Use of Antithrombotic Medications Among Elderly Ischemic Stroke Patients

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Background—The use of antithrombotic medications after ischemic stroke is recommended for deep vein thrombosis prophylaxis and secondary stroke prevention. We assessed the rate of receipt of these therapies among eligible ischemic stroke patients age ≥65 years and determined the effects of age and other patient characteristics on treatment.

Methods and Results—The analysis included Medicare fee-for-service beneficiaries discharged with ischemic stroke (ICD 433.x1, 434.x1, 436) randomly selected for inclusion in the Medicare Health Care Quality Improvement Program’s National Stroke Project 1998 to 1999, 2000 to 2001. Patients discharged from nonacute facilities, transferred, or terminally ill were excluded. Receipt of in-hospital pharmacological deep vein thrombosis prophylaxis, antiplatelet medication, anticoagulants for atrial fibrillation, and antithrombotic medications at discharge were assessed in eligible patients, stratified by age (65 to 74, 75 to 84, and 85+ years). Descriptive models identified characteristics associated with treatment. Among 31,554 patients, 14.9% of those eligible received pharmacological deep vein thrombosis prophylaxis, 83.9% antiplatelet drugs, 82.8% anticoagulants for atrial fibrillation, and 74.2% were discharged on an antithrombotic medication. Rates of treatment decreased with age and were lowest for patients ages 85 years or older. Admission from a skilled nursing facility and functional dependence were associated with lower treatment rates.

Conclusions—There was substantial underutilization of antithrombotic therapies among elderly ischemic stroke patients, particularly among the very elderly, those admitted from skilled nursing facilities, and patients with functional dependence. The reasons for low use of antithrombotic therapies, including the apparent underutilization of deep vein thrombosis prophylaxis in otherwise eligible patients, require further investigation. (Circ Cardiovasc Qual Outcomes. 2011;4:30-38.)

Key Words: stroke ■ secondary prevention ■ medical care ■ deep vein thrombosis ■ elderly

Stroke is an important public health problem in the elderly, with 75% of all strokes occurring in persons age 65 years and older.1 Stroke is the third most common cause of death and a leading cause of disability among Americans in this age group.2,3 The absolute number of elderly individuals with stroke will increase in the coming decades because of the stable or increasing incidence of stroke4–7 coupled with a growing elderly population.8,9 Patients who survive an acute ischemic stroke are at increased risk for recurrence, with the highest rates occurring within the first few weeks and reaching 10% after the first year.10,11

Treatment guidelines recommend the use of aspirin for patients with acute ischemic stroke, pharmacological and non-pharmacological prophylaxis for deep vein thrombosis (DVT), anticoagulation for atrial fibrillation, and a variety of antithrombotic drugs for secondary prevention.12 Despite their effectiveness,11,13–19 there is widespread underutilization of antithrombotic drugs among elderly stroke patients,20–27 suggesting that older patients may be receiving suboptimal care. There are relatively few age-specific data regarding the utilization of antithrombotics among the very elderly, particularly for stroke patients 85 years of age or older in the United States. This represents an important gap because the proportion of the population more than 85 years of age will increase 5-fold by 2050.8 Given the increasing longevity of the US population and the greater survivorship of stroke patients, it is important to determine whether proven secondary preventive therapies are appropriately used among the very elderly. Older age is associated with an increased risk of poststroke in-hospital mortality in...
Medicare beneficiaries, independent of sex, cognitive status, concomitant cardiac disease, or stroke severity. The results of studies conducted in other countries assessing age-related differences in the receipt of secondary preventive interventions are inconsistent. Variation in the use of these therapies may exist within the elderly population because of factors such as the prevalence of comorbid illness, impaired functional status, and perceived feasibility of treating patients of advanced age with medications such as warfarin. We sought to determine whether there were age-specific differences in the receipt of pharmacological DVT prophylaxis and antithrombotic drugs using a large, random sample of elderly patients hospitalized for acute ischemic stroke in the United States. A secondary aim was to determine whether there were patient characteristics that were associated with a greater likelihood of treatment within age groups.

WHAT IS KNOWN
- Antithrombotic medications are proven effective for deep vein thrombosis prophylaxis and secondary stroke prevention.
- The proportion of patients with ischemic stroke receiving these medications is high in hospitals participating in stroke-related quality improvement programs.
- Whether this finding is widely generalizable and is similar in the very elderly is unknown.

