Are There Disparities in Thrombolytic Treatment and Mortality in Acute Ischemic Stroke in the Hispanic Population Living in Border States versus Nonborder States?

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Abstract

Background—Recent studies have found an underutilization of hospital in-patient care for coronary artery disease in Hispanics living in border states.

Objective—To identify acute treatment disparities in acute ischemic stroke Hispanic patients and determine the effect of such disparity on patient outcomes.

Methods—We identified Hispanic and non-Hispanic acute ischemic stroke patients from the Nationwide Inpatient Sample-2011 data files. We determined the rate of utilization of thrombolytics and outcomes according to patient’s demographic and clinical characteristics and whether or not they lived in a border state (defined as California, Arizona, New Mexico, and Texas).

Results—A total of 34,904 Hispanic patients were admitted with ischemic stroke; of those 21,130 were admitted in border states and 13,774 in nonborder states. There was a significantly lower rate of thrombolytic use in Hispanic patients (1013 (4.8%) and non-Hispanics (5326 (5.7%), \( p=0.05 \)). After adjusting for age, gender, and other confounding risk factors, Hispanics were 30% more likely to suffer in-hospital mortality versus non-Hispanics in border states \( [OR 1.3 (1.1–1.6) \ p=0.009] \), which was not apparent in the non-border states \( [OR 1.0 (0.8–1.2) \ p=0.9] \).

Conclusions—There was an underutilization of thrombolytics and higher mortality in the Hispanic population admitted in border states but not in nonborder states. Further studies are warranted to better understand the associated factors.

INTRODUCTION

Stroke is the leading cause of disability and fifth leading cause of mortality in the United States. One of every 19 deaths in this country is accounted for by strokes; equaling about one death every four minutes. More importantly, it is the leading cause of long-term disability [1]. The Hispanic stroke burden in the United States is similarly as significant. A recent study looking at the stroke incidence in Nueces County Texas showed that approximately 53% of all stroke cases were Mexican-Americans. This study also showed that this population also had a higher cumulative incidence of intracerebral hemorrhage as compared to their non-Hispanic counterparts [19]. Given the rate of which this current population is growing in age along with the high immigration rates, the potential burden that the ischemic stroke patients could bring might quickly become unsustainable.

The economic impact of strokes was estimated to be $38.6 billion in 2009 alone with a 30-year projection to be $2.21 trillion [2,3]. With a healthcare model that is already overstrained, it is very clear just how significant the management of strokes are to the future sustainability of healthcare to this country. This economic impact has the potential to be greatly influenced with better care and reduction of morbidity and mortality.

According to data from the National Health and Nutrition Examination Survey (NHANES), the prevalence of stroke in the United States is approximately 2.8%, which equates to a staggering 6.8 million Americans [4]. The distribution of these strokes are not even among the different ethnicities. The lowest incidence is found among the Asian population (1.5%), whereas the highest is seen in the American–Indian (5.9%) ethnicity. The incidence rates seen in Whites and Hispanics are similar at 2.4% and 2.5%, respectively [5]. With a rapidly aging population, these numbers are expected to continue to increase steadily, with current projections estimating that an addi-
tional four million Americans will have had a stroke by 2030 [6]. A recent study done in 2013 showed an underutilization of inpatient care for coronary artery disease for Hispanics who were living in the border counties in Texas [7]. Our study aimed to demonstrate if this discrepancy translated to the treatment of acute ischemic stroke in Hispanic patients living in the four border states (California, Arizona, New Mexico, and Texas) and determine what effects if any the disparity may have on patient outcomes.

METHODS

Patient data were obtained through the Nationwide Inpatient Sample 2011 data files of patients that received the diagnosis of ischemic stroke. Of this sample, all of the patients who were ethnically identified as Hispanic were obtained. The Hispanic population living in the border states was compared to the rest of the nation’s Hispanic population. The Hispanics living in the border states were identified as those that reside in California, Arizona, New Mexico, and Texas. This number was also compared to the number of non-Hispanic Whites living in those border states. The rate of utilization of thrombolytics and its subsequent outcomes were determined according to patient’s demographic, clinical characteristics, and location of residence (border states vs. non-border states).

Patient’s age, gender, comorbid conditions, in hospital complications, in hospital procedures, lengths of stay and hospital charges were obtained. Outcomes were classified as none to minimal disability, moderate to severe disability, and in hospital mortality based on discharge disposition.

STATISTICAL ANALYSIS

Groups were compared using univariable analysis with chi squared or Fischer’s exact test where appropriate. Once univariable analysis was completed all significant ($p<0.05$) factors were used for multivariable analysis using logistic regression modeling. Age, gender, stroke severity, comorbid conditions, and vascular risk factors adjustment were conducted using established adjustment guidelines [8]. SAS software was used for all analysis.

RESULTS

Overall in 2011, a total of 34,904 Hispanic patients were admitted with ischemic stroke; of those 21,130 were admitted in the four border states and 13,774 in non-border states. Patient demographics, risk factors, complications and discharge disposition are included in Table 1. There were 1013 Hispanics living in the border states that received thrombolytics, approximately 4.8% of the total number of Hispanic patients admitted with stroke in those states. This rate was significantly lower than the rate of thrombolytic use in non-Hispanic patients living in the border which was approximately 5.7% (5,326 of 94,229, $p=0.05$). There was a significant difference in disposition as well; with a higher number of Hispanic patients discharged with no to minimal disability as compared to non-Hispanics, 61% and 58.5%, respectively. However, the Hispanic patient’s also saw a higher level of moderate to severe disability on discharge, 35.1% versus 38%. Also, more significantly, a higher rate of in hospital mortality of 3.9% versus 3.5%. In terms of comorbidities seen in the two groups, Hispanics had a higher rate of HTN, renal failure, and alcohol abuse than their non-Hispanic counterparts. They also had a significantly higher presence of diabetes, 40.4%, compared to the non-Hispanic rate of only 25.6%. After adjusting for age, gender, and other confounding risk factors, Hispanics were 30% more likely to suffer in-hospital mortality versus their non-Hispanic counterparts in border states [OR 1.3 (1.1–1.6) $p=0.009$], which was not apparent in the nonborder states [OR 1.0 (0.8–1.2) $p=0.9$].

