NATIONAL QUALITY FORUM

Memo

TO: NQF Members

FR: NQF Staff

RE: Voting Draft Report: *NQF Endorsed Measures for Neurological Conditions*

DA: July 13, 2016

Background

The Neurology Standing Committee evaluated 26 measures against NQF's standard evaluation criteria—14 new measures and 12 measures undergoing maintenance of endorsement review. Nine measures were recommended for endorsement and one measure was recommended for Approval for Trial Use. Six measures were recommended for Inactive Endorsement with Reserve Status and ten measures were not recommended for endorsement.

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 on May 12, 2016 through June 13, 2016. During this commenting period, NQF received 16 comments from five member organizations and one public organization. Comments received 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.

An additional comment submitted after the comment period closed is linked below:

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

A complete table of comments submitted post-evaluation, along with the responses to each comment and the actions taken by the Standing Committee, is posted to the project page on the NQF website, along with the measure submission forms.

The Committee reviewed all comments received and considered the pre-meeting comments prior to making an endorsement recommendation. The Committee also responded to all post-evaluation comments. Revisions to the draft report and the accompanying measure specifications are identified as red-lined changes. (Note: Typographical errors and grammatical changes have not been red-lined to assist in reading.)

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.

> **Committee Response:** Thank you for your comment. The Committee follows the NQF's measure evaluation criteria and evaluates each proposed measure against those standards. Although measures have been moved to Inactive endorsement with Reserve Status due to little to no additional performance opportunity, these measures will still remain within the Neurology portfolio. The purpose of an Inactive endorsement with Reserve Status is to retain endorsement of reliable and valid quality performance measures that have overall high levels of performance with little variability so that performance can be monitored as necessary to ensure that performance does not decline. This status would apply only to highly credible, reliable, and valid measures that have high levels of performance due to incorporation into standardized patient care processes and quality improvement actions. Endorsement with reserve status retains these measures in the NQF portfolio for periodic monitoring, while also communicating to potential users that the measures no longer address high-leverage areas for accountability purposes. The Committee recommends to the developer that if additional data indicating a performance gap is available, they should re-submit this measure for future consideration.

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.

> **Committee Response:** Thank you for your comments. The Committee evaluated the measure against the NQF measure evaluation criteria. Based on the *Evidence* criterion, the Committee countered the evidence presented by stating that more intractable patients could have been prescribed opioids resulting in more rebound headaches and

greater healthcare resource utilization, therefore the Committee did not believe there was sufficient evidence to recommend this measure for endorsement.

Another comment was received on *#2865 CSTK-02 Modified Rankin Score (mRS) at 90 days* recommending that the "measure be implemented for patient outcomes."

Committee Response: The Committee debated the appropriateness of holding providers accountable for this measure since it did not demonstrate how completing the Modified Rankin Score within 90 days would improve health outcomes. NQF evaluation criteria allows for measures that fail on evidence to be voted upon as an exception to evidence. The Committee moved to vote for exception to the empirical evidence criterion but failed to reach consensus. Therefore, the measure failed on this criterion and was not recommended for endorsement.

One commenter recommended that a measure be developed 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.

Committee Response: Thank you for your comment. The Committee recognizes the need to address several gap areas that would help produce a more comprehensive portfolio of neurological conditions. The Committee's work in identifying gaps sends a signal to measure developers of gaps in care that need further development. NQF provides a fostering environment through the NQF Measure Incubator to help facilitate and bring together resources to further measure development efforts.

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.

Committee Response: Thank you for your comment. Committee members suggest the developer provide additional wording in the measure to clarify that there is no penalty for hospitals if Nimodipine is discontinued prior to the recommended 21 days course of treatment. The Committee also recommended that the developer review other studies related to Nimodipine treatment to support the measure.

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 head 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.
>
> **Committee Response:** The Committee suggests in the future that the developer include supporting information within the measure to emphasize that scans should be interpreted as soon as possible.

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

On June 23, 2016, the Committee considered comments received and developer responses in further evaluation of the four measures in which Committee did not reach consensus on a recommendation during the April 4-5 in-person meeting. On re-vote, the Committee reached the following recommendations:

- # 0434: STK 01: Venous Thromboembolism (VTE) Prophylaxis **[Recommended for Inactive Endorsement Status]**
- # 2834: STK 04: Thrombolytic Therapy (e-measure) **[Not Recommended]**
- # 2876: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute ischemic stroke hospitalization with claims-based risk adjustment for stroke severity **[Not Recommended]**
- # 1814: Counseling for Women of Childbearing Potential with Epilepsy **[Not Recommended]**

Comments received included:

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.

> **Committee Response:** Committee members reviewed this measure according to the NQF measure evaluation criteria and highlighted three factors that relate to validity. The first factor was missing data. The developers assessed the frequency of missing NIH Stroke Scale scores from the GWTG Stroke Registry during the development of this measure. The registry data were used as a surrogate for data that will eventually come from claims once ICD-10 codes for stroke severity are available and consistently used by hospitals. The Committee raised concerns about the measure as it is not clear that ICD-10 when implemented will change that percentage of missing data. Secondly, there were concerns about whether the method described to assess validity met NQF validity criteria. Lastly, there was discussion about patient preferences and quality of care. The Committee suggested that race can be a partial marker of patient preference and believed it was unclear whether race should not be accounted for in the model. Overall the Committee did not believe this measure met the Validity criteria and therefore did not recommend this measure for endorsement.

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.

Committee Response: Thank you for your comment. The Committee reviewed these comments for consideration during their deliberations on the Post Comment Call on June 23, 2016. Although there had been further refinement of denominator exclusions, in particular for patients with intellectual disabilities, reliability data or the new/ refined exclusions was not available for the Committee's review. After further discussion, the measure failed on Reliability (a must pass criterion), therefore the Committee did not recommend for endorsement.

Measures where the Vote was deferred

Additionally, the Committee reviewed two measures for which voting was deferred during the April 4-5 in-person meeting. The Committee requested that the developer provide performance gap data for measure #0439 STK-06 Discharged on Statin Medication, since the performance gap data was based on the previous denominator specifications. The developer was unable to submit this data for review due to the timing of when the guidelines were updated. On re-vote, the Committee recommended one measure for inactive endorsement with reserve status while the other measure was not recommended for endorsement.

- #0439: STK-06: Discharged on Statin Medication **[Recommended for Inactive Endorsement Status]**
- #2836: STK-06: Discharged on Statin Medication (eMeasure) **[Not Recommended]**

Details of all comments received and the Committee's discussion are red-lined in the draft report.

NQF Member Voting

Information for electronic voting has been sent to NQF Member organization primary contacts. Accompanying comments must be submitted via the online voting tool.

Please note that voting concludes on July 27, 2016 at 6:00 pm ET – no exceptions.

Comment Submitted by the Developer

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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