Ambulatory Treatment Gaps in Patients with Ischemic Stroke or Transient Ischemic Attack

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Abstract

Background: This study evaluated goal attainment for patients with a history of noncardioembolic ischemic stroke (NCIS) or transient ischemic attack (TIA).

Methods: A cross-sectional study was conducted in patients aged 18 to 85 years with a history of validated NCIS or TIA. Data collected were demographics, comorbidities, blood pressure (BP), low-density lipoprotein cholesterol (LDL-C) values, and medications within 365 days and most proximal to December 31, 2010. Goal LDL-C and BP were defined as < 100 mg/dL and < 140/90 mm Hg, respectively. Differences in sex and age (< 65 vs ≥ 65 years) were evaluated.

Results: There were 1731 patients evaluated (mean age: 73.6 years; 58% women). Stroke type was NCIS in 51.9% and TIA in 48.1%. The LDL-C and BP were measured in 75.4% and 50.3% of patients, respectively. No difference in LDL-C screening rates existed for sex or age. Men and patients younger than age 65 years were significantly more likely to have BP measured. Overall, LDL-C and BP goals were attained by 48.9% and 43.3% of patients, respectively. Men and patients age 65 years or older were likelier than women and patients younger than age 65 years to attain LDL-C goals ($p < 0.01$). Men were also likelier than women to attain BP < 140/90 mm Hg ($p < 0.01$), but more patients younger than age 65 years vs older than age 65 years attained this goal ($p < 0.01$). Statins and antihypertensives were received by 51.9% and 46.9% of the patients, respectively.

Conclusion: Although attaining guideline-recommended goals for LDL-C and BP may present challenges, future research should focus on innovative methods to help patients attain optimal treatment goals.

Introduction

After acute treatment of ischemic stroke, secondary prevention efforts focus on control of modifiable risk factors.[1-3] National treatment guidelines for secondary stroke prevention recommend long-term use of evidence-based medications, including antiplatelets, hydroxy-3-methylglutaryl coenzyme A reductase inhibitors ("statins"), and antihypertensives.[1-3] Goals have been established for low-density lipoprotein cholesterol (LDL-C) and blood pressure (BP).[1-3] To help ensure that evidence-based care is applied to patients admitted to the hospital with acute stroke, quality-improvement initiatives aimed at hospital teams have been developed.[4-6] Although such initiatives improve use of evidence-based care at discharge, long-term persistence of interventions may decrease with time.[7-9] Limited data exist evaluating treatment patterns of ambulatory care patients with prior stroke or transient ischemic attack (TIA).

Few studies were identified evaluating the extent to which evidence-based practice guidelines are implemented for ambulatory care patients with a history of ischemic stroke in real-world clinical practice. Available studies in non-US populations indicate that application of evidence-based treatments and attainment of BP and/or LDL-C goals is suboptimal.[8-15] The aim of this study was to assess the extent to which patients with a history of noncardioembolic ischemic stroke (NCIS) or suspected TIA were treated according to clinical practice guidelines and to identify factors associated with attaining treatment goals.

Methods

This was a cross-sectional, data-only study of patients with a history of validated NCIS or suspected TIA. The study was conducted at Kaiser Permanente Colorado (KPCO), an integrated health care delivery system providing services to more than 500,000 members at 24 medical offices in the Denver-Boulder metropolitan area. Clinicians use an electronic medical record in which all office visit, vital sign, laboratory, and pharmacy data are housed. Most KPCO members receive prescription medications from KPCO pharmacies for a copayment. The study was approved by the KPCO institutional review board with a waiver of informed consent.

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Patient Population

Patients between age 18 and 85 years who were active KPCO members for at least 6 months before the index date were included. Patients had to have either a validated NCIS or TIA between January 1, 2001, and December, 31, 2009. Patients age 18 years or older with at least 1 inpatient stay or outpatient medical office visit with an International Classification of Diseases, Ninth Revision (ICD-9) diagnostic code between 430.xx and 438. xx and/or status code V12.54 (Personal History of Stroke) in the primary or secondary position recorded between January 1, 2001, and December 31, 2009, were identified administratively from inpatient hospital claims and outpatient visit records. All of a patient's cerebrovascular codes identified in the administrative data during the study period were captured; thus, a patient could have had more than 1 code category assigned in the inpatient and/or outpatient settings.

