976-82.

Appendix: Study Characteristics

Author (Date): Bravata DM (2010).

Title: *Processes of Care Associated with Acute Stroke Outcomes*
http://archinte.jamanetwork.com/article.aspx?articleid=415896

- **Objective**: identify processes of stroke care that are associated with improved patient outcomes after adjustment for both patient characteristics and other process measures
    - Processes of care evaluated: fever management, hypoxia management, blood pressure management, neurologic evaluation, swallowing evaluation, deep vein thrombosis (DVT) prophylaxis, and early mobilization
- **Cohort**: 1487 patients
- **Data source**: medical records
- **Outcome evaluated**: combined outcome of in-hospital mortality, discharge to hospice, or discharge to a SNF.
- **Risk-adjustment**: age, comorbidity (medical history), concomitant medical illness present at admission, preadmission symptom course, prestroke functional status, code status, stroke severity, nonneurologic status, modified APACHE (Acute Physiology and Chronic Health Evaluation) III score, and admission brain imaging findings
- **Results**: combined outcome was observed in 239 (16%) patients.
    - 3 processes of care are independently associated with reduction in combined outcome (after risk-adjustment): swallowing evaluation; DVT prophylaxis; and treating all episodes of hypoxia with supplemental oxygen.
    - Expected temporal relationship between earlier intervention and improved outcome was observed for some processes (e.g. the earlier the DVT prophylaxis, the better the protective effect) and the expected intermediate outcome relationship existed for some processes (e.g. patients receiving swallowing evaluation were less likely to have pneumonia).
    - Findings remained essentially unchanged when they restricted the analysis to death or discharge to hospice (without considering discharge to a SNF).

Author (Date): Ingeman A. et al (2008).

Title: *Quality of Care and Mortality Among Patients with Stroke: A Nationwide Follow-up Study*

- **Objective**: Examine the association between quality of care and mortality among patients with stroke.
    - Criteria used to evaluate quality of care:
        1. early admission to a stroke unit,
        2. early initiation of antiplatelet
        3. early initiation of oral anticoagulant therapy,
        4. early examination with computed tomography/magnetic resonance imaging scan,
        5. early assessment by a physiotherapist,
        6. early assessment by occupational therapist,
        7. nutritional risk
- **Data source**: Danish Civil Registration System and The Danish National Indicator Project – all Danish hospital departments caring for patients with stroke participate.
- **Cohort**: 29,573 patients hospitalized with stroke between January 13, 2003 and October 31, 2005
- **Outcome evaluated**: 30- and 90-day mortality rates
- **Risk-adjustment**: age, sex, marital status, housing, Scandinavian Stroke Scale, previous stroke, previous MI, atrial fibrillation, hypertension, diabetes, claudication, smoking, alcohol.
- **Results**: Six of the 7 criteria (all except examination with CT/MRI scan) were associated with lower 30- and 90-day mortality rates.
    - Adjusted mortality rate ratios corrected for clustering by department ranged from 0.41 to 0.83.
    - Found indication of an inverse dose-response relationship between the number of quality of care criteria met and mortality; the lowest mortality rate was found among patients whose

care met all criteria compared with patients whose care failed to meet any criteria. When analyses were stratified by age and sex, the dose-response relationship was found in all subgroups.

- **Conclusion**: Higher quality of care during the early phase of stroke was associated with substantially lower mortality rates.

Author (Date): Ross JS (2011).

Title: *Correlation of Inpatient and Outpatient Measures of Stroke Care Quality within Veterans Health Administration Hospitals*

- **Objective:** examine correlation between stroke care quality at hospital discharge and within 6 months post-discharge
    - Processes of care that represented discharge care quality:
        1. Prescription of anti-thrombotic and anti-lipidemic therapy
        2. Anti-coagulation for atrial fibrillation
        3. Tobacco cessation counseling
        4. Composite measure of defect-free care
- **Data source:** chart-abstracted
- **Cohort:** 3467 veterans discharged alive after acute ischemic stroke from 108 VHA medical centers; 2380 veterans with post-discharge follow-up within 6 months (2007)
- **Outcome:**
- **Risk-adjustment:**
- **Results:** median risk-standardized composite rate of defect-free care at discharge was 79%. The hospital composite rate of defect-free care at discharge was correlated with meeting the LDL goal and depression management goal, but was not correlated with blood pressure, INR, or glycosylated hemoglobin goals, nor with the composite measure of achieved post-discharge outcomes.
- **Conclusion:** discharge care quality wasn't consistently correlated with ambulatory care quality

Author (date): Lichtman JH (2011).