WHAT THE STUDY ADDS
- There is considerable variability in the use of antithrombotic medications in hospitalized stroke patients.
- Advanced age, admission from a skilled nursing facility, and decreased functional status are associated with decreased use of recommended therapies.
- Antithrombotic medication use is not optimal among elderly stroke patients.

Methods
Study participants were part of the Medicare Health Care Quality Improvement Program’s National Stroke Project. In brief, the National Stroke Project was authorized by the Health Care Financing Administration (now the Centers for Medicare and Medicaid Services) to improve the quality of care for patients with stroke or transient ischemic attack (TIA). A systematic random sample of up to 750 hospitalized, fee-for-service Medicare beneficiaries with a primary discharge diagnosis of stroke was identified from each of the 50 states, the District of Columbia, and Puerto Rico during 2 periods of data collection (1998 to 1999 and 2000 to 2001). These patients were drawn from 3876 hospitals. Patients were included in the present study if they had a primary diagnosis of ischemic stroke (ICD-9-CM codes 433.x1, 434.x1, and 436) and had confirmatory physician documentation of a new event. Patients were excluded if they were younger than 65 years (n = 4211), missing data on age or sex (n = 15), transferred to or from another acute-care facility (n = 3868), discharged within one day (n = 605), had left the hospital against medical advice (n = 131), or had terminal cancer or an illness with a life expectancy of less than 6 months (n = 1519); these exclusions are not mutually exclusive. Patients discharged alive within 1 day were excluded because they probably had conditions that were miscoded or misdiagnosed as ischemic stroke (eg, syncope, migraine, or hypoglycemia). Transfers were excluded because care at the other acute care facility was not captured in the medical record.

Data were obtained from medical record review by 2 clinical data abstraction centers using computerized abstraction tools. Patient sex, age, race-ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, or other), skilled nursing facility residence before admission, comorbid conditions, medical history, and discharge disposition (home, skilled nursing facility, or other) were recorded. The patients’ prestroke and discharge functional statuses were assessed using categories that reflect the modified Rankin scale (Figure 1) and were categorized as either independent, needing assistance, or dependent. We also assessed the change in scores from admission to discharge among patients discharged alive (patients who died in-hospital were not assigned a modified Rankin score).

Outcome measures included the rates of pharmacological DVT prophylaxis by the end of day 2 among nonambulatory patients not receiving mechanical DVT prophylaxis, antiplatelet medication during the hospitalization, anticoagulants (either warfarin, intravenous, subcutaneous, or low-molecular weight heparin) during the hospitalization among those with atrial fibrillation, and the prescription of or plan for an antithrombotic drug at discharge among patients eligible for these therapies. Table 1 gives the inclusion and exclusion criteria for each of the quality indicators. These conservative criteria were used to determine the frequency of treatment in a group of patients who generally should be given antithrombotic therapy.

Treatment rates were stratified by patient age (65 to 74, 75 to 84, and ≥85 years), as well as by admission from a skilled nursing facility and functional status at discharge. Hierarchical regression models were used to both identify patient characteristics associated with the receipt of therapies among eligible candidates and to account for patient clustering within hospitals. Model covariates included age, sex, race-ethnicity, comorbid conditions (diabetes, hypertension, prior stroke/TIA, history of atrial fibrillation, conges-
atrial fibrillation, congestive heart failure, and angina but older were more likely to have had a prior stroke, a history of criteria are presented in Table 2. Patients ages 75 years and

Hierarchical models were estimated using the GLIMMIX procedure conducted using SAS version 9.1.3 (SAS Institute Inc, Cary, NC). Because of missing modified Rankin scores (ranging from 1.6% to 32% of eligible patients across age groups. In secondary analyses, we included patients who received nonpharmacologic DVT prophylaxis, but results were essentially unchanged. Treatment rates ranged from 78.3% to 87.5% across age groups for antiplatelet drugs, 76.3% to 88.7% for anticoagulants among those with atrial fibrillation, and 70.3% to 76.7% for antithrombotic drugs at discharge. Treatment rates were lower for patients who were admitted from a skilled nursing facility (Figure 3) and those

