

# Patterns and Predictors of Depression Treatment among Stroke Survivors with Depression in Ambulatory Settings in the United States

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**Goal:** Despite the importance of treating depression, little is known regarding the current practice pattern of depression treatment among older adults with stroke and depression. We used national survey data from ambulatory settings to examine the depression treatment patterns and predictors among stroke survivors in the United States (US). **Materials and Methods:** We used a cross-sectional study design by pooling multiple-year data (2005-2011) from the National Ambulatory Medical Care Survey and the outpatient department of the National Hospital Ambulatory Medical Care Survey. Older adults (age  $\geq 50$  years) with stroke and depression constituted the final study sample. Depression treatment defined as antidepressant use with or without psychotherapy was the dependent variable in this study. All analyses adjusted for the complex survey design of the datasets to obtain nationally representative estimates. **Findings:** The overall depression treatment was observed in 47.32% of the study sample, mainly driven by antidepressant use alone. An overwhelming majority used selective serotonin reuptake inhibitors (77% of overall antidepressant use), and sertraline was the most prescribed antidepressant (30.5% of overall antidepressant use). Gender, race or ethnicity, region of residence, number of medications recorded at the sampled visit, and number of chronic conditions were significantly associated with depression treatment. **Conclusion:** According to this nationally representative sample, approximately 1 in 2 stroke survivors with depression received depression treatment in ambulatory care settings in the US. Appropriate interventions should be developed to optimize depression treatment. **Key Words:** Stroke—depression—older adults—ambulatory care settings—antidepressants—psychotherapy.  
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## Introduction

Stroke is a common cause of mortality and morbidity including cognitive and functional disability, and also leads to high financial burden (estimated to be \$33.6 billion per year) in the United States (US).<sup>1</sup> Stroke survivors often experience various physical and mental comorbidities, with depression being one of the most common psychiatric complications of stroke.<sup>2</sup> Prevalence of depression among stroke survivors varies depending on the population and methods used to tally, but epidemiological studies have shown depression to be prevalent among one third of stroke survivors.<sup>3</sup> Therefore, poststroke depression should be closely monitored among stroke survivors as it has a

significant impact on patients' quality of life.<sup>4</sup> The American Heart Association and American Stroke Association guidelines recommend treating patients with poststroke depression with antidepressant therapies.<sup>5</sup> Moreover, a randomized controlled trial of depressed stroke patients found that antidepressant therapy combined with psychotherapy reduced depression more than antidepressant therapy alone (Mitchell 2009). Despite recommendations from the American Heart Association and American Stroke Association for depression treatment among stroke survivors, to the best of our knowledge, there is no study examining the current practice patterns of depression treatment in this vulnerable population in the ambulatory care settings in the US. Such information would help improve understanding of depression treatment choices among stroke survivors, and help ensure optimal intervention and utilization of limited resources. Therefore, this study used national survey data to examine the patterns and predictors of depression treatment among older stroke survivors in the US.

## Materials and Methods

### *Study Design*

This is a cross-sectional study that pooled multiple-year data (2005-2011) from National Ambulatory Medical Care Survey (NAMCS) and the outpatient department (OPD) of the National Hospital Ambulatory Medical Care Survey (NHAMCS). The University of Arizona Institutional Review Board determined that this study does not require human subjects review.

### *Data Source*

NAMCS and NHAMCS provide nationally representative estimates regarding ambulatory medical care service utilization during visits to nonfederally employed, office-based physicians and outpatient departments of noninstitutional, general, and short-stay hospitals in the US.<sup>7</sup> The National Center for Health Statistics of the Centers for Disease Control and Prevention conducts NAMCS and NHAMCS data collection annually. These cross-sectional survey data provide weights, for each visit, which are used to obtain national-level estimates. Each physician-patient encounter or visit serves as the basic sampling unit for both NAMCS and NHAMCS data.