Title: *Outcomes after Ischemic stroke for hospitals with and without Joint Commission-certified primary stroke centers*

- **Objective:** assess whether 30-day RSMR and RSRR rates differed between hospitals with and without JC-certified PSCs in 2006
- **Data source:**
- **Cohort:** 310,381 ischemic stroke discharges (FFS Medicare beneficiaries) from 315 JC-certified PSC and 4,231 noncertified hospitals
- **Outcome:**
- **Risk-adjustment:**
- **Results:** RSMRs of hospitals with JC-certified PSCs were lower than in noncertified hospitals (10.7% vs 11.0%). Almost half of JC-certified PSC hospitals had RSMRs lower than the national average compared with 19% of noncertified hospitals.
- **Conclusion:** Hospitals with JC-certified PSCs had lower RSMRs compared with noncertified hospitals in 2006; however, differences were small. PSC certification generally identified better-performing hospitals for mortality outcomes, but some hospitals with certified PSCs may have high RSMRs whereas some hospitals without PSCs have low rates

The Joint Commission

Updated Performance Gap Data: Measure #0439 Discharged on a Statin Medication June 13, 2016

In October, 2015, specifications for measure #0439 Discharged on a Statin were revised to reflect current clinical practice guideline recommendations and the denominator population expanded to include all ischemic stroke patients. Prior to this date, the denominator population included only those ischemic stroke patients who were taking a lipid-lowering medication prior to hospital arrival, or had a measured LDL-c value greater than or equal to 100 mg/dL within the first 48 hours or 30 days prior to hospital arrival, or LDL-c not measured.

Data from fourth quarter 2015 were compared to previous quarters. Measure revision increased the sample size; performance rates were minimally impacted. A performance gap of 12-13% exists for hospitals in the tenth decile.

Below are rates for 4Q15 data for measure #0439:

Number of HCOs	Mean of Hospital Rates	Max	90th percentile	median	10th percentile	Min	No. Numerator	No. Denominator	national_rate
2381	0.95001	1	1	1	0.875	0	69709	71610	0.97345

PURPOSE

Evaluate whether or not a relationship exists among race and gender and ORYX Core Measures Stroke performance rates.

We built a linear mixed model with a two-way factorial fixed-effects of stroke measures for race and gender and a random effect using hospitals across the United States.

The data used to build the model consist of one year of data (third, and fourth quarter 2014 and first and second quarter for 2015) extracted from The Joint Commission data warehouse. The hospital selection was based on those hospitals that reported 12 months of data and had 30 or more denominator cases for the year.

Even if race and gender and their interaction have statistical significance, the means of every measure do not show any variation. Therefore, our conclusion is race and gender do not affect stroke measures outcome.

Disparity STK-1

Type III Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
gender	1	5981	0.01	0.9111
race	3	5981	0.54	0.6576
gender*race	3	5981	1.62	0.1833

gender Least Squares Means

gender	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	4.7186	0.07225	5981	65.31	<.0001	0.05	4.5770	4.8602	0.9912	0.000634	0.9898	0.9923
M	4.7143	0.07225	5981	65.25	<.0001	0.05	4.5727	4.8559	0.9911	0.000636	0.9898	0.9923

race Least Squares Means

race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	4.7281	0.07562	5981	62.52	<.0001	0.05	4.5799	4.8764	0.9912	0.000657	0.9898	0.9924
hs	4.7614	0.08912	5981	53.43	<.0001	0.05	4.5867	4.9361	0.9915	0.000749	0.9899	0.9929
other	4.6768	0.08661	5981	54.00	<.0001	0.05	4.5070	4.8466	0.9908	0.000791	0.9891	0.9922
white	4.6995	0.06779	5981	69.32	<.0001	0.05	4.5666	4.8324	0.9910	0.000606	0.9897	0.9921

