Underutilization of Ambulatory ECG Monitoring After Stroke and Transient Ischemic Attack

Missed Opportunities for Atrial Fibrillation Detection

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Background and Purpose—Detection and treatment of atrial fibrillation is a major goal in secondary stroke prevention. Guidelines recommend at least 24 hours of ECG monitoring after stroke. However, it is unclear how often this is done in routine practice.

Methods—In this longitudinal cohort study using data from the Ontario Stroke Registry, we analyzed consecutive patients presenting to designated stroke centers in Ontario, Canada (2003–2013) with a first acute ischemic stroke or transient ischemic attack (TIA) in sinus rhythm and without known atrial fibrillation. The primary outcome was the proportion of patients who received at least 24-hour Holter monitoring within 30 days after stroke/TIA. Secondary analyses assessed total duration of ECG monitoring completed within 90 days after stroke/TIA, temporal trends in monitoring use, and use of Holter monitoring relative to echocardiography.

Results—Among 17 398 consecutive eligible patients (mean age 68.8±14.3 years), 30.6% had at least 24 hours of Holter monitoring within 30 days after stroke/TIA. Less than 1% of patients received prolonged monitoring beyond 48 hours. The median time to start monitoring was 9 days poststroke (interquartile range 3–25). Stroke/TIA patients were nearly twice as likely to receive an echocardiogram than a Holter monitor within 90 days (odds ratio 1.8, 95% confidence interval 1.67–2.01).

Conclusions—Less than one third of patients in our cohort received guideline-recommended 24-hour Holter monitoring, and <1% received prolonged ambulatory ECG monitoring. These findings highlight a modifiable evidence-practice gap that likely contributes to an overdiagnosis of strokes as cryptogenic, an underdiagnosis of atrial fibrillation, and missed anticoagulant treatment opportunities for secondary stroke prevention. **(*Stroke*. 2016;47:1982-1989. DOI: 10.1161/STROKEAHA.115.012195.)**

Key Words: cardiac rhythm monitoring ■ ECG ■ Holter ■ screening ■ stroke

See related article, p 1969.

Atrial fibrillation (AF) is the leading cardiac cause of stroke,[1] and its identification after a stroke or transient ischemic attack (TIA) is important for guiding secondary prevention management. However, paroxysmal AF frequently goes undetected and untreated if sufficient ECG monitoring is not performed.[2]

Increasing evidence from observational studies and randomized trials supports the effectiveness of electrocardiography (ECG) monitoring for improving the detection and treatment of paroxysmal AF after stroke.[3] Holter ECG monitoring (24–72 hours) detects paroxysmal AF in ≈5% of stroke patients,[4] and longer duration ECG monitoring detects AF in an additional 5% to 30% of patients depending on the type and duration of monitoring.[5–9] Several current guidelines recommend a minimum of 24 hours of ECG monitoring after stroke.[10–20] However, it is unclear how intensively patients presenting with ischemic stroke or TIA are being screened for paroxysmal AF in routine practice.

The present study sought to evaluate the type and duration of ambulatory ECG monitoring performed after stroke/TIA in a large provincial stroke registry as a quality indicator for secondary stroke prevention.

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Methods

Study Design and Data Sources

This cohort study (2003–2013) used data from the Ontario Stroke Registry linked with administrative health data from the province of Ontario, Canada. This registry is authorized under provincial privacy legislation to perform data collection without individual patient consent and prospectively captures all consecutive patients with acute stroke or TIA presenting to the emergency department (ED) of 12 designated stroke centers. Details of the registry methodology have previously been described.[21] This study was approved by the Research Ethics Board at Sunnybrook Health Sciences Center.

Using unique encoded patient identifiers, we linked the stroke registry to administrative databases housed at the Institute for Clinical Evaluative Sciences to obtain data for diagnostic procedures and outcomes. We captured the use of currently available and reimbursed ambulatory ECG monitors in Ontario, including Holter monitoring (24, 48, and >60 hours) and 14-day event loop recorders, by linkage to the Ontario Health Insurance Plan database. This database provides data on physician claims for universally available government-funded hospital services, physician visits, and diagnostic tests for all of Ontario's ≈12 million registered residents (see Table I in the online-only Data Supplement). We used the Canadian Institute for Health Information Discharge Abstract Database to document readmissions for stroke (ICD-10 codes: I630-I635, I637-I639, I64) within 90 days of the index admission and the Ontario Registered Persons Database to obtain out-of-hospital mortality data for all deaths within 90 days of the index admission.