NAMCS uses a multistage probability design where the first probability sample is drawn from primary sampling units (PSUs) such as counties, groups of counties, county equivalents, or towns and townships within ambulatory care practice settings. In the next stage, probability sampling is conducted among practicing physicians in each of the PSUs. In the final stage, the patient visits within the yearly practices of sample

physicians are selected following a two-step process: (1) the complete physician sample is divided into 52 random subsamples of approximately equal size, and each of these subsamples is randomly assigned to the 1 week of the 52 weeks of the survey year, then (2) the physicians select a systematic random sample of visits during the assigned week. The NAMCS data collection form collects a wide range of information including patient characteristics, physician characteristics, physicians' diagnoses, prescribed pharmacotherapy, and the delivery of therapeutic services. A maximum of 3 diagnoses codes and 8 prescription medications could be recorded for each visit.

Data collection for NHAMCS is conducted in nonfederal and noninstitutional hospitals throughout the US. Again, to collect a nationally representative sample, a multistage probability sampling design is used to collect data from visits to outpatient and emergency departments of the hospitals.<sup>7</sup> The different stages of NHAMCS data collection include selection of probability samples of PSUs, hospitals from each PSU, some or all outpatient and emergency departments from hospitals, and patient visits within these departments. The final sampling stage of NHAMCS data collection is similar to the NAMCS process. The present study used only the OPD portion of the NHAMCS as the medical care provided in these settings is similar to the care provided in office-based, ambulatory care settings. The clinical nature of the OPD visits was collected using a data collection tool similar to NAMCS.

### *Study Population*

Older adults (age  $\geq 50$  years) with stroke and depression constituted the study sample. Ambulatory visits that involved stroke diagnosis were identified by using the International Classification of Diseases, Ninth Revision, Clinical Modification, of 430.xx-438.xx.<sup>8</sup> Depression was identified in visits where the patient answered "yes" to the question "Regardless of the diagnoses written... does the patient now have: depression?" Since 2005, this item has been added to identify 14 chronic conditions (including depression) to supplement chronic-disease-related ambulatory visits, and the robustness of using this variable is described elsewhere.<sup>9</sup>

### *Dependent Variable*

Depression treatment defined as antidepressant use with or without psychotherapy was the dependent variable for this study. Generic drug codes and Multum Lexicon codes were used to identify antidepressant use. To achieve appropriate relative standard error, we combined antidepressants into selective serotonin reuptake inhibitors (SSRIs) and other antidepressants. The variable

"PSYCHOTH" available in NAMCS and NHAMCS data was used to ascertain psychotherapy use.

### Independent Variables

Independent variables in this study were classified as (1) predisposing, (2) enabling, and (3) need factors based on the Anderson Behavioral Model.<sup>10</sup> Age, gender, race or ethnicity, geographical region, and metropolitan status constituted the predisposing factors. Health insurance status and physician or clinic specialty were the enabling factors. Reason for visit, total number of chronic conditions, and total number of medications used constituted the need factors.

### Statistical Analysis

Nationally representative descriptive statistics from this study were reported in terms of unweighted frequencies, weighted frequencies, and weighted percentages for the number of ambulatory care visits. Multivariate logistic regression analysis (adjusted for predisposing, enabling, and need factors) was conducted to ascertain the predictors of depression treatment. The complex survey design of NAMCS–NHAMCS was adjusted to obtain national-level data using SURVEY PROCEDURES (SURVEYFREQ and SURVEYLOGISTIC) in SAS version 9.4 (SAS Institute Inc., Cary, NC).

### Results

From 2005 to 2011, nearly 33.69 million ambulatory visits (national estimation) involved stroke diagnosis, out of which approximately 3.96 million visits (11.76%; 95% confidence interval [CI] 9.34%–14.17%) recorded a depression diagnosis that formed the final study sample.

Table 1 presents the individual-level characteristics of the study sample where majority of the visits were made by individuals who were aged 65 years and older (51.93%), female (63.35%), non-Hispanic white (80.26%), resided in metropolitan areas (89.10%), and had some form of government insurance (64.60%). In the study sample, the average total number of medications used and total number of chronic conditions was 5.28 (standard error .22) and 4.35 (standard error .13), respectively (data not presented in tabular form).

