A Comparison of Acute Ischemic Stroke Patients Discharged to Inpatient Rehabilitation vs a Skilled Nursing Facility: The Paul Coverdell National Acute Stroke Program

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Abstract

Objective: To compare the sociodemographic, clinical, and hospital related factors associated with discharge of acute ischemic stroke (AIS) survivors to inpatient rehabilitation (IRF) and skilled nursing facility (SNF) rehabilitation services.

Design: Retrospective descriptive study from the Paul Coverdell National Acute Stroke Program (PCNASP) participating hospitals during 2016 to 2019.

Setting: 9 Participating states from PCNASP in United States.

Participants: 130,988 patients with AIS from 569 hospitals (N=337,857).

Interventions: Not applicable.

Main Outcome Measure: Discharge to IRF and SNF.

Results: Patients discharged to a SNF had longer length of hospital stay, more comorbidities, and higher modified Rankin scores compared with patients discharged to an IRF. Nine characteristics were associated with being less likely to be discharged to an IRF than an SNF: older age (85+ years old, adjusted odds ratio [AOR]=0.20 [confidence interval [CI]=0.18–0.21]), identifying as non-Hispanic Black (AOR=0.85 [CI=0.81–0.89]), identifying as Hispanic (AOR=0.80 [CI=0.74–0.87]), having Medicaid or Medicare (AOR=0.73 [CI=0.70–0.77]), being able to ambulate with assistance from another person (AOR=0.93 [CI=0.89–0.97]), being unable to ambulate (AOR=0.73 [CI=0.62–0.87]) and having comorbidities, prior stroke (AOR=0.69 [CI=0.66–0.73]), diabetes (AOR=0.85 [CI=0.82–0.88]), and myocardial infraction or coronary artery disease

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(AOR=0.94 [CI=0.90–0.97]). Four characteristics were associated with being more likely to be discharged to an IRF than an SNF: being a man (AOR=1.20 [CI=1.16–1.24]), and having a slight disability (Rankin Score 2) (AOR=1.41 [CI=1.29–1.54]), being at larger hospitals (200–399 beds: AOR=1.31 [CI=1.23–1.40]; 400+ beds: AOR=1.29 [CI=1.20–1.38]), and being at a hospital with stroke unit (AOR=1.12 [CI=1.07–1.17]).

Conclusion: This study found differences in demographic, clinical, and hospital characteristics of AIS patients discharged for rehabilitation to an IRF vs SNF. The characteristics of patients receiving rehabilitation services may be helpful for researchers and hospitals making policies related to stroke discharge and practices that optimize patient outcomes. Populations experiencing inequities in access to rehabilitation services should be identified, and those who qualify for rehabilitation in IRF should receive this care in preference to rehabilitation in SNF.

Keywords

Acute; Ischemic stroke; Skilled nursing facilities; Stroke; Stroke rehabilitation

While most hospitalized acute stroke patients are discharged home after their hospital stay, those with significant deficits often receive additional rehabilitation.[1] Stroke patients may experience a range of physical impairments affecting mobility and balance, in addition to cognitive and psychological deficits affecting the ability to carry out activities of daily living.[2] Stroke is a leading cause of long-term disability in the United States, with approximately 795,000 people having a stroke each year.[3] American Heart Association and American Stroke Association guidelines recommend stroke survivors receive appropriate post-acute rehabilitative care to support the best functional recovery and independence, including receiving rehabilitation in an inpatient rehabilitation (IRF) or a skilled nursing facility (SNF).[4–6] The most intensive rehabilitation is provided in an IRF, while a skilled nursing facility primarily provides inpatient skilled nursing care and related services to patients who require medical, nursing, or subacute rehabilitative services but does not provide the level of care or treatment available in a hospital to support activities of daily living for patients who may not reach full recovery.[7,8] IRFs also provide more physician and nursing care than SNFs, resulting in higher costs.[9] Stroke survivors who receive care in an IRF are more likely to have improved functional outcomes than those in SNFs, even when controlling for baseline clinical differences and referral biases.[10] Comparative research related to stroke survivors discharge to rehabilitation services such as IRF vs SNF is limited.