Eligibility Criteria

We identified all consecutive patients with a first-ever acute arterial ischemic stroke or TIA presenting to the ED of designated stroke centers in Ontario from July 1, 2003, to March 31, 2013. To maximize specificity for the diagnosis of TIA, we only included TIA events with documented motor or speech presentation. To ensure that patients in the study cohort represented reasonable candidates for ECG monitoring, we excluded patients with known AF (previous history of AF or AF documented on admission ECG in the ED); pacemaker; history of prior stroke or TIA; any index stroke occurring in hospital or attributed to cervicocephalic artery dissection, vasculitis, or cerebral venous thrombosis; or documentation of a palliative care plan after stroke. To ensure that the study population focused primarily on those with an undetermined etiology, we excluded those who underwent carotid endarterectomy or carotid stenting within 90 days of the index event from all analyses, with the exception of comparisons between Holter monitoring and other diagnostic investigations.

Outcomes

The primary outcome was the proportion of patients who received at least 24-hour Holter monitoring within 30 days of their index stroke or TIA. Secondary outcomes included (1) the proportion of patients receiving single or multiple Holter studies for a maximum cumulative ECG monitoring duration of 24, 48, or >60 hours within 7, 30, or 90 days after stroke/TIA; (2) the proportion of patients receiving prolonged ECG monitoring with an event loop recorder within 7, 30, or 90 days after stroke/TIA.

Primary and secondary outcomes were analyzed both for the full study cohort and according to the following prespecified subgroups: (1) patients admitted to hospital versus those discharged from the ED; and (2) ideal candidates for AF screening, defined as those with a nonlacunar stroke event, who were discharged alive to home, inpatient rehabilitation, or another acute care hospital with a discharge modified Rankin scale score of 0 to 3 (ie, ambulatory without severe disability) versus the remainder of the study cohort.

We also conducted secondary analyses to evaluate factors associated with the primary outcome of 24-hour Holter monitoring within 30 days poststroke/TIA, assess temporal trends in monitoring use over the study period, and compare the proportion of patients undergoing at least 24-hour Holter monitoring to those undergoing other diagnostic procedures, including brain imaging with either computed tomography or magnetic resonance imaging, and echocardiography with either transthoracic or transesophageal echocardiography within 30 days after stroke/TIA.

Because inpatient telemetry was not routinely available in Ontario inpatient stroke units until recently, information on telemetry is not captured in these analyses. To assess the potential for bias in the exclusion of telemetry as an outcome, we surveyed the participating hospitals to determine whether routine inpatient telemetry was available for stroke patients during the study period.

Statistical Analyses

We generated frequency statistics to characterize the study cohort and used independent sample *t* tests and Chi-square testing to compare patients who underwent monitoring with those who did not on all continuous and categorical variables.

For the assessment of the primary outcome, we calculated the overall proportion of patients undergoing at least 24-hour Holter monitoring within 30 days after stroke or TIA. For secondary outcomes, we calculated the proportions of patients undergoing monitoring of different durations (24, 48, and >60 hours; total cumulative monitoring durations if patients had multiple monitors) within 7, 30, and 90 days after stroke or TIA. Chi-square testing was used to compare these proportions among prespecified subgroups.

We used cause-specific competing risk multivariable Cox regression to model patient factors affecting the rate of at least 24 hours of Holter monitoring within 30 days after stroke/TIA, adjusting for the competing risks of death and readmission for stroke before monitoring. Trend tests were used to evaluate changes in monitoring rates over the study period. McNemar χ^2 testing was used to compare the proportions of patients who underwent at least 24 hours of Holter monitoring with those who underwent brain imaging or echocardiography within 30 days from the date of the index stroke/TIA, and an unadjusted odds ratio was calculated to determine the likelihood of undergoing Holter monitoring versus echocardiography after stroke/TIA. SAS version 9.4 (SAS Institute Inc, Cary, NC) was used for all data analyses. All tests were 2-tailed, and P values <0.05 were considered significant.

Results

The cohort comprised 17 398 patients with a first acute ischemic stroke or TIA who met the eligibility criteria and were considered potential candidates for ECG monitoring for AF detection (Table 1). The mean age was 68.8±14.3 years, 62.8% had a history of hypertension, and 88.2% were functionally independent before the index event. The index event was an ischemic stroke in 75% of the patients and TIA in 25%. Two thirds (67.7%) of patients were hospitalized, with a median length of stay of 4 days (interquartile range: 0–10). Of those hospitalized, the majority (78.8%) had a modified Rankin Scale score of ≤3, indicating moderate, slight, or no disability, and 82.6% were discharged home or to inpatient rehabilitation (Table 1). Significant differences between those who did or did not undergo 24-hour Holter monitoring within 30 days of stroke or TIA were observed for several patient characteristics (Table 1).