Strokes were validated by manual chart review using standardized chart abstraction tools performed by trained clinical pharmacy specialists who were blinded to administrative ICD-9 codes. Information from each eligible patient's electronic medical record was considered the standard for determination of a confirmed stroke or suspected TIA. The chart abstraction tool was used to identify patients with a confirmed incident or prevalent stroke or TIA (cerebral event), to identify the event date, and, if a confirmed stroke, to classify the stroke type (ischemic, hemorrhagic, or unknown). Confirmed stroke required sufficient clinical and/or radiologic evidence of diagnosis such as focal neurologic symptoms and/or a computed tomography scan or magnetic resonance imaging verifying ischemia, infarct, or hemorrhage. Recognizing the difficulty in objectively diagnosing TIA, we defined a confirmed TIA as a coded diagnosis with written confirmation by a physician or physicians' inhospital progress/discharge notes or medical office notes. Intracerebral and subarachnoid bleeding were classified as hemorrhagic strokes. When chart review revealed clinical evidence of stroke, but insufficient clinical or radiologic evidence was available to establish the stroke type, the stroke was classified as "unknown."

Patients with hemorrhagic (intracerebral or subarachnoid), cardioembolic, or unknown stroke types were excluded from the study.

Data Collection

Administrative queries of KPCO's integrated, electronic office visit, laboratory and pharmacy databases were used to collect study-related data. Study data most proximal to but within the preceding 365 days of December 31, 2010 (index date), were collected. Age (as of December 31, 2010) and sex were collected from the records. Comorbidities included coronary artery disease (CAD, defined as acute myocardial infarction, percutaneous coronary intervention with or without stent, or coronary artery bypass graft surgery), hypertension, diabetes mellitus, congestive heart failure, peripheral artery disease, tobacco use, and atrial fibrillation. The presence of chronic renal insufficiency was determined using the definition of a glomerular filtration rate < 60 mL/minute and calculated using the modification of diet in renal disease formula.[16]

Fasting lipid profiles and BP values most proximal to and within 365 days before the index date were obtained. Direct LDL-C measurement was used when triglyceride levels were > 400 mg/dL. BP measurements from primary care and specialty office visits were used. Values obtained from Emergency Department visits or inpatient stays were excluded.

Data on prescription lipid-lowering and antihypertensive medications purchased at KPCO pharmacies were obtained from queries of the electronic pharmacy database using Generic Product Identifier codes. A patient was considered to have received a specific medication if a purchased medication had a day's supply that overlapped the index date. Prescription lipid-lowering therapy included statins, fibric acid derivatives, bile acid sequestrants, extended-release niacin, and ezetimibe. Antihypertensive therapy was categorized as diuretics (thiazide or loop), angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), β-blockers, calcium channel blockers, α-blockers, and others. Nonprescription medications

Table 1. Patient characteristics overall and by sex and age subgroups

Characteristic	Overall (N = 1731)	Sex			Age, years		
		Men (n = 730)	Women (n = 1001)	p value	< 65 (n = 351)	≥ 65 (n = 1380)	p value
Mean age, years (SD)	73.6 (12.2)	72.0 (11.7)	74.9 (12.4)	< 0.001	—	—	—
Noncardioembolic stroke, n (%)	898 (51.9)	407 (55.8)	491 (49.1)	0.006	198 (56.4)	700 (50.7)	0.057
TIA, n (%)	833 (48.1)	323 (44.2)	510 (50.9)	0.006	153 (43.6)	680 (49.3)	0.057
Hypertension, n (%)	1093 (63.1)	436 (59.7)	657 (65.6)	0.012	166 (47.3)	927 (67.2)	< 0.001
Chronic renal insufficiency, n (%)	360 (20.8)	148 (20.3)	212 (21.2)	0.645	19 (5.4)	341 (24.7)	< 0.001
Diabetes, n (%)	331 (19.1)	153 (21.0)	178 (17.8)	0.097	62 (17.7)	269 (19.5)	0.437
Tobacco user, n (%)	228 (13.2)	113 (15.5)	115 (11.5)	0.015	66 (18.8)	162 (11.7)	< 0.001
Atrial fibrillation, n (%)	188 (10.9)	73 (10.0)	115 (11.5)	0.326	11 (3.1)	177 (12.8)	< 0.001
Coronary artery disease, n (%)	102 (5.9)	36 (4.9)	66 (6.6)	0.147	12 (3.4)	90 (6.5)	0.028
Peripheral artery disease, n (%)	73 (4.2)	40 (5.5)	33 (3.3)	0.026	10 (2.9)	63 (4.6)	0.153
Congestive heart failure, n (%)	41 (2.4)	16 (2.2)	25 (2.5)	0.680	2 (0.6)	39 (2.8)	0.010

SD = standard deviation; TIA = transient ischemic attack.

such as over-the-counter niacin and aspirin were excluded because these are not accurately tracked through KPCO pharmacy databases.

