

**Follow-up to Steering Committee Meeting on August 27, 2012:
Regarding CMS's Hospital-Level Risk-Standardized Mortality Following
Acute Ischemic Stroke Measure**

We provide the following brief notes to clarify remarks made during the Steering Committee meeting on August 27, 2012.

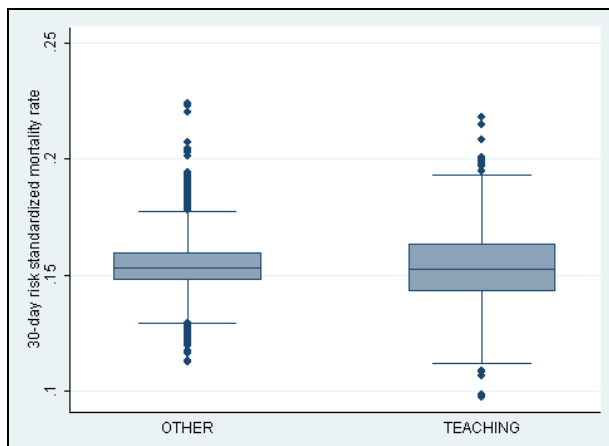
The Fonarow article does not use the CMS measure. Most importantly, the Fonarow model does not include a risk variable for ED-transfer patients.

The measure presented in the Fonarow article differs from the CMS measure in a number of ways, but most important is the lack of a risk variable for ED-transfer patients. The ED-transfer variable included in the CMS model is an important variable that likely captures some of the differences in stroke severity for patients treated in hospitals that are regional stroke centers. We investigated and added this variable in response to our Technical Expert Panel's concerns about creating an incentive for hospitals to not accept transfer patients. ED-transfer patients have higher mortality rates than non-transferred patients (crude mortality of 16.4 vs. 15.5). In our evaluation of this ED-transfer variable, we found that for a small number of hospitals, adding the ED-transfer variable to the risk-adjustment model had a meaningful difference in the risk-standardized rates, likely reflecting stroke severity.

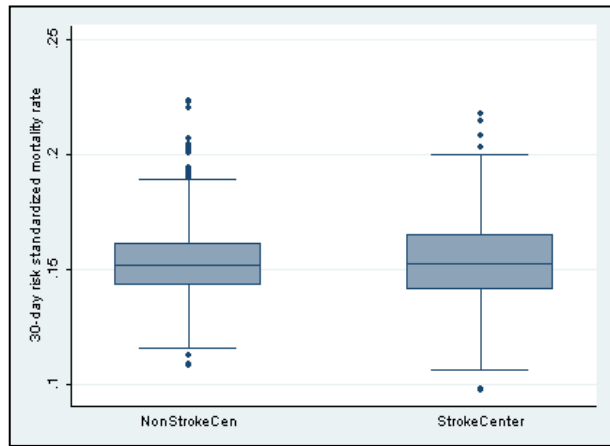
Stroke centers and teaching hospitals perform slightly better on the measure than other hospitals.

Committee members and the public expressed fears that the lack of a stroke severity measure could lead to teaching hospitals and stroke centers appearing to perform poorly on the measure. As mentioned during the Neurology Steering Committee meeting earlier this week, our analyses demonstrate that the performance on this measure for teaching hospitals and stroke centers is not different than that of non-teaching and non-stroke center hospitals. We provide the figures below showing that the average performance and range are quite similar between hospital types, with stroke centers and teaching centers generally doing slightly better on the mortality measure.

Stroke RSMR by Hospital Teaching Status



Stroke RSMR by 2010 Stroke Center Status



Hospital results on the CMS mortality measure correlate highly with hospital results of medical record models that include stroke severity

During the Neurology Steering Committee call, we reminded the Committee that the administrative model was validated against a medical record model that included a stroke severity measure as part of model development. The medical record model was built using the Medicare Health Care Quality Improvement Program's National Stroke Project (NSP) data, which included an assessment of stroke severity. This severity marker used in our medical record model validation is sometimes referred to as a modified Rankin, it is a scale that assesses the presence of visual, sensory, motor or speech deficits. This was assessed at the time of admission for an ischemic stroke. Although it does not have the same scale as the NIHSS, it has been shown to correlate well with NIHSS (0.65) (Husseini et. al., *Cerebrovascular Diseases*, 2011). Our chart model with the modified Rankin severity indicator had a c-statistic of 0.80. When we compared the results with the administrative model and the chart model with the Rankin scale, the correlation between results was very strong at 0.80 (See pg. 40 in the Stroke Mortality Methodology Report).

It is our understanding that the committee will also be receiving results from Dr. Fonarow's team showing that the hospital results for their administrative model and the administrative model with NIHSS have a very high correlation as well (Pearson 0.796). This correlation is reassuring because it demonstrates that hospital results are similar with and without stroke severity in the model.

As pointed out by Dr. Krumholz during the Neurology Steering Committee call, the key question in assessing CMS's claims-based measure is whether it can stand as a good surrogate for a model built with medical-record data – given that no such measure is feasible at this time. Our validation, the Fonarow analysis, and an additional paper by Keyhani et. al. (Keyhani et.al, *Circulation: Cardiovascular Quality and Outcomes*, 2012) all find that the output of a measure with stroke severity and one without produces very similar profiling of hospitals. Finally, the additional analyses by Fonarow et. al. indicate that for 99.6% of hospitals the result for the model including stroke severity falls within the confidence interval of the original result based on their administrative measure that did not include stroke severity.

The readmission model risk-adjustment would not likely be improved by addition of a stroke severity scale.

The Neurology Steering Committee did not have time to fully discuss the readmission measure. We would just remind the Committee that the Fonarow paper evaluated only the mortality measure. In our systematic review of the literature we found that there is not a consistent relationship between stroke severity and readmission risk (Lichtman et al., *Stroke*, 2010). Moreover, the hospital results produced by the claims-based readmission measure are also highly correlated with those of our medical record readmission model that included a stroke severity scale (0.99). Although the measure is "related" to the mortality measure, it is important that the Committee consider the scientific acceptability of the readmission measure independently. Please also note that this measure has been updated to further exclude planned readmissions from the outcome.