The overall depression was observed in less than half (47.32%; 95% CI 37.75%–56.88%) of the study sample. An overwhelming majority of the antidepressant use was driven by SSRIs use (77% of overall antidepressant use), and sertraline was the most prescribed individual antidepressant (30.5% of overall antidepressant prescription). Due to the very small sample size ( $n = 7$ ), national-level weighted percentage of psychotherapy was not estimated.

Table 2 summarizes findings from the multivariable logistic regression, which demonstrated that gender, race

**Table 1.** Demographic and clinical characteristics of adults with stroke and depression NAMCS–NHAMCS 2005–2011

Characteristics	Unweighted (N)	Wt. freq (millions)	Wt. %
Predisposing factors			
Age, years			
50–64	121	1.904	48.07
≥65	133	2.057	51.93
Gender			
Male	102	1.452	36.65
Female	152	2.509	63.35
Race/ethnicity			
White only, NH	188	3.179	80.26
Others	66	.782	19.74
Geographic region			
South	91	1.830	46.21
Others	163	2.131	53.79
Metro status			
Metro	237	3.529	89.10
Non-metro	17	.432	10.90
Enabling factors			
Insurance			
Govt insurance	173	2.559	64.60
Others	81	1.402	35.40
Physician/clinic specialty			
Others	187	2.853	72.03
Gen & Fam prac	67	1.108	27.97
Need factors			
Reason visit			
Chronic problem/routine	135	1.862	47.02
Others	119	2.099	52.98
Chronic diseases			
Arthritis	69	1.075	27.14
Cancer	30	.413	10.43
COPD	26	.593	14.98
Diabetes	67	.857	21.64
HYPLIPID	100	1.870	47.21
HTN	177	2.677	67.58
IHD	32	.583	14.72

Abbreviations: CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; Estab, established; Freq, frequency; Gen & Fam prac, general and family practice; Govt, government; HTN, hypertension; HYPLIPID, hyperlipidemia; IHD, ischemic heart disease; NAMCS, National Ambulatory Medical Care Survey; NH, non-Hispanic; NHAMCS, National Hospital Ambulatory Medical Care Survey; Wt, weighted.

Based on 254 (nationally representative weighted  $N = 3.96$  million visits) ambulatory visits of older adults (age ≥50 years) with stroke and depression using NAMCS and NHAMCS 2005–2011 data.

or ethnicity, geographic region, number of medications used, and total number of chronic conditions were significantly associated with depression treatment. For example, men were approximately 3 times more likely (odds ratio 2.772; 95% CI 1.127–6.819,  $P = .027$ ) than women to receive depression treatment.

**Table 2.** Predictors of depression treatment among older adults with stroke and depression NAMCS–NHAMCS 2005–2011

Characteristics	AOR	95% CI	Sig
<b>Predisposing factors</b>			
Age, years			
50–64	Ref		
≥65	1.360	[.566, 3.267]	.486
Gender*			
Female	Ref		
Male	2.772	[1.127, 6.819]	.027
Race/ethnicity*			
White only,	3.903	[1.631, 9.343]	.003
Non-Hispanic			
Other	Ref		
Geographic region*			
South	.219	[.077, .625]	.005
Other	Ref		
Metro			
Metro	Ref		
Non-metro	4.969	[.651, 37.903]	.120
<b>Enabling factors</b>			
Physician/clinical specialty			
Gen & Fam prac	Ref		
Others	1.252	[.427, 3.674]	.683
Insurance			
Govt—Medicare & Medicaid	Ref		
Others	2.276	[.988, 5.240]	.053
<b>Need factors</b>			
Reason visit			
Chronic	.824	[.341, 1.988]	.66
problem/routine			
No	Ref		
NUMMED*	1.456	[1.252, 1.692]	<.0001
TOTCHRON*	.699	[.494, .989]	.044

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; Gen & Fam prac, general and family practice; Govt, government; NAMCS, National Ambulatory Medical Care Survey; NH, non-Hispanic; NHAMCS, National Hospital Ambulatory Medical Care Survey; NUMMED, total number of medications; Physpec, physician specialty; Ref, reference group; Sig, significance; TOTCHRON, total number of chronic conditions.