Outcome Measures

Primary outcomes were the proportions of patients with LDL-C values < 100 mg/dL and BP < 140/90 mm Hg, each assessed individually. Both systolic and diastolic BP measurements were required to be controlled for patients to be considered "at goal." Secondary outcomes included the proportions of patients with LDL-C values < 70 mg/dL, BP < 120/80 mm Hg, and both BP < 140/90 mm Hg and LDL-C values < 100 mg/dL. If no LDL-C or BP measurement was available in the 365 days before the index date, it was assumed that patients did not meet the study endpoint. As a subgroup analysis, we also report the proportion of patients who attained these goals among those who have values measured. During the course of this study, updated treatment guidelines were published that established more aggressive LDL-C and BP goals.[3] Because clinicians would not have had sufficient time to incorporate the updated recommendations into practice, we elected to use conservative treatment goals for LDL-C and BP.[1,2]

Men and patients younger than 65 years were significantly more likely to have BP measured … and men were more likely than women to attain BP < 140/90 mm Hg.

The proportions of patients attaining primary and secondary endpoints were compared between the following predefined subgroups: men vs women and patients younger than age 65 years vs those age 65 years or older. The proportions of patients receiving statins vs other lipid-lowering agents, and diuretics with or without ACE inhibitors/ARBs vs other antihypertensives were determined. Factors independently associated with attaining the combined endpoint of LDL-C values < 100 mg/dL and BP < 140/90 mm Hg were identified using regression analysis.

Statistical Analysis

Data analyses were performed using statistical software (SAS version 9.1.3, statistical software SAS Institute Inc, Cary, NC). Outcome proportions were reported as percentages. Patient characteristics were reported as the mean, median, and standard deviation (SD) for continuous variables and proportions for categorical variables. Continuous variables were assessed for normality of distribution, and appropriate tests (eg, *t* test, rank-sum test) were used to compare differences between groups. Differences in proportions between groups were compared using Pearson χ^2 test of association.

Multivariate logistic regression analysis was used to identify factors associated with achieving LDL-C and BP goals. Patient factors used in the regression analysis included age as of the index date, sex, and comorbidities. Factors with a p value < 0.2 in the bivariate analyses were incorporated in the multivariate analysis. All statistical tests were 2-tailed with an α of 0.05.

Results

A total of 2785 patients had a validated stroke between January 1, 2001, and December 31, 2009. Of these, 948 patients (34%) were excluded because they did not have a history of NCIS or TIA. An additional 106 patients (3.8%) were excluded because they had active KPCO membership less than 6 months before the index date. The remaining 1731 patients were included in the study. Nearly all (99%) of these patients had been KPCO members for at least 12 months.

Characteristics of the patient population are summarized in Table 1. Mean age was 73.6 years (SD = 12.2 years); 79.7% were age 65 years or older. Of the patients, 57.8% were women. Stroke type was NCIS in 51.9% and TIA in 48.1% of patients. The most prevalent comorbidities were hypertension, chronic renal insufficiency, and diabetes mellitus. There were differences in some of the characteristics based on sex and age. For instance, hypertension was more prevalent among women compared with men (65.6% vs 59.7%, respectively; p = 0.012) and among patients age 65 years or older compared with those younger than age 65 years (67.2% vs 47.3%, p < 0.001). Chronic renal insufficiency was higher among those age 65 years or older vs younger than age 65 years (24.7% vs 5.4%, p < 0.001); however, there was no difference based on sex.

Table 2 details the study outcomes. Overall, LDL-C and BP values were measured within the observation period in 75.4% and 50.3% of patients, respectively. An LDL-C value < 100 mg/dL was attained in 48.9% of patients, and BP < 140/90 mm Hg was attained in 43.3% of patients; both goals were attained in 22.2% of patients. Few patients attained LDL-C values < 70 mg/dL (16.6%) or BP < 120/80 mm Hg (2.9%). Among those patients with LDL-C or BP values available in the observation period, the proportion attaining goals was much higher. For instance, an LDL-C value < 100 mg/dL was attained in 64.8% of patients, and BP > 140/90 mm Hg was attained in 86%. The mean LDL-C and BP values were 92.9 mg/dL and 125/73 mm Hg, respectively.