Analysis of the primary outcome indicated that 30.6% (95% confidence interval [CI] 29.8–31.4) of patients underwent at least 24 hours of Holter monitoring within 30 days after stroke/TIA (Table 2). Analysis of secondary outcomes indicated that among those who underwent monitoring within 7, 30, or 90 days of the index event, studies were almost exclusively restricted to 24- or 48-hour Holter recordings. Less than 1% of patients received prolonged ECG monitoring with

Table 1. Characteristics of Study-Eligible Patients Presenting to Registry Stroke Center Hospitals in Ontario With a First Acute Arterial Ischemic Stroke or TIA Who Were Eligible for ECG Monitoring (N=17 398) and Separately for Those Who Did (N=3749) and Did Not (N=13 649) Undergo 24-Hour ECG Monitoring Within 30 Days, From 2003 to 2013

Factor	Total Cohort, (N=17 398), N (%)	Received ECG Monitoring (N=3749), N (%)	Did Not Receive ECG Monitoring (N=13 649), N (%)	*P* Value*
Age (mean, SD)	68.84±14.33	69.32±13.55	68.71±14.54	0.02
Female	7994 (45.9)	1675 (44.7)	6319 (46.3)	0.07
Rural residence	1814 (10.4)	281 (7.5)	1533 (11.2)	<0.001
Index event				
Ischemic stroke	13 050 (75.0)	2961 (79.0)	10 089 (73.9)	
TIA	4348 (25.0)	788 (21.0)	3560 (26.1)	<0.001
Oxfordshire classification†				
LACS	1258 (11.0)	161 (1.4)	1097 (9.6)	
PACS	2566 (22.5)	371 (3.3)	2195 (19.3)	
POCS	1473 (12.9)	188 (1.7)	1285 (11.3)	
TACS	449 (3.9)	42 (0.4)	407 (3.6)	<0.001
Preadmission functional independence	15 346 (88.2)	3442 (91.8)	11 904 (87.2)	<0.001
Admission status				
Admitted to hospital	11 783 (67.7)	2705 (72.2)	9078 (66.5)	
Discharged from ED	5615 (32.3)	1044 (27.8)	4571 (33.5)	<0.001
Hospital LOS (mean, SD)	8.45±19.08	8.4±16.06	8.4±19.84	0.88
AF detected during hospitalization	451 (2.6)	89 (2.4)	362 (2.7)	0.34
Past medical history				
Hypertension	10 921 (62.8)	2445 (65.2)	8476 (62.1)	<0.001
Diabetes mellitus	4159 (23.9)	887 (23.7)	3272 (24.0)	0.69
Hyperlipidemia	6277 (36.1)	1543 (41.2)	4734 (34.7)	<0.001
Congestive heart failure	650 (3.7)	103 (2.7)	547 (4.0)	0.003
Valvular heart disease	405 (2.3)	80 (2.1)	325 (2.4)	<0.001
Valve replacement	183 (1.1)	32 (0.9)	151 (1.1)	<0.001
Angina pectoris or CAD	979 (5.6)	180 (4.8)	799 (5.9)	0.01
Myocardial infarction	1904 (10.9)	372 (9.9)	1532 (11.2)	0.02
PCI, PTCA, or CABG	1512 (8.7)	327 (8.7)	1185 (8.7)	0.94
Dementia	989 (5.7)	170 (4.5)	819 (6.0)	<0.001
Current smoker	3886 (22.3)	778 (20.8)	3108 (22.8)	0.01
Discharged to				
Home	10 511 (60.4)	2333 (62.2)	8178 (59.9)	
Other acute care hospital	1515 (8.7)	256 (6.8)	1259 (9.2)	
LTC/nursing home	818 (4.7)	116 (3.1)	702 (5.1)	
Inpatient rehabilitation	3859 (22.2)	935 (24.9)	2924 (21.4)	
Retirement home	203 (1.2)	55 (1.5)	148 (1.1)	
Complex continuing care	97 (0.6)	20 (0.5)	77 (0.6)	<0.001
mRS group				
0–3	13 705 (78.8)	3034 (80.9)	10 671 (78.2)	
4–5	3060 (17.6)	595 (15.9)	2465 (18.1)	
6	324 (1.9)	22 (0.6)	302 (2.2)	<0.001