gender*race Least Squares Means													
gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	4.7532	0.08207	5981	57.92	<.0001	0.05	4.5924	4.9141	0.9915	0.000696	0.9900	0.9927
F	hs	4.7377	0.09945	5981	47.64	<.0001	0.05	4.5427	4.9326	0.9913	0.000856	0.9895	0.9928
F	other	4.6345	0.1005	5981	46.10	<.0001	0.05	4.4375	4.8316	0.9904	0.000957	0.9883	0.9921
F	white	4.7490	0.07007	5981	67.77	<.0001	0.05	4.6116	4.8863	0.9914	0.000597	0.9902	0.9925
M	aa	4.7030	0.08355	5981	56.29	<.0001	0.05	4.5393	4.8668	0.9910	0.000744	0.9894	0.9924
M	hs	4.7851	0.09750	5981	49.08	<.0001	0.05	4.5940	4.9763	0.9917	0.000801	0.9900	0.9931
M	other	4.7190	0.1016	5981	46.45	<.0001	0.05	4.5198	4.9182	0.9912	0.000891	0.9892	0.9927
M	white	4.6501	0.06987	5981	66.55	<.0001	0.05	4.5131	4.7871	0.9905	0.000655	0.9892	0.9917

Disparity STK-2

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
gender	1	5802	10.77	0.0010
race	3	5802	4.28	0.0050
gender*race	3	5802	0.96	0.4096

race Least Squares Means												
race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	8.3837	0.3471	5802	24.16	<.0001	0.05	7.7033	9.0640	0.9998	0.000079	0.9995	0.9999
hs	8.5998	0.3739	5802	23.00	<.0001	0.05	7.8668	9.3328	0.9998	0.000069	0.9996	0.9999
other	9.0443	0.3796	5802	23.83	<.0001	0.05	8.3002	9.7883	0.9999	0.000045	0.9998	0.9999
white	8.4844	0.3387	5802	25.05	<.0001	0.05	7.8205	9.1483	0.9998	0.000070	0.9996	0.9999

gender*race Least Squares Means													
gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	8.2146	0.3526	5802	23.29	<.0001	0.05	7.5233	8.9059	0.9997	0.000095	0.9995	0.9999
F	hs	8.5723	0.3867	5802	22.17	<.0001	0.05	7.8141	9.3304	0.9998	0.000073	0.9996	0.9999
F	other	8.7436	0.3935	5802	22.22	<.0001	0.05	7.9721	9.5151	0.9998	0.000063	0.9997	0.9999
F	white	8.3503	0.3405	5802	24.52	<.0001	0.05	7.6827	9.0179	0.9998	0.000080	0.9995	0.9999
M	aa	8.5528	0.3596	5802	23.79	<.0001	0.05	7.8479	9.2577	0.9998	0.000069	0.9996	0.9999
M	hs	8.6273	0.3833	5802	22.51	<.0001	0.05	7.8758	9.3788	0.9998	0.000069	0.9996	0.9999
M	other	9.3449	0.4175	5802	22.38	<.0001	0.05	8.5264	10.1635	0.9999	0.000036	0.9998	1.0000
M	white	8.6185	0.3414	5802	25.24	<.0001	0.05	7.9491	9.2878	0.9998	0.000062	0.9996	0.9999

Disparity STK-3

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
gender	1	2598	0.28	0.5965
race	3	2598	2.83	0.0370
gender*race	3	2598	0.64	0.5901

gender Least Squares Means												
gender	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	7.6781	0.3917	2598	19.60	<.0001	0.05	6.9101	8.4462	0.9995	0.000181	0.9990	0.9998
M	7.7653	0.3950	2598	19.66	<.0001	0.05	6.9908	8.5397	0.9996	0.000167	0.9991	0.9998

race Least Squares Means

race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	7.3659	0.3981	2598	18.50	<.0001	0.05	6.5853	8.1465	0.9994	0.000251	0.9986	0.9997
hs	7.7491	0.4359	2598	17.78	<.0001	0.05	6.8942	8.6039	0.9996	0.000188	0.9990	0.9998
other	8.1382	0.4422	2598	18.41	<.0001	0.05	7.2711	9.0052	0.9997	0.000129	0.9993	0.9999
white	7.6337	0.3816	2598	20.00	<.0001	0.05	6.8854	8.3820	0.9995	0.000184	0.9990	0.9998