Table 1. Stroke Treatment and Eligibility Criteria*

<table>
<thead>
<tr>
<th>Treatment Definition</th>
<th>No. Treated</th>
<th>Eligibility Exclusion Criteria†</th>
<th>No. Eligible</th>
<th>Percent Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVT prophylaxis</td>
<td>1295</td>
<td>- (n=22 845 excluded)</td>
<td>8709</td>
<td>14.9%</td>
</tr>
<tr>
<td>Antiplatelet drugs</td>
<td>11 137</td>
<td>- (n=18 272 excluded)</td>
<td>13 282</td>
<td>83.9%</td>
</tr>
<tr>
<td>Anticoagulants for atrial fibrillation</td>
<td>3221</td>
<td>- (n=27 663 excluded)</td>
<td>3891</td>
<td>82.8%</td>
</tr>
<tr>
<td>Antithrombotics at discharge</td>
<td>13 380</td>
<td>- (n=13 530 excluded)</td>
<td>18 024</td>
<td>74.2%</td>
</tr>
</tbody>
</table>

NSAIDs indicates nonsteroidal anti-inflammatory drugs; ASA, aspirin.
†Subcategories of eligibility exclusion criteria are not mutually exclusive.

Results
Characteristics of the 31 554 patients who met initial study criteria are presented in Table 2. Patients ages 75 years and older were more likely to have had a prior stroke, a history of atrial fibrillation, congestive heart failure, and angina but were less likely to have hypertension or diabetes than patients ages 65 to 74. Older patients were more likely to have been admitted from a skilled nursing facility, more likely to be functionally dependent at admission and discharge, and less likely to be discharged home as compared with younger patients (P<0.001 for each comparison).

The proportion of eligible patients who received antithrombotic therapies decreased with advancing age except in the case of pharmacological DVT prophylaxis, which was slightly higher among patients aged 75 to 84 years as compared with those 65 to 74 years old (Figure 2). Overall rates of pharmacological DVT prophylaxis were particularly low, ranging from 11.4% to 17.0% of eligible patients across age groups. In secondary analyses, we included patients who received nonpharmacologic DVT prophylaxis, but results were essentially unchanged. Treatment rates ranged from 78.3% to 87.5% across age groups for antiplatelet drugs, 76.3% to 88.7% for anticoagulants among those with atrial fibrillation, and 70.3% to 76.7% for antithrombotic drugs at discharge. Treatment rates were lower for patients who were admitted from a skilled nursing facility (Figure 3) and those
who were functionally dependent (Figure 4) within each age group.

In risk-adjusted analyses (Table 3), the receipt of DVT prophylaxis as well as the use of antiplatelet drugs during the hospitalization did not differ between patients ages 65 to 74 years and 75 to 84 years, although the receipt of DVT prophylaxis was lower for those more than age 85 years. Receipt of in hospital anticoagulants for atrial fibrillation decreased with advancing age and was lowest for patients 85 years or older. The likelihood of receiving antithrombotic drugs at discharge did not differ between patients aged 65 to 74 and 75 to 84 years; however, those 85 years of age or older were less likely to receive these drugs.

Patients who were admitted from a skilled nursing facility were less likely to receive DVT prophylaxis ($P<0.0001$ for interaction between age and SNF admission), antiplatelet drugs in the hospital, anticoagulants for atrial fibrillation ($P<0.0001$ for interaction between age and SNF admission), and antithrombotics at discharge. Increasing levels of functional dependence were associated with progressively lower rates of utilization of each of these therapies (needs assistance and dependent versus functional independence), with a significant interaction between age and functional status at discharge for the receipt of DVT ($P<0.0001$) and anticoagulants for atrial fibrillation ($P<0.0001$). In secondary analysis, the inclusion of patients with missing Rankin scores did not appreciably alter the results. Elderly black patients were less likely to receive DVT prophylaxis in-hospital and antithrombotics at discharge than white patients, but there were no differences for antiplatelet drugs or anticoagulants during the hospitalization. Hispanic patients and those belonging to other race-ethnic groups were less likely to receive in-