(*Continued*)

Table 1. Continued

Factor	Total Cohort, (N=17 398), N (%)	Received ECG Monitoring (N=3749), N (%)	Did Not Receive ECG Monitoring (N=13 649), N (%)	*P* Value*
Discharge status				
Dead	324 (1.9)	22 (0.6)	302 (2.2)	<0.001
Death				
≤7 d	245 (1.4)	6 (0.2)	239 (1.8)	<0.001
≤30 d	533 (3.1)	31 (0.8)	502 (3.7)	<0.001
≤90 d	922 (5.3)	99 (2.6)	823 (6.0)	<0.001
Readmission for stroke				
≤7 d	187 (1.1)	43 (1.1)	144 (1.1)	0.63
≤30 d	321 (1.8)	82 (2.2)	239 (1.8)	0.08
≤90 d	434 (2.5)	108 (2.9)	326 (2.4)	0.09

AF indicates atrial fibrillation; CABG, coronary artery bypass graft; CAD, coronary artery disease; ED, emergency department; LACS, lacunar syndrome; LOS, length of stay; LTC, long term care; mRS, modified Rankin Scale; PACS, partial anterior circulation syndrome; PCI, percutaneous coronary intervention; POCS, posterior circulation syndrome; PTCA, percutaneous transluminal coronary angioplasty; SD, standard deviation; TACS, total anterior circulation stroke; and TIA, transient ischemic attack.

**P* value for Chi-square or *t* tests comparing patients who did and did not undergo monitoring in ≤30 days poststroke/TIA.

†Data only available ≤2009 (N=11 391).

either >60-hour Holter or an event loop recorder (Table 2). The median time from stroke or TIA to the first Holter monitoring procedure was 9 days (interquartile range 3–25). Analysis of temporal trends showed an encouraging trend of increasing rates of 24-hour Holter monitoring within 30 days after stroke/TIA over time, ranging from 5% to 10% in fiscal years 2003 to 2006 to 20% to 40% in 2007 to 2009 and ≈45% in 2010 to 2013; rates of prolonged monitoring remained at <1%. Results of the survey regarding inpatient telemetry use indicated that, of the 12 registry hospitals, one reported providing routine inpatient telemetry for stroke inpatients from 2003 to 2015, one reported routine use beginning in 2014, and one reported selective use beginning in 2010, confirming that only a small minority of patients underwent inpatient telemetry in this cohort.

Unadjusted comparisons between prespecified subgroups showed that significantly more stroke/TIA patients who were admitted to registry hospitals or who represented ideal candidates for ECG monitoring underwent 24- and 48-hour Holter procedures across most time points ($P<0.001$), but that no association between groups for monitoring procedures >60 hours in duration was observed (Table 3).

Adjusted cause-specific multivariable Cox regression modeling indicated that patients who were admitted to hospital and were living independently before admission were more likely to undergo Holter monitoring within 30 days after stroke/TIA, whereas those who were under 75 years of age, resided in a rural location, had a disabling stroke (modified Rankin Scale score 4–5) or had a TIA because the presenting event were significantly less likely to undergo Holter monitoring within 30 days (Table 4).

In contrast to the low observed rate of ECG monitoring, nearly all patients (97.3%, 95% CI 97.0–97.6) underwent brain imaging (computed tomography or magnetic resonance imaging) and just over half (55.3%, 95% CI 54.6–56.1) received echocardiography (transthoracic echocardiography or transesophageal echocardiography) within 30 days of stroke/TIA. McNemar testing revealed that the proportion of patients receiving echocardiography within 30 days after stroke/TIA was significantly higher than those receiving Holter monitoring (of any duration) ($P<0.001$; Figure). An unadjusted odds estimate showed that patients were almost 2× more likely to undergo echocardiography than Holter monitoring within 30 days after stroke/TIA (odds ratio 1.8, 95% CI 1.67–2.01).

Discussion

In this provincial stroke registry, we found that over the last decade, only one third (30.6%) of consecutive patients with a first acute ischemic stroke or TIA presenting to designated stroke centers received the minimum guideline-recommended 24-hour Holter ECG monitoring within 30 days of their index event. Less than 20% received such monitoring in the acute phase (within the first week after stroke). Of those who did undergo any monitoring, the vast majority of studies were limited to a single 24-hour Holter recording, and <1% of patients received prolonged monitoring beyond 48 hours.

