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Secondary prevention among uninsured stroke patients: A free clinic study

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Abstract

Objectives: Free clinics manage a diversity of diseases among the uninsured. We sought to assess the medical management of stroke in a population of uninsured patients.

Methods: A retrospective chart review was conducted to collect chronic disease statistics from 6558 electronic medical records and paper charts at nine free clinics in Tampa, Florida, from January 2016 to December 2017. Demographics and risk factors were compared between stroke patients and non-stroke patients. Medication rates for several comorbidities were also assessed.

Results: Two percent (107) of patients had been diagnosed with a stroke. Stroke patients were older (mean (M) = 56.0, standard deviation (SD) = 11.2) than the rest of the sample (M = 43.3, SD = 15.4), $p < 0.001$ and a majority were men (n = 62, 58%). Of the stroke patients with hypertension (n = 79), 81% (n = 64) were receiving anti-hypertensive medications. Of the stroke patients with diabetes (n = 43), 72% (n = 31) were receiving diabetes medications. Among all stroke patients, 44% were receiving aspirin therapy (n = 47). Similarly, 39% of all stroke patients (n = 42) were taking statins.

Conclusions: Uninsured patients with a history of stroke may not be receiving adequate secondary prevention highlighting the risk and vulnerability of uninsured patients. This finding identifies an area for improvement in secondary stroke prevention in free clinics.

Keywords

Uninsured, stroke, aspirin, disparities

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Introduction

Stroke is the 5th leading cause of death in the United States, and an estimated 80% of strokes are preventable.[1] Major modifiable risk factors for stroke include lack of exercise, poor diet, obesity, hypertension, hyperlipidemia, diabetes, alcohol use, and tobacco use.[1] Every year, approximately 700,000 Americans experience their first stroke and 200,000 have their second stroke.[2] Among patients who have more than one stroke, approximately 13% will experience their second stroke within 1 year of the initial stroke,[2] emphasizing the importance of medical management to prevent the risk of future strokes as well as behavioral modification of contributing risk factors such as diet, exercise, and smoking cessation.

As of 2016, there were approximately 28 million people in the United States without health insurance; however, there are only approximately 1200 free clinics in the United States.[3,4] Uninsured and low-income patients face increased disability and risk for complications after stroke compared with insured patients.[5] Uninsured patients and patients on Medicaid are less likely than privately insured patients to have risk factor management (primary prevention) before their first stroke.[5] Uninsured

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patients are more likely to present later to the hospital after onset of stroke and experience higher mortality in the hospital.[5] Being uninsured is associated with having an initial stroke at a younger age as compared with insured patients.[6] Despite suffering initial stroke at a younger age, these individuals experience higher levels of neurologic impairment, possibly due to delayed presentation and subsequent delay in treatment, as well as longer hospital stays when compared with their privately insured counterparts, which contribute to increased healthcare-related costs.[6] Uninsured patients are also less likely than their privately insured counterparts to utilize inpatient rehabilitation centers after stroke.[5] Low socioeconomic status is associated with higher mortality in the first year following a stroke.[7]

According to the American Heart Association and American Stroke Association, patients with a history of stroke need to be prescribed anti-thrombotic agents, lipid-lowering agents, and anti-diabetic medications if diabetic according to their modifiable risk factors.[1] For example, diabetic patients who have suffered a stroke require aggressive glycemic control. Each of these modifiable risk factors needs careful management to prevent future stroke, as well as patient encouragement to manage other lifestyle risk factors such as nutrition management and physical activity. Post-stroke patients who reported having any insurance were 31% more likely to adhere to medications prescribed at the time of hospital stay than uninsured patients.[8] In the same study, 83.6% of patients were prescribed anti-platelet therapy at hospital discharge, 77.3% were prescribed anti-hypertensive medication, 77.8% of patients were prescribed lipid-lowering agents, and 26.6% were prescribed diabetes medications.[8] The vast majority of these patients had some documented prescription insurance.[8] Lack of adequate adherence to secondary stroke preventive medications in the uninsured is comparable to the inadequate primary prevention in the uninsured.[5] Theoretically, poorer adherence and access to these medications could increase risk for future stroke in the uninsured.