DISCUSSION

Hispanic Americans are the largest and fastest growing minority population in the United States [9]. Approximately 16% of the US population is of Hispanic origin. Of these roughly 50 million people (52%) live in the four border states [9]. The Hispanic population’s risk factors for stroke have recently been reviewed in the latest AHA guidelines compared to other ethnic groups. Risk factors such as high prevalence of diabetes, hypertension, decreased physical activity, and lower socioeconomic status are abound in the Hispanic population and the importance of proper stroke management is even more essential as this population continuous to grow in number and in age [4,10].

It has also been shown that this population is at a higher risk. A study with the Brain Attack Surveillance in Corpus Christi Project (BASIC), which was a stroke surveillance project looking at the incidence of stroke among the Mexican–American and non-Hispanic white populations, confirmed that there was an increased stroke incidence among the Mexican–American population [11]. Aside from the risk factors mentioned earlier, access to affordable care also serves as a major barrier to achiev-
ing care. NHIS data from 2010 showed 87% of Whites had coverage versus less than 60% for Hispanics [11]. Our studies showed that there was a significant difference in hospital charges for Hispanic patients living in the border states compared to their non-Hispanic counterparts. On average a Hispanic patient’s hospital charges were $63,311 ± 20,223 versus a non-Hispanic White patients charges of approximately $55,175 ± 14,766. The cost-effectiveness of IV tPA has been well studied to be more efficient way of therapy if the patient does in fact present within the IV tPA window. One study showed that there was an approximate savings of $600 per patient treated with IV tPA compared to those without. It is estimated that only 2% of the more than 600,000 annual ischemic stroke patients are receiving IV tPA [20]. The potential for impactful cost savings is huge, with even a modest increase in IV tPA utilization from 2% to 5%, and using the $600 dollar savings per patient treated with IV tPA model, America could save $10.8 million annually. With the rapidly growing and aging Hispanic population in the United States, this potential for huge savings will only continue to increase.

There have been prior studies analyzing different methods of stroke intervention and the potential disparities in patient populations. In regards to mechanical thrombectomies, one study showed that nationwide the rates of thrombectomy treatments were higher for Whites (0.17%) compared to Hispanics and even more so for Blacks (0.13% and 0.7%, respectively) [12]. Another study performed in 2008 that looked at the rate of IV tPA among different ethnic groups did also show a significant discrepancy in rates of IV tPA given to Whites versus Hispanics and Blacks (49.5%, 46%, 42.3%, respectively) [13].

One of the possible explanations for the discrepancy in intervention among Hispanics is the way that Hispanics present with stroke symptoms and how long it takes for the provider to recognize the patient’s presentation as a stroke [14]. Numerous studies in the past have shown the unfortunate reality of healthcare provider implicit bias toward minority patients in terms of thrombolysis recommendations for Black and White patients with acute coronary syndrome [14]. There is also a perceived bias with patient ethnicity and whether or not patients will be compliant with therapy [15–18]. Now these studies have not mentioned whether or not there is a subsequent change in medical management coinciding with these biases but the mere fact that its presence is enough to cause concern for further studies. With the current political climate in regards to immigration in general, let alone the climate in the bordering states of Arizona and Texas, it is not farfetched to assume at least a partial element to the cause of this discrepancy in care among border Hispanics and nonborder Hispanics could be in part due to a provider bias.

Obviously, the four border states are going to have a higher population of Hispanic patients but that alone does not explain why there’s a difference in percentages of those that are being treated with thrombolytics. There are a wide variety of potential reasons why this discrepancy exists. Past studies have shown that the most accurate socioeconomic predictor of cardiovascular disease is education [21]. Unfortunately, there is a massive divide between the two populations, with 53.2% of Hispanics having an education level of at least a high school or greater compared with 90.1% of the rest of the country [22]. This along with the other factors of lower socioeconomic status such as a higher poverty rate and being uninsured explains the higher rates of morbidity and mortality commonly seen with lower socioeconomic status [23]. The lower education and barriers to access to healthcare (lack of a primary physician, minimal preventative medical care) are likely to be the most significant cause of detrimental effect on the lower use of IV tPA in these patients. Once the patient is outside of the IV tPA therapeutic window they no longer become eligible for that treatment and the complications of delayed treatment rapidly increase. One way of addressing this is to increase the number of facilities that are able to administer IV tPA, a very achievable objective with the main cost limitations being a computed tomography (CT) scanner and the cost of the IV tPA [24].

Further testing is required to determine which factors are responsible for the discrepancy in IV tPA treatment amongst the different patient populations as well as the difference in overall patient outcomes. In the mean time, the factors that are amendable, like proper medical education outreach, minimizing barriers to care, and lifestyle behavioral modifications should have continuous efforts made for improvement.

**LIMITATIONS OF STUDY**

Limitations of the study are its retrospective nature. The reporting in national database could not be accurate as race is self-reported, Time of onset of stroke and time of presentation to hospital was not available which can influence the thrombolysis rate administered by the provider. This could be due to lack of knowledge of stroke signs and symptoms that can differ among different social economic and ethnic groups.
Conclusion

There is a significant difference in IV tPA utilization between Hispanic and White patients in border states that lends to disparity in outcomes. The cause of this disparity is unknown and warrants further investigation.

REFERENCES