### Table 2. Demographic and Clinical Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Total (n=26,068)</th>
<th>Age, y</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>P Value</th>
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<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>65–74</td>
<td>75–84</td>
<td>85+</td>
<td></td>
<td></td>
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<tr>
<td>Sex</td>
<td></td>
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<tr>
<td>Male</td>
<td>12,462</td>
<td>39.5</td>
<td>49.7</td>
<td>39.9</td>
<td>28.2</td>
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<td>Female</td>
<td>19,092</td>
<td>60.5</td>
<td>50.3</td>
<td>60.1</td>
<td>71.8</td>
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<td></td>
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<tr>
<td>Age, y, mean±SD</td>
<td>79.4±7.7</td>
<td></td>
<td>70.1±2.8</td>
<td>79.6±2.8</td>
<td>89.0±3.5</td>
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<td>Race</td>
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<tr>
<td>Non-Hispanic white</td>
<td>24,816</td>
<td>78.7</td>
<td>73.7</td>
<td>80.3</td>
<td>81.1</td>
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<td>Non-Hispanic black</td>
<td>2,993</td>
<td>9.5</td>
<td>13.5</td>
<td>8.3</td>
<td>7.2</td>
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<td>Hispanic</td>
<td>633</td>
<td>2.0</td>
<td>2.9</td>
<td>1.8</td>
<td>1.4</td>
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<td>Other</td>
<td>3,112</td>
<td>9.9</td>
<td>9.9</td>
<td>9.6</td>
<td>10.3</td>
<td></td>
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<td>Comorbidity and medical history</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Prior stroke</td>
<td>17,090</td>
<td>54.2</td>
<td>53.0</td>
<td>55.3</td>
<td>53.6</td>
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<td>Prior TIA</td>
<td>885</td>
<td>2.8</td>
<td>2.8</td>
<td>3.0</td>
<td>2.5</td>
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<td>0.071</td>
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<td>Atrial fibrillation</td>
<td>6,667</td>
<td>21.1</td>
<td>13.3</td>
<td>21.6</td>
<td>28.7</td>
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<td>&lt;0.001</td>
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<tr>
<td>Congestive heart failure</td>
<td>6,151</td>
<td>19.5</td>
<td>13.1</td>
<td>18.8</td>
<td>27.4</td>
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<td>Hypertension</td>
<td>25,128</td>
<td>79.6</td>
<td>81.5</td>
<td>80.3</td>
<td>76.5</td>
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</tr>
<tr>
<td>Diabetes mellitus</td>
<td>9,742</td>
<td>30.9</td>
<td>40.3</td>
<td>30.8</td>
<td>21.0</td>
<td></td>
<td>&lt;0.001</td>
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<td>IHD/angina</td>
<td>16,445</td>
<td>52.1</td>
<td>49.7</td>
<td>53.4</td>
<td>52.6</td>
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<td>Prior myocardial infarction</td>
<td>10,229</td>
<td>32.6</td>
<td>31.7</td>
<td>33.1</td>
<td>32.9</td>
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<td>0.083</td>
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<tr>
<td>Admitted from skilled nursing facility</td>
<td>3,118</td>
<td>10.1</td>
<td>4.2</td>
<td>8.8</td>
<td>18.4</td>
<td></td>
<td>&lt;0.001</td>
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<tr>
<td>Functional status at admission</td>
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<tr>
<td>Independent</td>
<td>18,900</td>
<td>60.3</td>
<td>72.3</td>
<td>61.3</td>
<td>45.8</td>
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<tr>
<td>Needs assistance</td>
<td>9,955</td>
<td>31.7</td>
<td>22.5</td>
<td>31.3</td>
<td>42.3</td>
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<td>Dependent</td>
<td>2,505</td>
<td>8.0</td>
<td>5.2</td>
<td>7.4</td>
<td>12.0</td>
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<tr>
<td>Functional status at discharge</td>
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<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Independent</td>
<td>5,518</td>
<td>19.0</td>
<td>30.0</td>
<td>18.0</td>
<td>8.2</td>
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<tr>
<td>Needs assistance</td>
<td>12,182</td>
<td>41.9</td>
<td>40.2</td>
<td>43.3</td>
<td>41.3</td>
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<td>Dependent</td>
<td>11,402</td>
<td>39.2</td>
<td>29.8</td>
<td>38.7</td>
<td>50.5</td>
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<td>Discharge disposition</td>
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<tr>
<td>Home</td>
<td>11,143</td>
<td>35.3</td>
<td>49.1</td>
<td>34.8</td>
<td>21.6</td>
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<td>Skilled nursing facility</td>
<td>9,967</td>
<td>30.6</td>
<td>17.4</td>
<td>29.9</td>
<td>45.8</td>
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<td>Rehabilitation hospitals</td>
<td>6,216</td>
<td>19.7</td>
<td>23.2</td>
<td>21.2</td>
<td>13.6</td>
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<tr>
<td>Other</td>
<td>2,443</td>
<td>7.7</td>
<td>5.9</td>
<td>7.7</td>
<td>9.7</td>
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IHD indicates ischemic heart disease.
hospital anticoagulants as compared with non-Hispanic whites. The relationship of these covariates with receipt of antithrombotic drugs remained unchanged when age was treated as a continuous variable in the analysis.