Risk factor management can be especially challenging when access to healthcare is limited. Free clinics are usually utilized by uninsured, underserved populations. Many are racial and ethnic minorities, who face substantial barriers to attaining appropriate care such as lack of education, language differences, and cost.[9] Schroff et al.[10] reported that minorities, both insured and uninsured, may be less likely to receive necessary medical management with statins compared with Caucasians. The same study found that African Americans are less likely to be prescribed lipid-lowering drugs than Caucasians, and that low-income and uninsured individuals may also have decreased access to statins due to their high cost. Vulnerable subset populations (e.g. female sex and black race, or uninsured and black race) predicted an even lower rate of statin use compared to groups.[10] These socioeconomic barriers preclude appropriate secondary medical management for stroke in this population.

The purpose of this study was to describe and assess medical management of uninsured patients with a history of stroke and identify if there is a lack of adequate pharmacologic therapy for secondary stroke prevention in patients seen at free clinics. While data already exists to show that even the insured patient population fails to reach target values for blood pressure control and LDL-cholesterol,[11] our study aims to specifically highlight inadequate secondary prevention in the uninsured population. To our knowledge, this is the first study to specifically look at secondary stroke prevention in stroke patients seen in free clinics in the United States. We sought to identify specific areas for future intervention so that access to post-stroke care and risk factor management can be improved for this vulnerable population. The findings of this study may raise awareness about health disparities in free clinics to legislators and public health officials to potentially facilitate increased access to care and access to low-cost therapies for this population.

Method

Study sample and data collection

A retrospective chart review was conducted to collect chronic disease statistics from electronic medical records and paper charts from patients seen at nine free clinics in the Tampa Bay area in Florida. These free clinics manage primarily uninsured patients and are staffed by volunteer healthcare providers. All patients serviced between 1 January 2016 and 31 December 2017 were included for analysis. During the study period, 9127 patients were seen at nine free clinics; 2569 of these patients did not have any documented positive or negative history of stroke and were not included for further analysis. The data collection was performed by trained undergraduate and medical students from the University of South Florida and abstracted using REDCap, which is a web-based database that allows data capturing, data manipulation tracking, and export procedures to facilitate statistical analysis.[12] Patients with a history of ischemic stroke were included in the study sample. Although the specific stroke type was not always specified in the note, zero cases of hemorrhagic stroke were specifically documented. Most were documented as ischemic stroke and strokes that were not otherwise specified were assumed to be an ischemic stroke. Ischemic stroke is defined as brain ischemia secondary to embolism, thrombosis, or hypoperfusion.[13]

Patients with only a history of transient ischemic attack (TIA) were excluded from the study sample. In our sample, TIA was rarely documented. Though clinical management of TIA is similar to secondary stroke prevention, we excluded patients with TIA elicited in the history due to risk that this presentation may be confused with other syndromes, such as complex migraine, post-seizure paralysis, and syncope. Medication use and documented comorbidity data were also collected through chart review and entrance into REDCap. Comorbidities included in our study include diabetes and

Table 1. Demographics of the study sample including age, sex, race, employment status, smoking status, and alcohol consumption.

Characteristic	Total N	Non-stroke N (%)	Stroke N (%)	aOR (95% CI)[a]
Total	6558	6451	107	
Age				
Mean (SD)	43.3 (15.4)	43.1 (15.4)	56.0 (11.2)	
<45 years	3247	3233 (50.1%)	14 (13.1%)	Ref group
45–65 years	2965	2888 (44.8%)	77 (72.0%)	6.16 (3.59–11.37)
>65 years	346	330 (5.1%)	16 (15.0%)	11.20 (5.41–23.45)
Sex				
Female	3910	3865 (60.0%)	45 (42.1%)	Ref group
Male	2642	2580 (40.0%)	62 (57.9%)	2.01 (1.36–2.97)
Race/ethnicity				
White	1330	1291 (27%)	39 (42.9%)	Ref group
Black	622	611 (12.8%)	11 (12.1%)	0.87 (0.44–1.73)
Asian	148	145 (3.0%)	3 (3.3%)	0.51 (0.15–1.69)
Other race	46	46 (1.0%)	0 (0.0%)	–
Hispanic, all races	2725	2687 (56.2%)	38 (41.8%)	0.46 (0.29–0.73)
Employment/salary				
Employed	1939	1920 (54.5%)	19 (25%)	Ref group
Unemployed	1658	1601 (45.5%)	57 (75%)	2.87 (1.69–4.87)
Smoking status				
Never	3347	3305 (72.7%)	42 (50.6%)	Ref group
Past	501	484 (10.6%)	17 (20.5%)	1.94 (1.09–3.46)
Current	780	756 (16.6%)	24 (28.9%)	2.59 (1.55–4.32)
Alcohol consumption				
Never	2883	2837 (72.7%)	46 (63.9%)	Ref group
Past	154	151 (3.9%)	3 (4.2%)	1.17 (0.36–3.83)
Current	937	914 (23.4%)	23 (31.9%)	2.06 (1.23–3.46)