gender*race Least Squares Means

gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	7.3457	0.4123	2598	17.82	<.0001	0.05	6.5373	8.1541	0.9994	0.000266	0.9986	0.9997
F	hs	7.8995	0.4832	2598	16.35	<.0001	0.05	6.9520	8.8470	0.9996	0.000179	0.9990	0.9999
F	other	7.8723	0.4671	2598	16.85	<.0001	0.05	6.9563	8.7883	0.9996	0.000178	0.9990	0.9998
F	white	7.5950	0.3838	2598	19.79	<.0001	0.05	6.8425	8.3476	0.9995	0.000193	0.9989	0.9998
M	aa	7.3860	0.4234	2598	17.44	<.0001	0.05	6.5558	8.2163	0.9994	0.000262	0.9986	0.9997
M	hs	7.5986	0.4700	2598	16.17	<.0001	0.05	6.6769	8.5202	0.9995	0.000235	0.9987	0.9998
M	other	8.4041	0.5303	2598	15.85	<.0001	0.05	7.3642	9.4439	0.9998	0.000119	0.9994	0.9999
M	white	7.6723	0.3846	2598	19.95	<.0001	0.05	6.9181	8.4265	0.9995	0.000179	0.9990	0.9998

Disparity STK-4

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
gender	1	5258	27.69	<.0001
race	3	5258	1.39	0.2428
gender*race	3	5258	4.28	0.0050

gender Least Squares Means												
gender	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	4.0204	0.08249	5258	48.74	<.0001	0.05	3.8587	4.1821	0.9824	0.001429	0.9793	0.9850
M	4.2423	0.08301	5258	51.10	<.0001	0.05	4.0795	4.4050	0.9858	0.001160	0.9834	0.9879

race Least Squares Means												
race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	4.1152	0.08635	5258	47.66	<.0001	0.05	3.9459	4.2844	0.9839	0.001365	0.9810	0.9864
hs	4.0908	0.09742	5258	41.99	<.0001	0.05	3.8998	4.2817	0.9835	0.001576	0.9802	0.9864
other	4.2241	0.09767	5258	43.25	<.0001	0.05	4.0326	4.4155	0.9856	0.001389	0.9826	0.9881
white	4.0953	0.07869	5258	52.04	<.0001	0.05	3.9410	4.2496	0.9836	0.001268	0.9809	0.9859

Disparity STK-5

Ctrl+C

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
gender	1	5695	13.08	0.0003
race	3	5695	2.43	0.0636
gender*race	3	5695	0.81	0.4902

gender Least Squares Means												
gender	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	4.9799	0.08130	5695	61.25	<.0001	0.05	4.8205	5.1393	0.9932	0.000551	0.9920	0.9942
M	5.1893	0.08276	5695	62.70	<.0001	0.05	5.0271	5.3516	0.9945	0.000456	0.9935	0.9953

race Least Squares Means												
Ctrl+C												
race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	5.0200	0.08552	5695	58.70	<.0001	0.05	4.8524	5.1877	0.9934	0.000557	0.9923	0.9944
hs	4.9769	0.1109	5695	44.88	<.0001	0.05	4.7595	5.1942	0.9932	0.000754	0.9915	0.9945
other	5.2185	0.1110	5695	47.03	<.0001	0.05	5.0010	5.4360	0.9946	0.000594	0.9933	0.9957
white	5.1231	0.07311	5695	70.07	<.0001	0.05	4.9798	5.2664	0.9941	0.000430	0.9932	0.9949

gender*race Least Squares Means													
Ctrl+C													
gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	4.9557	0.09414	5695	52.64	<.0001	0.05	4.7712	5.1403	0.9930	0.000654	0.9916	0.9942
F	hs	4.8004	0.1265	5695	37.95	<.0001	0.05	4.5525	5.0484	0.9918	0.001024	0.9896	0.9936
F	other	5.1130	0.1355	5695	37.73	<.0001	0.05	4.8473	5.3786	0.9940	0.000806	0.9922	0.9954
F	white	5.0505	0.07636	5695	66.14	<.0001	0.05	4.9008	5.2002	0.9936	0.000483	0.9926	0.9945
M	aa	5.0844	0.09993	5695	50.88	<.0001	0.05	4.8885	5.2803	0.9938	0.000611	0.9925	0.9949
M	hs	5.1533	0.1317	5695	39.13	<.0001	0.05	4.8951	5.4115	0.9943	0.000753	0.9926	0.9956
M	other	5.3240	0.1374	5695	38.76	<.0001	0.05	5.0548	5.5933	0.9952	0.000663	0.9937	0.9963
M	white	5.1957	0.07789	5695	66.70	<.0001	0.05	5.0430	5.3484	0.9945	0.000427	0.9936	0.9953