There were differences in LDL-C and BP screening or goal attainment with respect to sex and age. There was no difference in LDL-C screening rates for sex or age; however, men and patients younger than age 65 years were significantly more likely to have BP measured. Despite no difference in LDL-C screening rates, men and patients age 65 years or older were more likely than women and patients younger than age 65 years to attain LDL-C goals, both overall and among those with measures. Overall, men were also more likely than women to attain BP < 140/90 mm Hg, and more patients younger than 65 years compared with those age 65 years or older attained this goal. However, there was no difference between groups among those with BP measures available. Men and patients younger than age 65 years were more likely than women and patients age 65 years or older to attain both LDL-C values < 100 mg/dL and BP < 140/90 mm Hg (both p < 0.001, see Table 2).

Overall, statins and antihypertensives (ACE inhibitors/ARBs and/or diuretics) were received by 51.9% and 46.9% of the patients, respectively (Table 3). The mean LDL-C value among those treated with statins was 84.2 mg/dL (SD = 28.8 mg/dL) compared with 105.9 mg/dL (SD = 34.2 mg/dL) for those not treated (p < 0.001). Similarly, the mean BP for those treated with ACE inhibitors/angiotensin receptor blocker and/or diuretics was 127.0/72.1 mm Hg (SD = 15.8/10.0

mm Hg) compared with 122.7/73.4 mm Hg (SD = 16.1/10.7 mm Hg) for those not treated ($p < 0.001$ for systolic BP, $p = 0.093$ for diastolic BP). Patients age 65 years or older and men were more likely than patients younger than age 65 years and women to have received lipid-lowering therapy (both $p < 0.05$). Women and patients age 65 years or older were more likely to have received any antihypertensive therapy (both $p < 0.01$). Factors independently associated with attainment of the combined endpoint of both LDL-C level < 100 mg/dL and BP < 140/90 mm Hg were men (odds ratio [OR] = 1.60, 95% confidence interval [CI] = 1.26-2.04), age younger than 65 years (OR = 2.39, 95% CI = 1.78-3.20), no tobacco use (OR = 1.47, 95% CI = 1.01-2.13), and receiving a lipid-lowering medication (OR = 3.45, 95% CI = 2.63-4.53) (Table 4).

Discussion

In this cross-sectional study of real-world patients with a history of a validated ischemic stroke or suspected TIA, most patients failed to attain conservatively defined LDL-C and BP goals. Even fewer patients attained goals according to the most recently published practice guidelines, which recommend an LDL-C value < 70 mg/dL, and although no specific BP goal is recommended, a normal BP < 120/80 mm Hg is reported.[3] Our primary analysis considered patients without an LDL-C or BP value available in the measurement year as "not at goal." Evaluating only patients with these values available found controlled rates much higher for BP, although LDL-C goal attainment remained relatively low. Statins and antihypertensives were underused. Additionally, this study demonstrated disparities in care on the basis of sex and age. Our findings confirm previous studies suggesting that a substantial proportion of patients with a history of ischemic stroke or suspected TIA neither receive recommended medications nor attain treatment goals for BP and LDL-C.

The process of BP and LDL-C management consists of screening, treatment initiation when appropriate, and follow-up to ensure patients attain goals. A considerable amount of research exploring treatment gaps has been conducted in patients with CAD.[17-21] Research in patients with NCIS or TIA appears to demonstrate similar findings and highlights important treatment gaps among this population. Although there are considerably fewer studies by which to draw conclusions compared with the CAD literature, studies report that