Many individual and clinical factors may predict discharge disposition, including the type and severity of stroke, the patient's functional ability after a stroke and cognitive and psychological status at discharge as well as a patient's medical history, sociodemographic characteristics, and insurance status.[11–16] Hospital-related factors may also affect discharge disposition and include Medicare insurance status, availability of rehabilitation services, and hospital characteristics such as number of beds and teaching hospital status.[8,11] The Paul Coverdell National Acute Stroke Program (PCNASP), which captures data on stroke patients across the continuum of care, began collecting discharge data during the 2015–2020 funding cycle.[17,18] In this study, we examine the sociodemographic, clinical, and hospital-related factors associated with discharge of acute ischemic stroke (AIS) survivors to IRF vs SNF rehabilitation services.

Methods

The PCNASP is an ongoing, voluntary acute stroke quality improvement program funded by the Centers of Disease Control and Prevention (CDC).[17,18] Deidentified data on stroke patients from participating hospitals was collected across 9 states: California, Georgia, Massachusetts, Michigan, Minnesota, New York, Ohio, Wisconsin, and Washington. This study focused on patients hospitalized with a clinical diagnosis of AIS and discharged to rehabilitation facilities (an IRF or SNF) during 2016 to 2019.

Patients who had a stroke while admitted to the hospital were excluded (ie, in-hospital stroke). For this study, individual characteristics of patients included age, sex, race or ethnicity, and insurance type. Clinical characteristics included National Institute of Health Stroke Scale (NIHSS), modified Rankin score, ambulatory status at discharge, history of comorbidities, and length of stay. Hospital characteristics included number of beds, presence of a stroke unit, and whether the site was a teaching hospital. Outcome variable was discharge to IRF vs SNF.

Statistical analysis

We used Chi-square tests among categorical variables and Wilcoxon-Mann-Whitney rank tests among continuous variables to describe the sample. We used multivariate adjusted generalized estimating equation (GEE) to account for the clustering of patients within the hospitals included in the PCNASP when testing for the association between outcome (discharge to IRF vs SNF) and individual, clinical, and hospital characteristics. For the GEE analysis, we adjusted for age, sex, race or ethnicity, insurance, NIHSS score, modified Ranking score, ambulatory status at discharge, medical history of stroke, diabetes, myocardial infarction or coronary artery disease, dyslipidemia, hypertension, smoking, hospital bed size, stroke unit, and teaching hospital status and obtained adjusted odds ratio (AOR) along with 95% confidence intervals (CIs). All P values were two-sided with <0.05 being considered statistically significant. We performed all analyses using SAS, version 9.4 (SAS Institute, Cary, NC, USA).

Results

In this sample of 337,857 AIS patients discharged from 569 PCNASP hospitals, 130,988 patients with AIS were discharged to an IRF (68,189; 52.1%) or SNF (62,799; 47.9%). Table 1 presents the demographic characteristics of the patients discharged to IRF and SNF facilities. Compared with patients discharged to an IRF, a higher percentage of patients discharged to SNF had longer length of hospital stay (mean [SE], 6.2 days [5.5] vs 7.8 days [8.2]) and had more comorbidities (P<.0001). A higher percentage of patients discharged to SNF had higher modified Rankin scores, (Score 5–severe disability, bedridden) in comparison with those discharged to IRF (22.7% vs 9.8%), while a higher percentage of patients who could ambulate independently were discharged to IRF (25.1%) compared with SNF (19.8%).

The GEE adjusted analyses showed that age was significantly associated with being discharged to IRFs vs SNFs. The oldest age group, 85+ year old, were least likely to be