**Discussion**

Although national guidelines recommending the use of antithrombotic drugs for DVT prophylaxis and secondary stroke prevention have been in place for many years, we found an overall underutilization of these therapies in eligible elderly patients hospitalized with ischemic stroke, particularly among the oldest patients. Among eligible ischemic stroke patients 85+ years of age, only 11% received pharmacological DVT prophylaxis, 76% received antiplatelet medications, 76% received anticoagulants for atrial fibrillation, and 70% received antithrombotics at discharge. Because we assessed treatment rates among eligible patients, these relatively low utilization rates cannot be attributed to differences in contraindications by age. Decreased mobility and admission from a skilled nursing facility were also associated with lower receipt of each therapy. Race-ethnicity was associated with the rates of DVT prophylaxis, anticoagulant use for atrial fibrillation, and antithrombotic use at discharge, but these associations were inconsistent across race-ethnic groups and treatments. The overall low use of DVT prophylaxis and the reasons for these differences in otherwise eligible patients requires further investigation.

Prior analyses using the National Stroke Project data show that antithrombotics prescribed at discharge for patients with acute stroke or transient ischemic attack and warfarin for patients with atrial fibrillation are underused in patients ages 65 years or older. Our analyses extend this prior work, stratifying the receipt of treatment by age groups for the subset of patients with a new ischemic stroke. We found that...
the underutilization of therapies is even more pronounced for the very elderly and differs by other patient characteristics including admission location and level of functional dependence. The receipt rate of therapy for atrial fibrillation in our study was higher than that reported by Jencks et al. This is likely because of their consideration of all Medicare patients with a principal discharge diagnosis of atrial fibrillation whether or not they had an ischemic stroke. In contrast,

**Figure 4.** Receipt of therapies by discharge modified Rankin score (independent, needs assistance, or dependent) stratified by age.