As practice guidelines recommend a minimum of 24 hours of ECG monitoring after stroke,[10–20] these findings highlight an evidence–practice gap. Underutilization of ECG monitoring has implications for both etiologic stroke diagnosis and secondary stroke prevention. Approximately 25% of ischemic strokes are classified as cryptogenic,[22] and a growing body of evidence indicates that undetected paroxysmal AF likely accounts for a proportion of these events.[23,24] Current diagnostic criteria for an embolic stroke of undetermined source require a minimum of 24-hour Holter monitoring,[22] shown to detect AF in ≈5% of patients.[4] Four randomized trials have demonstrated the effectiveness of longer duration ECG monitoring for improving AF detection and increasing oral anticoagulant treatment rates,[5–8]

Table 2. Proportions of Patients Who Underwent at Least 24-Hour Holter Monitoring Within 30 Days After Stroke/TIA (Primary Outcome) and Single or Cumulative Monitoring at Maximum Durations of 24, 48, and >60 Hours or Prolonged Event Loop Recording Within 7, 30, and 90 Days After Stroke/TIA (Secondary Outcomes), From 2003 to 2013 (n=17 398)

Monitoring Duration and Time, days	Number of Patients Who Received Monitoring	Proportion of Patients Who Received Monitoring, %	Standard Error	95% Confidence Interval, %
Primary outcome				
At least 24-h Holter				
Within 30 d	5318	30.6	0.003	29.8–31.4
Secondary outcomes				
24-h Holter				
Within 7 d	2227	12.8	0.002	12.3–13.4
Within 30 d	3749	21.5	0.003	20.9–22.3
Within 90 d	4687	26.9	0.003	26.3–27.7
48-h Holter*				
Within 7 d	798	4.6	0.002	4.3–5.0
Within 30 d	1699	9.8	0.002	9.3–10.3
Within 90 d	2253	12.9	0.003	12.4–13.5
>60-h Holter*				
Within 7 d	≤5	<0.1	0.000	0.0–0.1
Within 30 d	12	0.1	0.000	0.0–0.2
Within 90 d	25	0.1	0.000	0.0–0.3
Event loop recorder				
Within 7 d	6	<0.1	0.000	0.0–0.0
Within 30 d	45	0.3	0.000	0.0–0.0
Within 90 d	139	0.8	0.001	0.0–0.0

TIA indicates transient ischemic attack.
*Includes patients who received multiple monitors (eg, 2 separate 24-h monitors=48-h).

and emerging guideline recommendations are now calling for prolonged ECG monitoring for selected patients with cryptogenic stroke.[10,19,20] As anticoagulant therapy is superior to antiplatelet therapy for preventing stroke in patients with AF,[25,26] but is not usually prescribed for stroke/TIA patients unless AF is documented, the goal of ECG monitoring is to find AF that may change patient management. Although some patients will be found to have only brief subclinical AF of uncertain significance, others will have a significant AF burden that would likely benefit from anticoagulant therapy.[20] Economic analysis suggests that 7 to 30 days of noninvasive ECG monitoring is likely to be a cost-effective strategy for detecting AF and preventing recurrent strokes.[7,27]

A striking observation in the present study is the discrepancy in the utilization of Holter monitoring relative to transthoracic echocardiography. We found that patients were almost 2× more likely to receive an echocardiogram than a Holter monitor study after stroke/TIA (odds ratio 1.8, 95% CI 1.67–2.01), a finding that we interpret as an evidence–practice paradox (Figure). Specifically, an additional 21% of patients had an echocardiogram compared with a Holter monitor within 90 days of stroke or TIA. However, if a patient is considered a candidate for echocardiography, then a Holter or other ambulatory cardiac rhythm monitoring study is arguably at least as important, if not more important, for poststroke patient management.[9] Potential reasons for the observed low rates of ECG monitoring after stroke include lack of access to ambulatory ECG monitoring, lack of direct evidence that prolonged monitoring leads to lower rates of recurrent stroke, lack of inclusion of ECG monitoring as a quality measure, lack of emphasis on ECG monitoring in guidelines, and until recently, a lack of explicit guideline recommendations for any poststroke monitoring beyond 24 hours.