Disparity STK-6

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
gender	1	5455	29.97	<.0001
race	3	5455	7.85	<.0001
gender*race	3	5455	3.81	0.0097

gender Least Squares Means												
gender	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	4.5916	0.08006	5455	57.35	<.0001	0.05	4.4346	4.7485	0.9900	0.000795	0.9883	0.9914
M	4.8978	0.08166	5455	59.98	<.0001	0.05	4.7377	5.0579	0.9926	0.000600	0.9913	0.9937

race Least Squares Means												
race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	4.8530	0.08705	5455	55.75	<.0001	0.05	4.6824	5.0237	0.9923	0.000669	0.9908	0.9935
hs	4.6325	0.1041	5455	44.51	<.0001	0.05	4.4285	4.8365	0.9904	0.000993	0.9882	0.9921
other	4.8799	0.1077	5455	45.30	<.0001	0.05	4.6687	5.0911	0.9925	0.000806	0.9907	0.9939
white	4.6134	0.07265	5455	63.50	<.0001	0.05	4.4710	4.7559	0.9902	0.000706	0.9887	0.9915

gender*race Least Squares Means												
gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	4.7033	0.09432	5455	49.86	<.0001	0.05	4.5184	4.8882	0.9910	0.000840	0.9892	0.9925
F	hs	4.5931	0.1230	5455	37.35	<.0001	0.05	4.3520	4.8342	0.9900	0.001220	0.9873	0.9921
F	other	4.6988	0.1266	5455	37.10	<.0001	0.05	4.4505	4.9470	0.9910	0.001133	0.9885	0.9929
F	white	4.3711	0.07441	5455	58.74	<.0001	0.05	4.2252	4.5170	0.9875	0.000917	0.9856	0.9892
M	aa	5.0028	0.1056	5455	47.38	<.0001	0.05	4.7958	5.2098	0.9933	0.000700	0.9918	0.9946
M	hs	4.6718	0.1195	5455	39.09	<.0001	0.05	4.4375	4.9061	0.9907	0.001098	0.9883	0.9927
M	other	5.0609	0.1365	5455	37.07	<.0001	0.05	4.7933	5.3286	0.9937	0.000855	0.9918	0.9952
M	white	4.8558	0.07700	5455	63.06	<.0001	0.05	4.7048	5.0067	0.9923	0.000590	0.9910	0.9934

Disparity STK-8

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
gender	1	5258	27.69	<.0001
race	3	5258	1.39	0.2428
gender*race	3	5258	4.28	0.0050

gender Least Squares Means												
gender	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	4.0204	0.08249	5258	48.74	<.0001	0.05	3.8587	4.1821	0.9824	0.001429	0.9793	0.9850
M	4.2423	0.08301	5258	51.10	<.0001	0.05	4.0795	4.4050	0.9858	0.001160	0.9834	0.9879

race Least Squares Means												
race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	4.1152	0.08635	5258	47.66	<.0001	0.05	3.9459	4.2844	0.9839	0.001365	0.9810	0.9864
hs	4.0908	0.09742	5258	41.99	<.0001	0.05	3.8998	4.2817	0.9835	0.001576	0.9802	0.9864
other	4.2241	0.09767	5258	43.25	<.0001	0.05	4.0326	4.4155	0.9856	0.001389	0.9826	0.9881
white	4.0953	0.07869	5258	52.04	<.0001	0.05	3.9410	4.2496	0.9836	0.001268	0.9809	0.9859

gender*race Least Squares Means													
gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	4.0903	0.09310	5258	43.94	<.0001	0.05	3.9078	4.2729	0.9835	0.001507	0.9803	0.9862
F	hs	3.8772	0.1092	5258	35.51	<.0001	0.05	3.6631	4.0913	0.9797	0.002170	0.9750	0.9836
F	other	4.0707	0.1106	5258	36.81	<.0001	0.05	3.8539	4.2875	0.9832	0.001825	0.9792	0.9864
F	white	4.0433	0.08063	5258	50.14	<.0001	0.05	3.8852	4.2014	0.9828	0.001366	0.9799	0.9852
M	aa	4.1400	0.09436	5258	43.88	<.0001	0.05	3.9550	4.3250	0.9843	0.001456	0.9812	0.9869
M	hs	4.3043	0.1112	5258	38.70	<.0001	0.05	4.0862	4.5223	0.9867	0.001463	0.9835	0.9893
M	other	4.3775	0.1120	5258	39.10	<.0001	0.05	4.1580	4.5969	0.9876	0.001371	0.9846	0.9900
M	white	4.1473	0.08037	5258	51.60	<.0001	0.05	3.9897	4.3048	0.9844	0.001231	0.9818	0.9867