aOR: adjusted odds ratios; CI: confidence interval; SD: standard deviation.
[a]Age-adjusted odds ratios and 95% confidence intervals. Odds ratios associated with age categories are crude odds ratios.

hypertension because these conditions are major risk factors for vascular disease and also treatable with pharmacologic therapy.[14,15] Behavioral and demographic data were inconsistently documented possibly due to differences in clinic documentation protocols, thus resulting in missing data points in some categories. This project was approved by the University of South Florida Institutional Review Board and the IRB # is Pro00023920.

Statistical analysis

Patients' multiple visits were aggregated across the study period to capture a comprehensive medical history. Logistic regression was used to model stroke history as a function of each demographic or behavioral risk factor of interest after controlling for age (entered as a quadratic term); measures of association are thus presented as age-adjusted odds ratios (aOR). Missing risk factor values were excluded from the calculation of aOR and confidence intervals. Welch's t-test was used to test differences in mean age between study groups. Stroke patients with pertinent comorbidities were assessed to determine the proportion receiving appropriate medications. All participating clinics consented to the access of their data. All analyses were conducted with R version 3.6.3 software.[16]

Results

Of the 6558 patients included for analysis, 107 (1.6%) had a documented history of stroke and the remaining 6451 (98.4%) had a documented negative history of stroke. Stroke patients had a median time since diagnosis of 2 years (interquartile range = 1–5). Age differed significantly between stroke patients (mean (M) = 56.0, standard deviation (SD) = 11.2) and non-stroke patients (M = 43.1, SD = 15.4), $t(112.7) = 11.764$, $p < .001$. Men were more likely to have a history of stroke than women (aOR 2.01, 95% CI 1.36, 2.97) and patients with stroke were more likely to be unemployed than patients without a history of stroke (aOR 2.87, 95% CI 1.69, 4.87) (Table 1). Compared with non-Hispanic white patients, Hispanic patients were significantly less likely to have a history of stroke (aOR 0.46, 95% CI 0.29, 0.73). Non-Hispanic black and non-Hispanic Asian patients had lower, though non-significant, odds of having history of stroke compared with non-Hispanic white patients. Patients with stroke were significantly more likely to be current smokers

Table 2. Percentages of stroke patients receiving medications for their comorbid cardiovascular risk factors.

Chronic disease	N	Currently prescribed medication N (%)
Secondary stroke (aspirin)	107	47 (43.9%)
Secondary stroke (statin)	107	42 (39.3%)
Hypertension	79	64 (81.0%)
Diabetes mellitus	43	31 (72.1%)

(aOR 2.59, 95% CI 1.55, 4.32) or past smokers (aOR 1.94, 95% CI 1.09, 3.46) than patients without stroke. In addition, patients with stroke were significantly more likely to be current alcohol consumers (aOR 2.06, 95% CI 1.23, 3.46) than patients without stroke.

The number of patients receiving medication for comorbid disorders is included in Table 2. Approximately 44% (47/107) of the stroke patients had aspirin documented as a current medication in their chart. Of the 79 stroke patients with hypertension, 81.0% (64/79) were receiving any antihypertensive medication. Of 107 stroke patients, 39.3% (42/107) were receiving a statin. About 26.2% (28/107) of our stroke patients had their LDL level documented in the chart. Of those, the M (SD) of LDL was 105.4 (40.6) and 14.3% (4/28) had an LDL level $<$ 70 mg/dL. About 72% (31/43) of diabetics in our sample were receiving any antidiabetic medication.