Table 2. Lipid and blood pressure goal outcomes overall and by sex and age

		Sex			Age, years		
Outcome	Overall (N = 1731)	Male (n = 730)	Female (n = 1001)	p value	< 65 (n = 351)	≥ 65 (n = 1380)	p value
LDL-C measured,% (n)	75.4 (1306)	77.7 (567)	73.8 (739)	0.066	71.5 (251)	76.5 (1055)	0.055
LDL-C, mean (SD), mg/dL	92.9 (32.9)	89.0 (32.6)	95.9 (32.8)	< 0.001	99.3 (39.2)	91.3 (31.0)	0.001
LDL-C < 100 mg/dL, %							
Overall cohort	48.9	54.4	44.9	< 0.001	40.5	51.0	< 0.001
Among those with a measure	64.8	70.0	60.8	< 0.001	56.8	66.7	0.003
LDL-C < 70 mg/dL, %							
Overall cohort	16.6	19.6	14.5	0.006	12.5	17.7	0.020
Among those with a measure	22.1	25.2	19.6	0.016	17.5	23.1	0.054
BP measured, % (n)	50.3 (871)	54.8 (400)	47.1 (471)	0.002	86.9 (305)	41 (566)	< 0.001
Systolic BP, mean (SD), mm Hg	124.6 (16.1)	124.9 (16.7)	124.3 (15.6)	0.516	123.3 (16.2)	125.3 (16.0)	0.010
Diastolic BP, mean (SD), mm Hg	72.8 (10.4)	72.9 (10.7)	72.7 (10.1)	0.981	76.1 (10.2)	71.0 (10.1)	< 0.001
BP < 140/90 mm Hg, %							
Overall cohort	43.3	46.9	40.6	0.008	75.2	35.1	< 0.001
Among those with a measure	86.0	88.8	86.2	0.849	86.6	85.7	0.725
BP < 120/80 mm Hg, %							
Overall cohort	2.9	3.6	2.4%	0.153	3.7	2.7	0.307
Among those with a measure	32.2	30.8	33.3	0.416	32.8	31.8	0.767
LDL-C < 100 mg/dL and BP < 140/90 mm Hg, %	22.2	27.3	18.5	< 0.001	30.2	20.1	< 0.001

BP = blood pressure; LDL-C = low-density lipoprotein cholesterol level; SD = standard deviation.

Table 3. Evidence-based medication use overall and by sex and age (percentage)

		Sex			Age, years		
Medication	Overall (N = 1731)	Men (n = 730)	Women (n = 1001)	p value	< 65 (n = 351)	≥ 65 (n = 1380)	p value
Statin	51.9	54.7	49.9	0.048	39.9	54.9	< 0.001
Any antihypertensive	62.1	57.8	65.2	0.002	45.3	66.4	< 0.001
ACE inhibitor/ARB	36.8	36.0	37.4	0.569	26.8	39.4	< 0.001
Diuretic	28.1	24.1	31.1	0.002	22.2	29.6	0.004

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker.

BP and/or LDL-C goals are attained in less than half of patients with ischemic stroke.[9,10,14] Similar to our current investigation, one prior study reported that only 20% of patients attained both LDL-C and BP goals.[10] Interestingly, comparisons of treatment practices for patients with CAD and NCIS find that having a diagnosis of NCIS alone is independently associated with failure to attain either LDL-C or BP goals compared with CAD; this finding suggests some differences in applying treatment practices to patients with CAD compared with NCIS.[10,13] Screening rates for LDL-C were generally higher than that for BP in our study. Not surprising, proportionally more patients who had been screened for either BP or LDL-C in the measurement year attained treatment goals highlighting the importance of screening to identify patients who may require treatment and follow-up.

Underuse of statins and antihypertensives is at least in part responsible for the minority of patients attaining LDL-C and BP goals. A number of studies have evaluated the application of evidence-based medications for patients with NCIS. Whereas medication use varies considerably between reports, generally medications appear to be underused and consequently associated with poor outcomes.[7-13] One large study of 14,529 patients with first-ever ischemic stroke evaluated the prescription of antiplatelets, ACE inhibitors, statins, and anticoagulants at hospital discharge on mortality over 1.4 years.[11] Use of anticoagulants and statins were both independently associated with lower mortality rates; however, use of ACE inhibitors and antiplatelets were not.[11] Another study of 28,634 patients with acute ischemic stroke reported that secondary prevention medication use decreased with increasing age, which was associated with increased mortality.[22] No difference was observed on the basis of sex.

Our study found that male sex and age younger than 65 years were independent factors associated with attaining both LDL-C levels < 100 mg/dL and BP < 140/90 mm Hg. We also observed differences in medication use between men and women as well as between age groups (< 65 vs ≥ 65 years). Differences in goal attainment and medication use between men and women and age groups have been observed previously.[10,11,22,23] Men tend to attain goals and receive medication at higher rates than do women.[10,11,22] Except for one other study[13] in addition to ours, older patients are less likely to use evidence-based medications or attain treatment goals.[10,11,22] These findings are similar to those in the CAD population.[24,25]

Table 4. Factors independently associated with attaining both lipid and blood pressure goals (N = 1731)[a]