Based on 254 (nationally representative weighted N = 3.96 million visits) ambulatory visits of older adults (age ≥50 years) with stroke and depression using NAMCS and NHAMCS 2005–2011 data.

\*Statistically significant at  $P < .05$ .

## Discussion

To the best of our knowledge, this is the first study to examine the US national-level patterns and predictors of depression treatment among stroke survivors with comorbid depression in ambulatory care settings. Findings from this study showed that less than half of older adults with stroke and depression received any form of depression treatment in such settings, which is unsurprising

as older adults are underdiagnosed and undertreated for depression regardless of stroke history. However, this is concerning as untreated depression among stroke survivors can lead to several negative outcomes. Another surprising finding was the extremely low use of psychotherapy in our study population ( $n = 7$ ) despite existing evidence that demonstrated the benefits of antidepressant use in combination with psychotherapy compared with antidepressant use alone among poststroke patients.<sup>6</sup> Therefore, access and coverage of psychotherapy in combination with antidepressant therapy should be promoted, along with prescriber education about the success of such approach.

Existing literature suggests that SSRIs have beneficial effects on dependence, disability, neurological deficit, mood, and anxiety among individuals recovering from stroke<sup>11</sup>; hence, our finding that majority of the antidepressant use was driven by SSRIs is not surprising. Among individual antidepressants, sertraline was observed to be the most prescribed in our study sample, which can be explained in light of the findings from an open-label study among stroke survivors with major depression that demonstrated continuous improvement of depressive symptoms as well as cognitive and functional performances with sertraline use.<sup>12</sup> Also, the currently available SSRIs differ somewhat significantly in their side effect profiles, in which sertraline has emerged as the preferred agent for older adults who are at higher risk of experiencing an adverse event from anticholinergic symptoms and QTc prolongation.<sup>13</sup> Thus, the antidepressant use pattern observed in the current study is consistent with available evidence in treating older stroke patients with depression.

According to our study findings, men are approximately 3 times more likely to receive depression treatment compared with women, which is inconsistent with the findings from general population that suggest women are two-and-half times more likely to receive antidepressants.<sup>14</sup> Thus, there may be a gender bias at play among older stroke patients with depression in the present study. Likewise, we observed a race or ethnic disparity in terms of depression treatment, where white patients were almost 4 times more likely to receive depression treatment compared with older stroke survivors in other race or ethnic categories. Similar findings have been reported for over 2 decades of research showing race or ethnic disparity in depression treatment, which has been attributed to insurance status, health literacy, differences in culture, attitudes of patients, and relationship between physicians and patients.<sup>15</sup> Additionally, our study findings indicate that stroke survivors with depression residing in the Southern US were less likely to receive depression treatment compared with those living in other regions, which is interesting and in contrary to the Dartmouth Atlas of Medicare Prescription Drug Use, which noted clustering of newer antidepressants use in the Southern region.<sup>16</sup>



Finally, our study findings indicate that an increase in number of chronic diseases is associated with lower likelihood of receiving depression treatment, which can be partially attributed to competing demands due to other comorbid conditions<sup>17</sup> and risk of drug interactions and polypharmacy.<sup>18</sup> However, benefits of treating depression in stroke patients should be weighed against the patient-specific risks to prevent complications from undertreatment.

The results from this study should be interpreted with caution per study limitations. Some of the limitations of this study are due to using a small unweighted sample ( $n = 254$ ), availability of only 3 diagnoses for each visit, unavailability of duration and severity of stroke and depression, unavailability of types of stroke, as well as patient and physician preferences. To attain appropriate relative standard error, we combined categories of different variables (e.g., insurance, region) to obtain reliable estimates. This study did not adjust for other conditions, such as pain, for which antidepressants might be prescribed. Finally, the latest available NHAMCS data is from 2011.

## Conclusion

Approximately 1 out of 2 stroke survivors with depression received some form of depression treatment in ambulatory settings in the US. SSRIs and specifically sertraline were the most prescribed antidepressant class and agent, respectively. Depression treatment was significantly influenced by gender, race or ethnicity, region of residence, number of medications used, and total number of chronic conditions. Appropriate interventions should be developed to optimize depression treatment.

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