Discussion

Our study reveals the following findings about stroke patients seeking care at free clinics in the Tampa Bay area: (1) pharmacologic secondary stroke prevention with aspirin and statins is underutilized, (2) diabetes and hypertension medications are inadequately prescribed, (3) stroke patients are more likely to be current alcohol and tobacco users, (4) stroke patients are more likely to be male, and (5) whites were more likely to have a stroke history than Hispanic individuals.

Patients from racial or ethnic minorities may face additional barriers to obtaining stroke-related care. Hispanic and African American patients in our study had lower stroke prevalence. This is inconsistent with the general population stroke data which show that African Americans are twice as likely to have a stroke compared with Caucasians.[17] However, there were 611 total African Americans above the age of 18 in our free clinic patient sample and only 11 had a documented stroke history. This small sample size may be related to an infrequent use of free clinics for a variety of reasons or patients with a stroke history may be lost to follow-up. It is also possible that minorities and the uninsured may have a higher chronic disease burden and had lengthy medical histories that may have not been completely elicited or difficult to clinically evaluate in short appointments.[18,19]

The patients with a history of stroke in our study were younger than the general population age of first stroke. Approximately 75% of strokes occur in people over the age of 65 in the general population,[20] but only 15% of our stroke patients were over 65 years of age. Increased risk factors for stroke, such as increased alcohol and tobacco use, offer a possible explanation for the younger age of first stroke in our sample, although this is not verifiable with our cross-sectional study design. This may also be due to the fact that older patients qualify for Medicare and thus fewer elderly people use our free clinics. Our stroke patients had lower employment rates than our non-stroke patients. Being of low income also has a higher association with obesity and increased use of tobacco and alcohol.[21] The stroke patients had a higher rate of smoking and alcohol use than our non-stroke patients.

Diabetes management requires strict adherence to medication, lifestyle regimen, and regular follow-up appointments are necessary. In the uninsured, many patients are lost to follow-up or cannot afford the necessary medication to adequately control their diabetes. Moreover, uninsured patients are less likely to have access to regular HgbA1c testing and diabetes education than those with commercial insurance or Medicaid.[22,23] Furthermore, uninsured patients are two times as likely to present with a diabetes-related emergency.[24] Our study found that a quarter of patients with a history of diabetes mellitus and stroke are not taking medication to control their diabetes, supporting previous research on diabetes in the uninsured and low-income.[10]

Those with diabetes are two times as likely to suffer a stroke independent of other risk factors and are more likely to suffer a stroke at a younger age than non-diabetics.[25] Since diabetes screening measures are not readily available to the uninsured, it is possible that some patients in our sample had undiagnosed diabetes. Therefore, diabetes control is paramount in reducing overall stroke risk, especially in those utilizing free clinics.

The majority (56%) of stroke patients in our study are not taking aspirin despite having a history of stroke. In addition, major modifiable risk factors in stroke patients are not adequately managed in the free clinic setting. Short-term initiation and long-term administration of aspirin decreases mortality and risk of recurrent ischemic stroke without increasing the risk of hemorrhagic stroke, regardless of unmodifiable patient characteristics such as sex and race.[26–28] Uninsured populations may face unique barriers that affect treatment success. Cost and pharmacological adherence are major obstacles that preclude standard secondary prevention.[29] This study highlights an important disparity and opportunity for intervention in the free clinic setting.

Hypertension is another major stroke risk factor. Seemingly small reductions in both systolic and diastolic blood pressure can attenuate stroke risk by over half.[25] However, the decreased rates of appropriate medical management in the uninsured also extends to hypertension management. Uninsured patients are less likely than

insured patients to take routine anti-hypertensive medication.[30] We found a similar correlation: 19% of the stroke patients with hypertension are not on any anti-hypertensive medication, increasing overall stroke risk. Similar to diabetes, there is a lack of education about hypertension in uninsured patients.[28]

Hyperlipidemia management guidelines have historically focused on achieving a certain LDL-C level based on various patient characteristics, and new importance is being placed on intensity of statin treatment.[31] Approximately 39% of stroke patients are receiving a statin of any intensity in our clinics. The majority of ischemic stroke patients should be on a statin and should be aiming for an LDL level of <70 mg/dL.[30] Achieving this LDL level has been found to decrease the risk of cardiovascular events when compared with those with an LDL >90 mg/dL.[14] Only approximately 26% of our stroke patients had their LDL level documented in the chart. Of those, only about 14% had an LDL level <70 mg/dL. Statin use has been associated with stroke risk reduction of 11%–40%.[25] More efforts should be undertaken to make statins more available for uninsured patients, and to follow their compliance with treatments. Patient education could be a helpful tool to increase compliance in this vulnerable population.

