

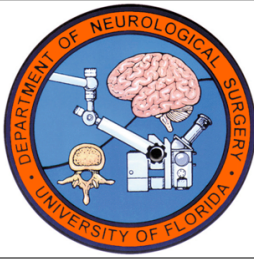


Race and Income Disparity in Ischemic Stroke Care: Nationwide Inpatient Sample Database, 2002-2008

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Introduction

Healthcare disparities exist between demographic groups with stroke. Individuals with lower median income, or of certain ethnicities may have limited access to care for acute stroke. Intravenous thrombolysis is a treatment option for acute ischemic stroke readily available with current guidelines recommending treatment up to 4.5 hours after stroke symptom onset. Given the narrow therapeutic window for thrombolytic therapy, timely transport to an appropriate medical facility is critical.

Factors that contribute to disparity in stroke treatment may include a lack of awareness of stroke symptoms and the necessity for emergent care, social limitations such as language barriers, inequality of income and lack of insurance. Certain minorities or low-income groups may arrive in a delayed fashion or lack access to high-volume hospitals, which we know achieve better outcomes in stroke.

Materials and Methods

We collected hospitalizations for ischemic stroke from 2002 to 2008 in the NIS database using ICD-9 codes for ischemic stroke. We studied independently the effect of race and income on: 1) treatment in a high stroke case-volume hospital and 2) treatment with IV thrombolysis.

The NIS database is the largest all-payer hospital inpatient database in the US and contains data approximating a 20% sample of US hospitals. Each hospital’s volume of stroke admissions was defined as “high-volume” if its stroke case volume met or exceeded the 67th percentile. Treatment with IV thrombolysis was determined by ICD-9 code 99.10. The NIS classifies median income into quartiles and is determined by the median household income of residents in the patient’s ZIP code. Race was classified as white, African-American, Hispanic, Asian/Pacific Islander, Native American or other.

Statistical Analysis

For the primary analysis, there were two outcome variables: IV thrombolysis and hospital volume, and two predictor variables: race and median income. Race and median income were studied independently to avoid confounding effects. Gender, age and comorbidity score were used as covariates.

Results

There were 477,474 patients with ischemic stroke: 10,781 (2.3%) received intravenous thrombolysis, and 380,400 (79.7%) were treated in high-volume hospitals. Race (p<0.0001) and median income (p<0.001) were significant predictors of receiving IV thrombolysis, with minorities and low-income patients less likely to receive IV thrombolysis. Median income was a predictor of access to high-volume hospitals (p<0.0001) with wealthier patients more likely to be treated in high-volume hospitals. High stroke volume hospitals had lower mortality (p=0.0002). Patients in high-volume hospitals were 1.84 times more likely to receive IV thrombolysis (p<0.0001).

Results

Odds of thrombolysis use by race when compared to white patients			
Race	Odds Ratio (OR)	95% Confidence Interval	P value
African-Americans	0.58	0.15 to 0.99	<0.001
Native Americans	0.59	0.10 to 0.909	0.017
Hispanics	0.76	0.68 to 0.905	0.002
Asians	0.96	0.71 to 1.23	0.775
Other	0.91	0.751 to 1.11	0.343

Odds of thrombolysis use by median income when compared to the poorest incomes			
Median Income Quartile	Odds Ratio (OR)	95% Confidence Interval	P value
High	1.55	1.37 to 1.76	<0.0001
Middle-High	1.40	1.23 to 1.64	<0.0001
Low-Middle	1.26	1.14 to 1.39	<0.0001

Odds of treatment at high stroke case-volume hospitals by race when compared to white patients			
Race	Odds Ratio (OR)	95% Confidence Interval	P value
Native Americans	0.73	0.65 to 0.83	<0.0001
African-Americans	1.00	1.70 to 1.85	<0.0001
Hispanics	1.32	1.09 to 1.17	<0.0001
Other	1.03	0.73 to 1.43	0.965
Asians	1.00	0.539 to 1.84	0.987

Odds of treatment at high stroke case-volume hospitals by median income when compared to the poorest incomes			
Median Income Quartile	Odds Ratio (OR)	95% Confidence Interval	P value
High	2.54	2.48 to 2.60	<0.0001
Middle-High	1.57	1.53 to 1.60	<0.0001
Low-Middle	1.00	1.00 to 1.15	<0.0001

Effect of Race on IV Thrombolysis:

Race was a highly significant predictor for receiving IV thrombolysis (p<0.0001). Relative to whites, the odds of IV thrombolysis for African-Americans was 0.58 (p<0.001), for Native Americans 0.59 (p=0.0166) and for Hispanics 0.76 (p=0.0020).

Effect of Income on IV thrombolysis:

Median income was a significant predictor of receiving IV thrombolysis (p<0.001). Compared to patients from the poorest ZIP codes, the odds of IV thrombolysis for patients from the wealthiest ZIP codes was 1.55 (p<0.0001)for middle to high 1.48 (p<0.0001) and for low to middle 1.26 (p<0.0001).

Effect of Race on Access to High Stroke Case-Volume Hospitals:

Relative to whites, Native Americans were less likely to be treated at a high-volume hospital (p<0.0001). African-Americans (p<0.0001) and Hispanics (p<0.0001) were more likely to be treated at a high-volume hospital.

Effect of Income on Access to High Stroke Case-Volume Hospitals:

Median income was a predictor of treatment at a high-volume hospital (p<0.0001). Relative to patients from the poorest ZIP codes, the odds of being treated in a high-volume hospital for those in the wealthiest ZIP codes was 2.54 (p<0.0001) 1.57 (p<0.0001) for middle to high income 1.08 (p<0.0001) for low to middle income.

Discussion

Prior studies have shown that thrombolysis rates are highest at academic medical centers and higher stroke treatment volume hospitals. In smaller studies it was found that thrombolysis rates were higher in white patients. Our study has shown that African-Americans, Hispanics, Native Americans, and low-income patients have decreased access to IV thrombolysis, and low-income patients also have decreased access to high stroke-volume hospitals.

Part of the disparity may be that some groups of minorities and the poor live in rural areas often remote from large medical centers. This is likely the case for Native Americans whose largest populations are located in the remote four-corners region of the southwest United States and rural Oklahoma. Remote location does not appear to be the only factor. Large populations of minorities and low-income patients live in urban centers close to major medical centers, yet our study found disparities in stroke treatment among minoroties and low-income patients across all hospital locations and types. Studies have shown that African-Americans are less likely to arrive within the 3 hour window for thrombolysis, and another study noted that minorties with stroke symptoms have longer ER waiting times. In the present study, African-Americans and Hispanics were more likely to be evaluated in high-volume hospitals where IV thrombolysis was more likely overall, but less likely to receive it than whites. Low-income patients were less likely to be treated in a high-volume hospital and receive thrombolysis. The lack of thrombolysis in these groups may be because they are presenting to hospitals in a delayed fashion.

Conclusions

Our data suggests that a disparity exists for certain minorities and low-income patients with ischemic stroke. Low-income patients lack access to high-volume hospitals, which are more likely to use IV thrombolysis, and associated with better outcomes. African-Americans and Hispanics are more likely to be seen at high-volume hospitals, though less likely to receive IV thrombolysis. Delayed arrival to appropriate medical facilities may be an important factor for minority and low-income patients, making them ineligible for thrombolysis. The delay in arrival may be due to poor recognition of stroke symptoms, the urgency in which they need to be evaluated, or lack of insurance and concern about the cost of care. This may be improved by educating these groups about stroke symptoms and the urgency that they need to seek care.

(References available upon request)