**Table 3. Risk-Adjusted Analysis of Quality Indicators**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>DVT Prophylaxis in Hospital (n=6864)</th>
<th>Antiplatelet Drugs in Hospital (n=28 942)</th>
<th>Anticoagulants for AF in Hospital (n=3372)</th>
<th>Antithrombotics at Discharge (n=17 742)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR 95% CI</td>
<td>OR 95% CI</td>
<td>OR 95% CI</td>
<td>OR 95% CI</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Age 75–84 y (vs 65–74)</td>
<td>0.95 (0.81–1.11)</td>
<td>1.01 (0.95–1.08)</td>
<td>0.72 (0.53–0.97)</td>
<td>0.96 (0.88–1.04)</td>
</tr>
<tr>
<td>Age 85+ y (vs 65–74)</td>
<td>0.58 (0.48–0.70)</td>
<td>0.98 (0.91–1.06)</td>
<td>0.48 (0.35–0.65)</td>
<td>0.84 (0.76–0.93)</td>
</tr>
<tr>
<td>Male (vs female)</td>
<td>1.12 (0.98–1.28)</td>
<td>1.02 (0.97–1.08)</td>
<td>1.13 (0.91–1.39)</td>
<td>1.08 (1.01–1.16)</td>
</tr>
<tr>
<td>Black race (vs white)</td>
<td>0.75 (0.61–0.93)</td>
<td>1.06 (0.96–1.17)</td>
<td>0.95 (0.61–1.46)</td>
<td>0.88 (0.78–0.99)</td>
</tr>
<tr>
<td>Other/Hispanic race (vs white)</td>
<td>0.81 (0.65–1.01)</td>
<td>0.97 (0.89–1.06)</td>
<td>0.52 (0.38–0.71)</td>
<td>1.10 (0.98–1.23)</td>
</tr>
<tr>
<td>Medical history</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.19 (1.04–1.36)</td>
<td>1.09 (1.02–1.15)</td>
<td>1.12 (0.89–1.41)</td>
<td>0.89 (0.83–0.96)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.97 (0.83–1.14)</td>
<td>1.31 (1.23–1.40)</td>
<td>1.26 (1.01–1.57)</td>
<td>1.18 (1.09–1.29)</td>
</tr>
<tr>
<td>Prior stroke</td>
<td>1.37 (1.20–1.57)</td>
<td>1.02 (0.97–1.08)</td>
<td>1.01 (0.83–1.23)</td>
<td>1.13 (1.05–1.21)</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>4.23 (3.69–4.85)</td>
<td>0.36 (0.34–0.39)</td>
<td>1.82 (1.48–2.23)</td>
<td>1.80 (1.63–1.99)</td>
</tr>
<tr>
<td>Prior MI</td>
<td>1.10 (0.97–1.26)</td>
<td>1.09 (1.02–1.15)</td>
<td>1.08 (0.88–1.32)</td>
<td>1.14 (1.05–1.23)</td>
</tr>
<tr>
<td>CHF</td>
<td>1.34 (1.16–1.55)</td>
<td>0.80 (0.75–0.86)</td>
<td>0.88 (0.72–1.09)</td>
<td>0.91 (0.83–1.00)</td>
</tr>
<tr>
<td>Admitted from SNF (vs not SNF)</td>
<td>0.83 (0.70–0.99)</td>
<td>0.58 (0.53–0.63)</td>
<td>0.38 (0.30–0.50)</td>
<td>0.80 (0.71–0.91)</td>
</tr>
<tr>
<td>Functional score at discharge</td>
<td></td>
<td></td>
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<tr>
<td>Needs assistance (vs independent)</td>
<td>0.72 (0.55–0.93)</td>
<td>0.93 (0.86–1.00)</td>
<td>0.75 (0.52–1.07)</td>
<td>0.75 (0.68–0.82)</td>
</tr>
<tr>
<td>Dependent (vs independent)</td>
<td>0.43 (0.34–0.55)</td>
<td>0.66 (0.61–0.72)</td>
<td>0.19 (0.14–0.27)</td>
<td>0.68 (0.61–0.76)</td>
</tr>
<tr>
<td>Discharged to SNF (vs not SNF)</td>
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OR indicates odds ratio; CI, confidence interval; MI, myocardial infarction; CHF, congestive heart failure; and SNF, skilled nursing facility.

*Adjusted for all the variables listed in the table, as well as change in functional status.
we determined the receipt of therapy among ischemic stroke patients with documented evidence of atrial fibrillation during the hospitalization. Our lower rate of antithrombotic use at discharge as compared with Jencks et al probably reflects differences in inclusion and exclusion criteria.

DVT prophylaxis in immobilized stroke patients can reduce the risk of death caused by pulmonary embolism by 56% to 82%.46 Although we found the level of utilization to be consistent with the reported rate of 13.8% among eligible Medicare patients in Michigan,37 they were lower than those reported from the California Acute Stroke Pilot Registry (CASPR, 64% in 2003 and 43% in 2004) and Get-With-The-Guidelines (GWTG)-Stroke (74% in 2003) databases.38–40 Rates may be higher in GWTG-Stroke and CASPR hospitals as they have a particular interest in stroke and both are designed as quality improvement programs. Variation in rates between studies may also reflect differences in the age distributions of included patients, differing criteria for appropriate prophylaxis, as well as the accuracy of assessment and documentation for the level of patient activity by day 2 of the hospitalization. There may also be increased DVT prophylactic use over time, as evidenced by the increase from 13.8% to 17.9% found in Medicare beneficiaries from 1998 to 200241 and a 15.8% increase in GWTG-Stroke hospitals from 2003 through 2007.38

More than three-quarters of patients who were eligible to receive antplatelet drugs during the hospitalization received them, with the proportion declining in successively older age groups. These observations are consistent with another study that found unadjusted utilization rates of 73.7% among stroke patients ages 65 to 75 years and 71.9% among those >75 years old; however, risk-adjusted analyses combined the older groups and compared them with patients younger than 65 years of age.22 Hierarchical models revealed no difference in the receipt of antplatelet drugs across age groups during the acute hospitalization.