Disparity STK-10

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
gender	1	5976	0.14	0.7050
race	3	5976	11.05	<.0001
gender*race	3	5976	8.04	<.0001

gender Least Squares Means												
gender	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	5.6853	0.09778	5976	58.14	<.0001	0.05	5.4936	5.8770	0.9966	0.000330	0.9959	0.9972
M	5.6634	0.09790	5976	57.85	<.0001	0.05	5.4715	5.8553	0.9965	0.000337	0.9958	0.9971

race Least Squares Means												
race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
aa	5.8446	0.1047	5976	55.84	<.0001	0.05	5.6394	6.0498	0.9971	0.000301	0.9965	0.9976
hs	5.5410	0.1195	5976	46.36	<.0001	0.05	5.3067	5.7753	0.9961	0.000465	0.9951	0.9969
other	5.8020	0.1248	5976	46.49	<.0001	0.05	5.5574	6.0467	0.9970	0.000375	0.9962	0.9976
white	5.5098	0.08972	5976	61.41	<.0001	0.05	5.3339	5.6857	0.9960	0.000360	0.9952	0.9966

gender*race Least Squares Means													
gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	5.8739	0.1170	5976	50.19	<.0001	0.05	5.6445	6.1034	0.9972	0.000327	0.9965	0.9978
F	hs	5.4541	0.1320	5976	41.33	<.0001	0.05	5.1954	5.7128	0.9957	0.000560	0.9945	0.9967
F	other	5.7404	0.1491	5976	38.51	<.0001	0.05	5.4482	6.0326	0.9968	0.000476	0.9957	0.9976
F	white	5.6727	0.09380	5976	60.48	<.0001	0.05	5.4888	5.8565	0.9966	0.000320	0.9959	0.9971
M	aa	5.8152	0.1183	5976	49.15	<.0001	0.05	5.5833	6.0472	0.9970	0.000351	0.9963	0.9976
M	hs	5.6278	0.1310	5976	42.96	<.0001	0.05	5.3710	5.8846	0.9964	0.000468	0.9954	0.9972
M	other	5.8636	0.1505	5976	38.95	<.0001	0.05	5.5685	6.1587	0.9972	0.000425	0.9962	0.9979
M	white	5.3470	0.09182	5976	58.23	<.0001	0.05	5.1670	5.5270	0.9953	0.000433	0.9943	0.9960

STK-10 is not present in the model

To explore SAS proc GLIIMMIX is a procedure for fitting Generalized Linear Mixed Models

gender*race Least Squares Means

gender	race	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper	Mean	Standard Error Mean	Lower Mean	Upper Mean
F	aa	3.9743	0.1415	1255	28.09	<.0001	0.05	3.6968	4.2518	0.9816	0.002561	0.9758	0.9860
F	hs	3.8936	0.1768	1255	22.02	<.0001	0.05	3.5466	4.2405	0.9800	0.003460	0.9720	0.9858
F	other	3.7771	0.1711	1255	22.08	<.0001	0.05	3.4415	4.1127	0.9776	0.003742	0.9690	0.9839
F	white	3.9311	0.1232	1255	31.91	<.0001	0.05	3.6894	4.1728	0.9808	0.002325	0.9756	0.9848
M	aa	4.1020	0.1453	1255	28.23	<.0001	0.05	3.8169	4.3871	0.9837	0.002326	0.9785	0.9877
M	hs	4.0764	0.1766	1255	23.09	<.0001	0.05	3.7300	4.4228	0.9833	0.002897	0.9766	0.9881
M	other	4.0408	0.1720	1255	23.49	<.0001	0.05	3.7032	4.3783	0.9827	0.002922	0.9759	0.9876
M	white	4.1094	0.1230	1255	33.42	<.0001	0.05	3.8682	4.3507	0.9838	0.001954	0.9795	0.9873