

Sex Disparity in Stroke Quality of Care in a Community-Based Study

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Background: Studies have suggested that women may receive lower stroke quality of care (QOC) than men, although population-based studies at nonacademic centers are limited. We investigated sex disparities in stroke QOC in the Brain Attack Surveillance in Corpus Christi Project. *Methods:* All ischemic stroke patients admitted to 1 of 6 Nueces County nonacademic hospitals between February 2009 and June 2012 were prospectively identified. Data regarding compliance with 7 performance measures (PMs) were extracted from the medical records. Two overall quality metrics were calculated: a composite score of QOC representing the number of achieved PMs over all patient-appropriate PMs, and a binary measure of defect-free care. Multivariable models with generalized estimating equations assessed the association between sex and individual PMs and between sex and overall quality metrics. *Results:* A total of 757 patients (51.6% female) were included in our analysis. After adjustment, women were less likely to receive deep vein thrombosis prophylaxis at 48 hours (relative risk [RR] = .945; 95% CI, .896-.996), an antithrombotic by 48 hours (RR = .952; 95% CI, .939-.965), and to be discharged on an antithrombotic (RR = .953; 95% CI, .925-.982). Women had a lower composite score (mean difference -.030, 95% CI -.057 to -.003) and were less likely to receive defect-free care than men (RR = .914; 95% CI, .843-.991). *Conclusions:* Women had lower overall stroke QOC than men, although absolute differences in most individual PMs were small. Further investigation into the factors contributing to the sex disparity in guideline-concordant stroke care should be pursued. **Key Words:** Ischemic stroke—women—gender—quality.

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Introduction

Women have worse outcomes after stroke than men.^{1,2} Even after adjustment for women's older age at stroke onset, women are more likely than men to have transitioned to institutional living at 3 months³ and are less likely than men to be independent in their instrumental activities of daily living at 6 months⁴ after stroke.

Studies investigating the reasons for sex-specific differences in stroke outcome have suggested that women may receive fewer standard diagnostic tests^{5,6} and less frequent appropriate therapy^{7,8} after stroke when compared to their male counterparts. In addition, women may receive lower guideline-concordant quality of care (QOC) after stroke than men. In an analysis of almost 400,000 ischemic stroke patients in the Get With the Guidelines Stroke (GWTG-Stroke) Program, women were less likely than men to receive defect-free stroke care (66.3% versus 71.1%, $P < .0001$).⁹

Population-based studies regarding sex differences in stroke QOC are limited, with most being registry based. Population-based studies at nonacademic centers may better represent typical stroke care in the United States than studies involving treatment at academic centers. Thus, the paucity of data from nonacademic sites limits our understanding of the important real-world factors contributing to women's worse outcomes after stroke. We investigated sex disparities in QOC in the population-based Brain Attack Surveillance in Corpus Christi (BASIC) Project in Nueces County, Texas, a community without an academic medical center.

Methods

The methods of the BASIC project have been described in detail elsewhere.¹⁰ In brief, BASIC is an observational study that uses active and passive surveillance to identify Nueces County residents aged more than 44 years with potential stroke who are admitted to any of the 6 hospitals in the community. These hospitals serve a biethnic, predominantly urban population. The 2 major hospital systems in this community have been involved in the American Heart Association GWTG-Stroke program since 2007, although the current project was separate from any activities for GWTG-Stroke. Two of the hospitals were certified as Primary Stroke Centers by the Joint Commission, one in January 2009 and the other in December 2010. Each potential stroke patient is validated as an acute ischemic stroke through systematic medical record review by a neurologist or stroke fellowship-trained emergency medicine physician. Validated stroke cases are invited to participate in an interview, and those who are interviewed undergo detailed medical record abstraction. Our study cohort consisted of all acute ischemic stroke patients who participated in BASIC between February 2009 and June 2012.

Baseline demographic data for all validated stroke patients were recorded. Data were abstracted from the medical record regarding compliance with 7 Joint Commission performance measures (yes versus no): patient provided deep vein thrombosis (DVT) prophylaxis at 48 hours; patient discharged on an antithrombotic; patients with atrial fibrillation discharged on anticoagulation; patient given tissue plasminogen activator (tPA); patient prescribed an antithrombotic at 48 hours; patient prescribed a cholesterol medication at discharge; and patient evaluated for rehabilitation. Of note, medication contraindications are included in the definition of each quality measure, so it was not considered a failure if a patient did not receive a medication that was not appropriate for him or her. A composite score of QOC representing the number of achieved performance measures over all patient-appropriate measures was calculated for each patient. We also included a binary measure of defect-free care (yes versus no): patient received all appropriate performance measures. Our assessments of these quality metrics were performed independent of each hospital's internal quality assessment. Furthermore, we did not report our metrics back to the relevant hospitals until after data collection was complete.

We used generalized estimating equations (GEE) to examine the association between sex and each individual performance measure and between sex and the overall quality metrics (composite score and defect-free care). To examine sex differences in individual performance measures, we fit a Poisson model (unadjusted) with robust standard errors to report relative risk (RR) for the binary outcomes and a linear model (unadjusted) with robust standard errors for the continuous composite score. To account for hospital clustering, we then used GEE with a log link function for the binary outcomes and GEE with the identity link function for the continuous outcome, and robust standard errors were additionally corrected for the small number of clusters used ($n = 6$ hospitals).¹¹ Adjustment for hospital clustering was not performed for the tPA and anticoagulant for atrial fibrillation performance measures due to small numbers of eligible participants for these measures at some of the hospitals. In order to assess the effect of potential confounders of any observed sex differences in the quality measures, we sequentially added covariates to the regression models for each of the individual and overall quality metrics, beginning with an unadjusted model including sex alone, next adding in hospital clustering (except for tPA and atrial fibrillation indicators as above), and then demographics including age and ethnicity. To avoid overfitting the model, no additional adjustment was performed for the individual performance measures due to the low number of outcome events per variable.¹² However, for the 2 overall quality metrics where there were a larger number of outcome events per variable, a final fully adjusted model was developed to additionally adjust for

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