Uninsured patients are at increased risk for severe strokes and are also more likely to die from a stroke.[6,32] This disparity has been partially attributed to lack of awareness of cardiovascular risk factors and inability to seek primary care.[32] Patients of low socioeconomic status may also wait longer to pursue treatment, increasing the severity of stroke.[33] Our results align with the findings of these studies, as hypertension, diabetes, and hyperlipidemia are incompletely managed with lifestyle or pharmacologic interventions in our sample. It is essential that modifiable risk factors are treated so that morbidity can be minimized or prevented.

Limitations

Although they do not detract from our conclusions, our study has limitations that may be addressed by future studies. Data collection relied on accurate reporting by patients presenting to free clinics, comprehensive history taking, and accurate documentation by healthcare professionals. Demographic and behavioral risk factors were inconsistently reported, resulting in a large number of missing values. Our calculations of age-adjusted odds ratios utilize listwise deletion of missing values; the accuracy of these effect sizes relies upon the assumption that missing data points are missing completely at random. Given the amount of missing data and the small sample size of stroke patients, this study was underpowered to meaningfully detect and quantify risk factors associated with prescribed medications. Additional years of data collection and an increase in the number of participating clinics could help direct targeted efforts to increase rates of pharmacologic treatment in the secondary prevention of stroke.

In addition, our study is limited to management of cardiovascular risk factors for stroke and lacks analysis of prevention of complications that may occur post-stroke. Our study is not designed to compare secondary prevention in uninsured patients to the insured population and we recognize that insured Americans may also face many of the same challenges that our study population experiences with regard to secondary stroke prevention.

Some patients may have failed to disclose current medications or pertinent past medical history, considering the substantial language barrier that many patients face when receiving care at free clinics. These stroke diagnoses would therefore not have been included in our study sample if they were undocumented in the medical chart. We also recognize the possibility that some of the patients in our sample may have had some form of health insurance that was not documented in their chart. While this study included a robust overall sample size from nine free clinics in Tampa, our sample comprised a large proportion of Hispanic individuals (42%) and thus may not be generalizable to other ethnicities or to other regions. Our sample also had a relatively small proportion of African American stroke patients (11%), so our study is not powered to make statistically significant conclusions about treatment rates between racial or ethnic groups. In view of this, additional studies including uninsured populations from other areas will expand the generalizability of these findings and perhaps elucidate unique barriers experienced by people of other ethnic and racial backgrounds.

Conclusions

Secondary prevention may be improved among free clinic patients with a history of stroke. Uninsured individuals have a large burden of chronic disease, decreased access to preventive care, and may have financial barriers to obtaining medications for chronic disease management.[34] The lack of adequate medication rates in our sample, across a variety of cardiovascular risk factors, sheds light on an important area for improvement of access to healthcare in the uninsured. We also describe the demographic makeup of our study sample and highlight disparities, which can help increase awareness of the needs of this vulnerable population.

Patients seeking care at free clinics with a diagnosis of stroke may not be adequately medicated with aspirin, statins, anti-hypertensives, and anti-diabetic medications. The lack of success in risk factor management in these patients is likely multifactorial. Appropriate medical management of stroke risk factors is essential to prevent future strokes in this vulnerable population. In addition, patient education is crucial to increase medication compliance and to promote behavioral changes such as better diet, increased exercise, smoking cessation, weight, and adequate mental health treatment which can reduce stroke risk. This study bolsters awareness of the

medical vulnerability and lack of access to medical care in the uninsured patient population. We hope this study will lead to further studies in uninsured populations and create changes in health policy that will lead to more resources for these patients.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval for this study was obtained from the University of South Florida Institutional Review Board and the IRB # is Pro00023920.

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Informed consent

Informed consent was not sought for the present study because this was a retrospective study in which no patient identifiers were collected. Informed consent was waived by the IRB.

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