discharged to an IRF (AOR=0.20 [CI=0.18–0.21]), and age 55 years and older were less likely to be discharged to IRF than age 18–54 years (table 2). Men were more likely to be discharged to IRFs (AOR=1.20 [CI=1.16–1.24]) than to SNFs. When compared with non-Hispanic White patients, non-Hispanic Black patients (AOR=0.85 [CI=0.81–0.89]) and Hispanic patients (AOR=0.80 [CI=0.74–0.87]) were less likely to be discharged to IRFs than to SNFs. Patients with Medicaid or Medicare (AOR=0.73 [CI=0.70–0.77]) were less likely to be discharged to IRFs than to SNFs than patients with private insurance. Those with an NIHSS score higher than 4 were less likely to be discharged to IRFs than those with a NIHSS score of 0–4. Compared with patients with no disability, patients with a slight disability (Rankin Score 2) (AOR=1.41 [CI=1.29–1.54]) were more likely to be discharged to an IRF than to an SNF followed by patients with moderate to severe disability (Rankin Score 3–4) (AOR=1.34 [CI=1.24–1.45]). Patients who were able to ambulate with assistance from another person (AOR=0.93 [CI=0.89–0.97]) and those unable to ambulate (AOR=0.73 [CI=0.62–0.87]) were less likely to be discharged to an IRF than patients who were able to ambulate independently. Patients with comorbidities such as prior stroke (AOR=0.69 [CI=0.66–0.73]), diabetes (AOR=0.85 [CI=0.82–0.88]), and myocardial infarction or coronary artery disease (AOR=0.94 [CI=0.90–0.97]) were less likely to be discharged to an IRF compared with those who did not have comorbidities. Patients with dyslipidemia (AOR=1.06 [CI=1.02–1.11]) were more likely to be discharged to an IRF. Patients at larger hospitals (200–399 beds: AOR=1.31 [CI=1.23–1.40]; 400+ beds: AOR=1.29 [CI=1.20–1.38]) or hospitals with stroke unit (AOR=1.12 [CI=1.07–1.17]) were more likely to be discharged to an IRF than to an SNF.

Discussion

Our findings reveal significant differences in patient characteristics between those discharged to an IRF and those discharged to an SNF and show that differences in discharge are likely multifactorial. Older patients, Black and Hispanic patients, patients with higher NIHSS scores, those with moderate to severe disability, those unable to ambulate and who ambulate with assistance, those who had comorbidities, and those with Medicare were less likely to be discharged to IRFs than to SNFs. We also found that larger hospitals and those with stroke units were more likely to discharge patients to IRFs than to SNFs.

Similar to previous studies, we identified individual and clinical factors associated with discharge to IRFs or SNFs: those who are racial or ethnic minorities, older age groups, and those with public insurance were less likely to be discharged to an IRF than Whites, those in younger age groups, or those with private insurance.[8,9,19–21] In a study exploring Medicare beneficiaries discharged to IRF or SNF, researchers found that a higher proportion of women and older age groups were discharged to SNFs than to IRFs and had a longer length of stay.[10] Patient characteristics, including presence of comorbidities, especially for older patients, may make it hard for them to participate in intensive rehabilitation activities.[11,22,23] Features of IRF and SNF such as level of care may also influence the discharge disposition of stroke patients.[7–9] Because each of these rehabilitation settings differ by the duration of expected rehabilitation per day, in addition to the intensity and type of interventions delivered, and also the degree of involvement of medical, nursing or the multidisciplinary team, the clinical and demographic characteristics of the stroke

patients may play a stronger role in discharge disposition. The most intensive rehabilitation is provided in an IRF, where patients receive therapy for at least 3 hours, for 5 days a week.[7–9] Patients with fewer comorbidities, less severe stroke, or related disabilities are thus more likely to be discharged to an IRF than to an SNF, to improve their chances of independent return to the community.[10,24,25] Thus, the patient's potential to benefit from rehabilitation and ability to withstand the intensive rehabilitation services may influence discharge planning decisions.[25] Similarly, older patients with more comorbidities, or higher NIHSS score and those who need assistance ambulating are less likely to be discharged to IRFs.[6,10] It may be that differences in discharge to an IRF seen in those who are older are due to more comorbidities in the older age group as it may be hard for them to participate in rehabilitation activities and need to rely on systematic management at the SNFs.[11,22] The findings of our study also support this trend.

Insurance barriers may also play a role in discharge decisions.[26,27] Our findings are consistent with previous findings regarding insurance status. Patients with Medicaid or Medicare and those without documented insurance were less likely to be discharged to IRFs than to an SNF as compared with those with private insurance. Medicare provides insurance coverage for up to 100 days in an SNF, and as a result, insurance type may influence discharge decisions. This may be particularly for patients requiring longer duration of care or who have more severe stroke with comorbidities as research shows higher costs for patients discharged to IRFs than for those discharged to SNFs.[9,11,28,29] The PCNASP registry does not capture information from the hospitals as to the reason for discharge to IRF or SNF based on the insurance status. However, these differences may be important and this limitation triggers future research questions that should explore the differences in characteristics of patients who have Medicaid or Medicare discharged to SNFs vs those patients that do not have Medicaid or Medicare and are discharged to IRFs.