Factor	Odds ratio (95% CI)[b]
Men (vs women)	1.60 (1.26-2.04)
Age < 65 years (vs ≥ 65 yrs)	2.39 (1.78-3.20)
Transient ischemic attack (vs cardioembolic stroke)	1.10 (0.86-1.40)
Nontobacco user (vs tobacco user)	1.47 (1.01-2.13)
Any lipid-lowering therapy (vs no lipid-lowering therapy)	3.45 (2.63-4.53)
Hypertension	1.30 (0.99-1.77)
Diabetes	1.18 (0.88-1.57)
Any antihypertensive therapy (vs no antihypertensive therapy)	1.21 (0.89-1.65)

[a] Low-density lipoprotein cholesterol level < 100 mg/dL and blood pressure < 140/90 mm Hg.
[b] c-statistic = 0.698.
CI = confidence interval.

It is unclear why disparities in care exist, particularly for women. For older patients, competing comorbidities may result in lower priority placed on secondary stroke prevention. Data from studies in CAD populations suggest that clinician, patient, and health care system factors likely contribute to treatment gaps.[26,27] To help address treatment gaps, quality-improvement initiatives aimed at hospital teams have been developed. The American Heart Association's Get With The Guidelines-Stroke program facilitates continuous quality-improvement efforts for acute stroke treatment and prevention in hospitalized patients.[4,5,28] Although this program has improved care delivery among patients admitted to the hospital with acute stroke in the short term,[4,5,15] it does not focus on long-term delivery of care in the ambulatory setting, and long-term recidivism is high.[7,8,22]

Evaluations of health care delivery systems focusing on long-term care are needed to identify efficient, cost-effective methods that improve outcomes of patients with ischemic stroke. Six of the 10 quality-of-care measures comprising the Get With The Guidelines-Stroke program could potentially be initiated and reinforced through ongoing monitoring after hospital discharge when necessary. At KPCO, a clinical pharmacy specialist-managed service dedicated to patients with CAD has demonstrated improved outcomes for the patients enrolled and could be applied to patients with ischemic stroke.[29-31]

Our study has some limitations. This was a retrospective, cross-sectional study; thus, temporal trends in the data were not assessed. We were unable to determine the date when a given patient had his/her stroke; thus, we likely had a mix of recent and old strokes in our study population. Given that evidence for implementing evidence-based medicine is strongest for patients with acute or recent strokes, prescribing patterns may have been higher among this subgroup. It is possible that patients were not receiving evidence-based medicines because of intolerances or allergies. We were unable to capture these data administratively. We were unable to analyze the extent to which antiplatelets were used in our population, because our pharmacy databases are unable to accurately capture nonprescription aspirin. Additionally, we were unable to capture prescription use for the small proportion of patients (< 2%) who filled their prescriptions at pharmacies outside KPCO.

It is possible that additional, unmeasured factors might have predicted attainment of LDL-C and BP goals. A number of patients did not have values for LDL-C (n = 425, 24.6%) or BP (n = 860, 49.7%). We chose a conservative approach for our primary analysis and assumed that if a patient did not have a measure available in the prior 365

days, s/he was not at goal. However, it is probable that some of these patients may have attained goals had a measure been available. Additionally, patients may have had values measured that fell outside our 365-day window; thus, we did not capture them. Regarding BP, it is possible that patients measured their BP at home. These readings were not captured in our medical records and thus would have been missed.

Conclusion

We found that few patients with a history of NCIS or suspected TIA attained LDL-C levels < 100 mg/dL and BP < 140/90 mm Hg goals. Treatment gaps were identified between men and women and patients younger than age 65 years and those age 65 years or older. Although national efforts have been successful at ensuring that patients are discharged from the hospital with evidence-based treatment strategies implemented, not all patients with ischemic stroke present to the Emergency Department or are admitted to the hospital. Efforts are needed to identify patients in the ambulatory care setting with a history of ischemic stroke or TIA. Furthermore, even if patients are placed on an optimal drug regimen at hospital discharge, there is no guarantee that they will adhere to that regimen over the ensuing months and years.

Research is needed to develop cost-effective methods that reach the most patients to assist health systems in developing programs to ensure that evidence-based treatments are initiated and treatment goals are attained and maintained over time. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Subtraction

Our days flowed around well-charted, often traveled courses, and yet, the underlying sense of falling out of time, out of the trajectory of one's life, not by choice, but by subtraction, was frequent and disquieting. Then I grieved for him, for the lost and previous Paul. He grieved for that man too.

— Diane Ackerman. *One hundred names for love: a stroke, a marriage, and the language of healing.* New York, NY: WW Norton & Co; 2012