Direct comparisons with prior research reporting utilization rates of warfarin for in-hospital atrial fibrillation with our study are limited because these other studies either included patients <65 years of age43,44 or those without a diagnosis of acute ischemic stroke.21,23,32,33 A recent study of ischemic stroke patients treated at designated stroke centers in Ontario reported similar rates of treatment as our study, with a nonsignificant decrease in the receipt of warfarin at discharge (87.2% for <59 years, 81.5% for 60 to 69 years, 82.7% for 70 to 79 years, and 76.8% for 80+ years of age).29 Older patients with atrial fibrillation are known to benefit from anticoagulant treatment45–48; however, we found lower receipt rates in the older age groups. This suggests that patient age may influence physicians’ decisions to prescribe warfarin independent of other demographic and clinical factors; a finding consistent with other reports in older populations.21,43 One explanation for this age difference may be physicians’ desire to avoid hemorrhagic stroke, the risk for which increases with age.22 Although the risk of major anticoagulant-associated bleeding is higher in the very elderly,49 the risks do not offset the benefits for most high risk patients with atrial fibrillation if anticoagulants are carefully administered.45–48

We found that one-fourth of eligible patients did not receive antithrombotic medications at discharge, a rate that is somewhat higher than the 16% to 17% reported in 2 studies of Medicare patients in Michigan during the same time period.24,41 It is possible that our observed rate differs because of local variations in stroke care that are not evident within a single geographic location. Furthermore, the Michigan studies included cases with transient arterial occlusion (ICD-9 code 362.34), restricted stroke cases to white or black race, and excluded cases in which there was physician documentation that at least one antithrombotic therapy was considered but not prescribed.

Volpato et al27 found no difference in the prescription of antithrombotic therapy at discharge among elderly stroke patients in Italian clinical centers but did find lower utilization rates with decreased functional independence. A Canadian study reported similar rates of antithrombotics at discharge across all elderly age groups (<59, 60 to 69, 70 to 79, and 80+) but only included patients admitted to designated stroke centers in Ontario, which may represent a higher level of care than in nonstroke center facilities.29 Our findings differ from data reported from CASPR, which found no age difference (80+ versus <80) in optimal utilization of antithrombotic therapy.49 Optimal therapy was defined as receipt at discharge of at least 1 medication from the class (ie, an antplatelet drug or an anticoagulant) or a valid contraindication to treatment. There was wide variation in the rates of actual and optimal treatment across the 11 CASPR hospitals. The differences in reported results between this study and ours may reflect greater variation in our sample, which was drawn from hospitals across the United States, and/or may represent selection bias (and as noted above CASPR hospitals were selected based on their interest in stroke care and experience in using registries). Higher compliance rates would also be expected among committed hospitals that were aware they were being monitored for these therapies, including those participating in quality improvement programs such as the GWTG-Stroke program.40

Our study has several limitations. First, we may have underestimated the proportion of patients prescribed antithrombotics before admission or at discharge because of lack of documentation, particularly for nonprescription medications such as aspirin. We used a conservative approach, excluding patients with a range of potential contraindications for the use of antplatelet drugs, yet still found a large proportion of untreated patients. Additional clinical contraindications for acute anticoagulation may not have been documented and information on stroke size, which might affect the use of these drugs, was not available. Determining patient immobility from chart review had moderate reliability and may have influenced the observed rates. The data reflect treatment patterns at the time of the study. Although care may have improved over time, practice recommendations for the use of antithrombotic therapies have not appreciably changed.16,34,35 We did not have information on reasons that physicians may not have prescribed these medications; however, a review of published articles assessing practice patterns and barriers to warfarin use in the setting of atrial fibrillation indicates that advanced patient age is consistently
identified as a factor influencing decision-making. Finally, our findings may not be generalizable to patients who are transferred to or from other facilities as they were excluded from the analysis.

Our findings suggest that antithrombotic medication use is not optimal and that treatment rates may be affected by patient age as well as other patient characteristics, including admission from a skilled nursing facility and functional status. These differences were present regardless of patient demographics and comorbidities. Further research is needed to replicate these results in other data resources and understand the reasons for these differences. The underutilization of antithrombotic drugs among elderly stroke patients, particularly the very elderly, suggests that there may be an opportunity to improve their poststroke DVT prophylaxis and secondary preventive care. Future work will need to determine the effectiveness of performance improvement activities such as primary stroke center certification, the Get-With-The-Guidelines-Stroke program, and other similar efforts in the elderly population.

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Disclosures

None.

References


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