Hospital-level factors may also influence discharge to an IRF or SNF.[15] Previous studies have found that hospitals with characteristics such as the presence of a stroke unit or a greater number of beds were more likely to discharge patients to IRFs than to SNFs.[20] We corroborated these findings in our study. Larger hospitals with stroke units may have more stroke experience, established stroke protocols, and partnerships that support discharge of AIS patients to IRFs in comparison to SNFs.[19] Future research should explore the infrastructure of hospitals with stroke units including medical personnel, rehabilitation specialists, hospital size, and association with increasing referrals to IRFs.

Study limitations

This study has 3 limitations. First, although the study was derived from one of the nation's largest stroke registries, findings may not be generalizable as participation of the hospitals in PCNASP is voluntary and does not cover all parts of the country or all AIS patients within a state. Selection bias may exist as hospitals may participate for part of the study time and may not submit data to PCNASP consistently across all years. Second, although this study showed that 43.1% of patients were discharged to rehabilitation, it is unknown whether validated decision tools were used to select the most appropriate level of care at discharge for patients in this sample. Third, other than insurance status, little is known about social

determinants or patient preferences that may have contributed to discharge to rehabilitation in this sample.

Conclusions

This study found differences in demographic, clinical, insurance status, and hospital characteristics of AIS patients discharged for rehabilitation to IRF vs SNF. In addition, older patients, Black and Hispanic patients, those with higher NIHSS scores and disability, those unable to ambulate, those who had comorbidities, and those with Medicare were less likely to be discharged to IRFs than to SNFs. Larger hospitals and hospitals with a stroke unit were more likely to discharge AIS patients to an IRF than to an SNF. The current funding cycle of PCNASP supports the implementation of comprehensive stroke systems of care in states with populations, that are disproportionately affected by stroke hospitalizations and mortality and those at highest risk for stroke events as indicated by state-level data. The findings from this study suggest that identifying characteristics of patients receiving rehabilitation services in IRFs and SNFs may be a helpful start to considering equity in patient care and optimizing outcomes. Evidence from previous studies consistently suggests that stroke patients who qualify for rehabilitation in an IRF should receive this care in preference to rehabilitation in an SNF for improved functional outcomes.[6,10] The Million Hearts 2027 initiative aims to advance health equity through specific policies, processes, and practices that provide fair access to resources.[30] It has a deliberate emphasis on certain populations, including those with lower income and people from racial or ethnic minority groups. Findings of this study may be helpful in identifying specific populations experiencing inequities and supporting policies and programs such as Million Hearts initiative to ensure equity in rehabilitation services and the best stroke outcomes possible.

List of abbreviations:

AIS	acute ischemic stroke
AOR	adjusted odds ratio
CI	confidence interval
GEE	generalized estimating equation
IRF	inpatient rehabilitation
NIHSS	National Institute of Health Stroke Scale
PCNASP	Paul Coverdell National Acute Stroke Program
SNF	skilled nursing facility

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Table 1

Hospital characteristics, and patient characteristics of Acute Ischemic Stroke survivors discharged to rehabilitation in IRF or SNF, PCNASP 2016–2019 (N=130,988)

Characteristics	Total	IRF	SNF	P Value[*]
Total	130,988 (100)	68,189 (52.1)	62,799 (47.9)	
Age (y)				
Median	75	71	79	<.0001
Range (IQR)	65–84	61–81	69–87	
Mean (SE)	73.7 (13.4)	70.2 (13.5)	77.5 (12.2)	
Age group (y)				
18–54	11,398 (8.7)	8582 (12.6)	2816 (4.5)	<.0001
55–64	20,546 (15.7)	13,513 (19.8)	7033 (11.2)	<.0001
65–74	31,384 (24)	18,130 (26.6)	13,254 (21.1)	<.0001
75–84	36,176 (27.6)	17,415 (25.5)	18,761 (29.9)	<.0001
85+	31,484 (24)	10,549 (15.5)	20,935 (33.3)	<.0001
Sex				
Men	62,415 (47.6)	35,643 (52.3)	26,772 (42.6)	<.0001
Women	68,573 (52.4)	32,546 (47.7)	36,027 (57.4)	
Race				
Non-Hispanic White	92,427 (70.6)	47,174 (69.2)	45,253 (72.1)	<.0001
Non-Hispanic Black	23,711 (18.1)	13,103 (19.2)	10,608 (16.9)	<.0001
Hispanic	5065 (3.9)	2523 (3.7)	2542 (4)	0.0011
Other race	9785 (7.5)	5389 (7.9)	4396 (7)	<.0001
Insurance				
Medicaid/Medicare	105,162 (80.3)	51,287 (75.2)	53,875 (85.8)	<.0001
Private insurance	22,053 (16.8)	14,765 (21.7)	7288 (11.6)	<.0001
No insurance/self-pay	2088 (1.6)	1472 (2.2)	616 (1)	<.0001
Not documented	1685 (1.3)	665 (1)	1020 (1.6)	<.0001
NIHSS score				
N	120,634	64,356	56,278	
Median	5	5	6	<.0001

