Death and Rehospitalization after Transient Ischemic Attack or Acute Ischemic Stroke: One-year Outcomes from the Adherence Evaluation of Acute Ischemic Stroke–Longitudinal Registry

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Background: Longitudinal data directly comparing the rates of death and rehospitalization of patients discharged after transient ischemic attack (TIA) versus acute ischemic stroke (AIS) are lacking. *Methods:* Data were analyzed from 2802 patients (TIA n = 552; AIS n = 2250) admitted to 100 U.S. hospitals participating in the Get With The Guidelines–Stroke and the Adherence Evaluation of Acute Ischemic Stroke–Longitudinal registry. The primary composite outcome was the adjusted rate of all-cause death and rehospitalization over 1 year after discharge. Four additional single or combined outcomes were explored. *Results:* Compared with AIS, TIA patients were older (median 69 *v* 66 years; $P = .007$) and more likely female (53.3% *v* 44.2%; $P < .0001$). Secondary prevention medication use after hospital discharge was less intensive after TIA, with underuse for both conditions. All-cause death or rehospitalization at 1 year was similar for TIA and AIS patients (37.7% *v* 34.6%; $P = .271$); the frequency for TIA patients was higher after covariate adjustment (hazard ratio [HR] 1.19; 95% confidence interval [CI] 1.01-1.41). One-year all-cause mortality was similar among those with TIA compared to AIS patients (3.8% *v* 5.7%; $P = .071$; adjusted HR 0.86; 95% CI 0.52-1.42). All-cause rehospitalizations were higher for TIA compared to AIS patients (36.4% *v* 33.0%; $P = .186$; adjusted HR 1.20; 95% CI 1.02-1.42), but similar for stroke rehospitalizations (10.1% *v* 7.4%; $P = .037$; adjusted HR 1.38, 95% CI 0.997-1.92). *Conclusions:* Patients with TIA have similar or worse 12-month postdischarge risk

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of death or rehospitalization as compared with those with AIS. Outcomes after TIA and AIS might be improved with better adherence to secondary preventive guidelines. **Key Words:** Acute stroke—stroke care—stroke management—transient ischemic attack.
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The number of cases of transient ischemic attack (TIA) in the United States may be approaching 500,000 per year.[1,2] The current estimate of more than 795,000 new or recurrent strokes in the country[3] is expected to grow as the population ages.[4] Death, recurrent stroke, and rehospitalization are frequent after acute ischemic stroke (AIS).[5-8] Epidemiologic and observational studies show that the risk of stroke after TIA is highest over the first few days,[9-11] but is also associated with a 43% 10-year risk of stroke, myocardial infarction, or vascular death.[12] National secondary prevention guidelines do not significantly differ for patients having TIA or stroke.[13] Longitudinal data directly comparing the rates of death and rehospitalization of patients discharged after TIA versus those who had an AIS, however, are lacking. These measures will likely be publically reported in the near future by the Centers for Medicare and Medicaid Services (CMS). The Adherence Evaluation of Acute Ischemic Stroke–Longitudinal (AVAIL) study recruited patients with TIA or AIS enrolled in the American Heart Association's/American Stroke Association's (AHA/ASA) Get With The Guidelines–Stroke (GWTG-S) program from across the United States.[14] The primary aim of this analysis was to compare all-cause rates of death and rehospitalization over the first year after hospital discharge among subjects with TIA and AIS. We also assessed the use of secondary preventive therapies at hospital discharge for the 2 conditions and explored differences for other outcomes.

Design

Subjects were recruited prospectively from 106 hospitals participating in the AHA/ASA GWTG-S program. The AVAIL study enrolled patients who were hospitalized after presenting to emergency departments with TIA or AIS from all regions of the United States: Midwest (33.6%), Northeast (32.8%), South (22.7%), and West (10.9%). Participating hospitals were primarily academic centers (78.1%) with a median of 380 beds (interquartile range 300-524 beds) with 84.1% being Joint Commission–certified as a Primary Stroke Center.

The purpose, scope, and methodology of the AVAIL registry program, and analyses from the AVAIL registry including 3-month and 1-year follow-ups, have been published.[14,15] Outcome Sciences, Inc. serves as the data collection and coordination center for GWTG-S. The Duke Clinical Research Institute (DCRI) serves as the data analysis center for GWTG-S and has an agreement to analyze aggregate, deidentified data for research purposes. The DCRI was also the lead institute for AVAIL and coordinated all telephone follow-up interviews.

The subject's physician-diagnosed TIA or AIS was based on standard clinical criteria. Ischemic stroke was defined in the research protocol as a focal neurologic deficit lasting ≥24 hours resulting from brain ischemia; for TIA, the symptoms last for <24 hours, regardless of whether there was neuroimaging of ischemic injury.[16] Diagnoses, however, were not centrally adjudicated. Day 0 was the day of hospital discharge, and telephone follow-up surveys were obtained at 3 months and 1 year after discharge. Responses were obtained primarily from the subject; a proxy was used for those who could not provide self-response (e.g., stroke-related deficits, death). If interviewers were unable to contact subjects, the National Death Index was accessed and Internet searches were performed to determine if the subject had died.

The primary outcome was the adjusted rates of the occurrence of death or rehospitalization for any reason over 1 year after discharge. Four additional single or combined outcomes were explored: (1) death, defined as mortality within the first year after discharge; (2) death or stroke rehospitalization, defined as either a death or a rehospitalization related to stroke; (3) stroke rehospitalization; and (4) all-cause rehospitalization. Day 0 is defined as the day of hospital discharge. Event times were determined based on the first rehospitalization date or death date if no rehospitalization occurred. Time to event was defined as the number of days from index hospital discharge to death or the first rehospitalization (hospitalization for >24 hours). Each study site obtained institutional review board approval before enrolling subjects into the AVAIL registry, and all AVAIL subjects consented to participate in the study.

Statistical Methods

Key variables were summarized by subjects' 1-year primary outcome (died or rehospitalized vs counterpart). Standard descriptive statistical techniques were used to summarize baseline characteristics and follow-up data as well as hospital characteristics. For continuous variables, medians were compared using Wilcoxon rank sum tests; the frequency distributions of categorical variables were compared using chi-square tests.

The survival functions were estimated with Kaplan–Meier estimates and compared using log-rank tests. First, univariate statistics were used to compare the

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