Characteristics	Total	IRF	SNF	P Value[*]
Range (IQR)	2–11	2–10	2–12	
Mean (SE)	7.6 (7)	7.1 (6.6)	8.2 (7.5)	
NIHSS in groups				
Missing	10,354 (7.9)	3833 (5.6)	6521 (10.4)	
0–4	53,337 (40.7)	29,568 (43.4)	23,769 (37.8)	<.0001
5–24	63,429 (48.4)	33,284 (48.8)	30,145 (48)	0.0034
25	3868 (3)	1504 (2.2)	2364 (3.8)	<.0001
Modified Rankin Score				
Missing	358 (0.4)	205 (0.4)	153 (0.4)	
No symptoms	1384 (1.6)	650 (1.4)	734 (1.9)	0.0001
no significant disability despite symptoms	3194 (3.8)	1794 (3.9)	1400 (3.6)	<.0001
slight disability	5809 (6.9)	3634 (7.9)	2175 (5.6)	<.0001
3 - moderate disability, can walk without assistance	14,311 (16.9)	8754 (19.1)	5557 (14.4)	<.0001
4 - moderate to severe disability, needs assistance to walk	46,113 (54.6)	26,228 (57.3)	19,885 (51.4)	<.0001
5 - severe disability, bedridden	13,281 (15.7)	4500 (9.8)	8781 (22.7)	<.0001
Ambulatory status at discharge				
Missing	8370 (6.4)	3837 (5.6)	4533 (7.2)	
Able to ambulate independently	29,585 (22.6)	17,124 (25.1)	12,461 (19.8)	<.0001
With assistance from another person	70,766 (54)	39,593 (58.1)	31,173 (49.6)	<.0001
Unable to ambulate	22,267 (17)	7635 (11.2)	14,632 (23.3)	<.0001
Medical history				
Stroke	39,244 (30)	18,061 (26.5)	21,183 (33.7)	<.0001
Diabetes	49,018 (37.4)	25,086 (36.8)	23,932 (38.1)	<.0001
MI/CAD	32,005 (24.4)	15,488 (22.7)	16,517 (26.3)	<.0001
Dyslipidemia	68,324 (52.2)	34,767 (51)	33,557 (53.4)	<.0001
Hypertension	104,713 (79.9)	53,345 (78.2)	51,368 (81.8)	<.0001
Smoking	21,363 (16.3)	13,198 (19.4)	8165 (13)	<.0001
Length of stay (days)				
Median	5	5	5	<.0001
Range (IQR)	3–8	3–7	3–9	
Mean (SE)	6.9 (7)	6.2 (5.5)	(8.2)	

Characteristics	Total	IRF	SNF	P Value*
Hospital bed size				
Missing	10,185 (7.8)	3865 (5.7)	6320 (10.1)	
<200	15,408 (11.8)	6870 (10.1)	8538 (13.6)	<.0001
200–399	36,444 (27.8)	19,092 (28)	17,352 (27.6)	<.0001
400+	68,951 (52.6)	38,362 (56.3)	30,589 (48.7)	<.0001
Stroke unit				
Missing	9583 (7.3)	3551 (5.2)	6032 (9.6)	
Yes	68,613 (52.4)	38,039 (55.8)	30,574 (48.7)	<.0001
No	52,792 (40.3)	26,599 (39)	26,193 (41.7)	
Teaching hospital				
Missing	9583 (7.3)	3551 (5.2)	6032 (9.6)	
Yes	80,460 (61.4)	43,805 (64.2)	36,655 (58.4)	<.0001
No	40,945 (31.3)	20,833 (30.6)	20,112 (32)	

Abbreviations: IQR, interquartile range; MI/CAD, myocardial infarction or coronary artery disease.

*
*P*value, obtained from Chi-Square or Wilcoxon significance testing, measures association between demographic, patient & hospital characteristics, and rehab types (IRF and SNF).

Table 2

Association between select characteristics and discharge to IRF among patients who had acute ischemic stroke, PCNASP 2016–2019

Ischemic Stroke IRF		
Characteristics	**OR (95% CI)**	**AOR (95% CI)**[*]
Age (y)		
18–54	Reference	Reference
55–64	0.63 (0.60–0.66)	0.67 (0.62–0.72)
65–74	0.45 (0.43–0.47)	0.52 (0.49–0.56)
75–84	0.37 (0.28–0.47)	0.36 (0.33–0.39)
85	0.30 (0.21–0.42)	0.20 (0.18–0.21)
Sex		
Men	1.43 (1.24–1.65)	1.20 (1.16–1.24)
Women	Reference	Reference
Race		
Non-Hispanic White	Reference	Reference
Non-Hispanic Black	1.05 (0.96–1.15)	0.85 (0.81–0.89)
Hispanic	0.84 (0.76–0.94)	0.80 (0.74–0.87)
Other	1.04 (0.95–1.14)	1.13 (1.06–1.20)
Insurance		
Private insurance	Reference	Reference
Medicaid/Medicare	0.48 (0.42–0.55)	0.73 (0.70–0.77)
No insurance/self-pay	1.10 (0.95–1.27)	0.94 (0.83–1.07)
Others	0.30 (0.26–0.35)	0.97 (0.65–1.47)
NIHSS Score		
0–4	Reference	Reference
5–24	0.86 (0.83–0.91)	0.96 (0.93–0.99)
25+	0.52 (0.48–0.55)	0.73 (0.67–0.81)
Modified Rankin Score		
Modified Rankin Score 0–1	Reference	Reference
Modified Rankin Score 2	1.46 (1.35–1.58)	1.41 (1.29–1.54)
Modified Rankin Score 3–4	1.20 (1.13–1.28)	1.34 (1.24–1.45)
Modified Rankin Score 5	0.45 (0.42–0.48)	0.66 (0.54–0.82)
Ambulatory status at discharge		
Able to ambulate independently	Reference	Reference
With assistance from another person	0.94 (0.91–0.98)	0.93 (0.89–0.97)
Unable to ambulate	0.38 (0.36–0.39)	0.73 (0.62–0.87)
Medical history		
Prior stroke		
Yes	0.93 (0.80–1.08)	0.69 (0.66–0.73)
No	Reference	Reference
Prior diabetes		

Ischemic Stroke IRF		
Characteristics	**OR (95% CI)**	**AOR (95% CI)**[*]
Yes	0.86 (0.80–0.92)	0.85 (0.82–0.88)
No	Reference	Reference
Prior MI/CAD		
Yes	0.94 (0.79–1.11)	0.94 (0.90–0.97)
No	Reference	Reference
Prior dyslipidemia		
Yes	0.95 (0.86–1.04)	1.06 (1.02–1.11)
No	Reference	Reference
Prior hypertension		
Yes	0.77 (0.72–0.82)	0.99 (0.94–1.05)
No	Reference	Reference
Prior smoking		
Yes	1.42 (1.29–1.57)	0.96 (0.92–1)
No	Reference	Reference
Hospital bed size		
<200	Reference	Reference
200–399	1.37 (1.32–1.42)	1.31 (1.23–1.40)
400+	1.61 (1.55–1.67)	1.29 (1.20–1.38)
Stroke unit		
Yes	1.28 (1.24–1.31)	1.12 (1.07–1.17)
No	Reference	Reference
Teaching hospital		
Yes	0.98 (0.91–1.05)	1.02 (0.97–1.08)
No	Reference	Reference

Abbreviations: OR, odds ratio; MI/CAD, myocardial infarction or coronary artery disease.

[*] Adjusted for age, sex, race and ethnicity, insurance, NIHSS score, Modified Rank Score, ambulatory status at discharge, medical history of stroke, diabetes, MI/CAD, dyslipidemia, hypertension, smoking, hospital bed size, stroke unit, teaching hospital variables in the GEE model.