This study has limitations. We could not determine how many patients had inpatient telemetry (and for what duration), as this was not captured in the registry and is not consistently documented in hospital charts in clinical practice. However, our survey of participating hospitals indicated that only a small minority of patients would have had the opportunity to receive inpatient stroke unit telemetry in this cohort. Furthermore, negative inpatient telemetry does not exclude paroxysmal AF nor obviate the need for additional ambulatory ECG monitoring if AF is suspected, and similarly low rates of outpatient ECG monitoring were observed even among the patients who were not admitted to hospital (for

Table 3. Subgroup Comparisons of Patients Who Underwent Single or Cumulative ECG Monitoring Studies After Stroke/TIA, From 2003 to 2013

Monitoring Duration and Time, days	Event Proportion, %		*P* Value*	Event Proportion, %		*P* Value*
	Admitted (N=11 783)	Not Admitted (N=5615)		Ideal (N=12 234)	Other (N=5164)	
24-h Holter						
7 d	16.7	4.6	<0.001	12.9	12.5	0.48
30 d	23.0	18.6	<0.001	23.0	18.2	<0.001
90 d	26.1	28.7	0.002	29.7	20.5	<0.001
48-h Holter						
7 d	5.8	2.0	<0.001	5.1	3.4	<0.001
30 d	10.5	8.3	<0.001	10.8	7.1	<0.001
90 d	12.9	13.1	0.59	14.7	8.8	<0.001
>60-h Holter						
7 d	0.0	0.0	0.33	0.0	0.0	0.36
30 d	0.1	0.0	0.25	0.1	0.0	0.11
90 d	0.2	0.1	0.38	0.2	0.1	0.29
Event loop recorder						
7 d	0.0	0.1	0.07	0.0	0.0	0.48
30 d	0.2	0.4	0.04	0.4	0.0	<0.001
90 d	0.8	0.9	0.35	1.1	0.1	<0.001

TIA indicates transient ischemic attack.
**P* value for Chi-square comparisons between subgroups.

whom inpatient telemetry was not performed apart from whatever monitoring may have been conducted in the ED). In terms of generalizability, the results of this study reflect poststroke management in tertiary care centers in a Canadian healthcare system and, thus, may not be representative of diagnostic practices in other jurisdictions. However, our findings are consistent with reported low rates of ECG monitoring in other high-income countries.[28,29] Because our data reflect practice in hospitals with access to on-site Holter laboratories, it is likely that the rates of Holter monitoring are even lower in smaller community and rural hospitals. We acknowledge that ECG monitoring is not appropriate or necessary for all stroke patients, specifically those with catastrophic stroke, poor life expectancy, or contraindications to anticoagulant therapy. Ideal candidates for monitoring are elderly patients with an unexplained embolic stroke event, and good quality of life, who would be eligible for anticoagulant therapy if a sufficient burden of AF were detected. It is not possible from our stroke registry, however, to determine precisely which of our patients had an embolic stroke of undetermined source because this was not captured in the database. Based on the data available in our registry, we comprised an ideal subgroup as an approximation of individuals who we felt would represent prime candidates to consider for ECG monitoring.

Conclusions

Over the past decade in a large provincial stroke registry, we found that the majority of stroke/TIA patients did not receive a 24-hour Holter monitor study within 90 days, and almost none underwent serial or prolonged ECG monitoring beyond 48 hours. The underuse of poststroke ECG monitoring over the past decade has likely contributed to an overdiagnosis of stroke events as cryptogenic, an underdiagnosis of AF, and missed anticoagulant treatment opportunities for secondary stroke prevention. This study underscores the need for

Table 4. Patient Factors Associated With Undergoing Holter Monitoring Within 30 Days After Stroke/TIA, Adjusted Cause-Specific Competing Risks Multivariable Cox Regression Model

Factors	Hazard Ratio	95% Confidence Interval	*P* Value
Age (<75 y)	0.92	0.86–0.98	0.02
Rural residence	0.66	0.58–0.75	<0.001
Atrial fibrillation diagnosed in hospital*	0.87	0.70–1.09	0.27
Preadmission independence	1.50	1.32–1.70	<0.001
Moderate stroke severity (mRS=4–5)†	0.82	0.75–0.90	<0.001
Presenting event TIA	0.80	0.74–0.88	<0.001
Admission to registry hospital	1.30	1.20–1.42	<0.001
Prior history of dementia	0.91	0.78–1.08	0.29

mRS indicates modified Rankin Scale; and TIA, transient ischemic attack.
*Refers to those individuals who had newly-detected atrial fibrillation during the hospital stay.
†mRS=0–3 used as reference category.

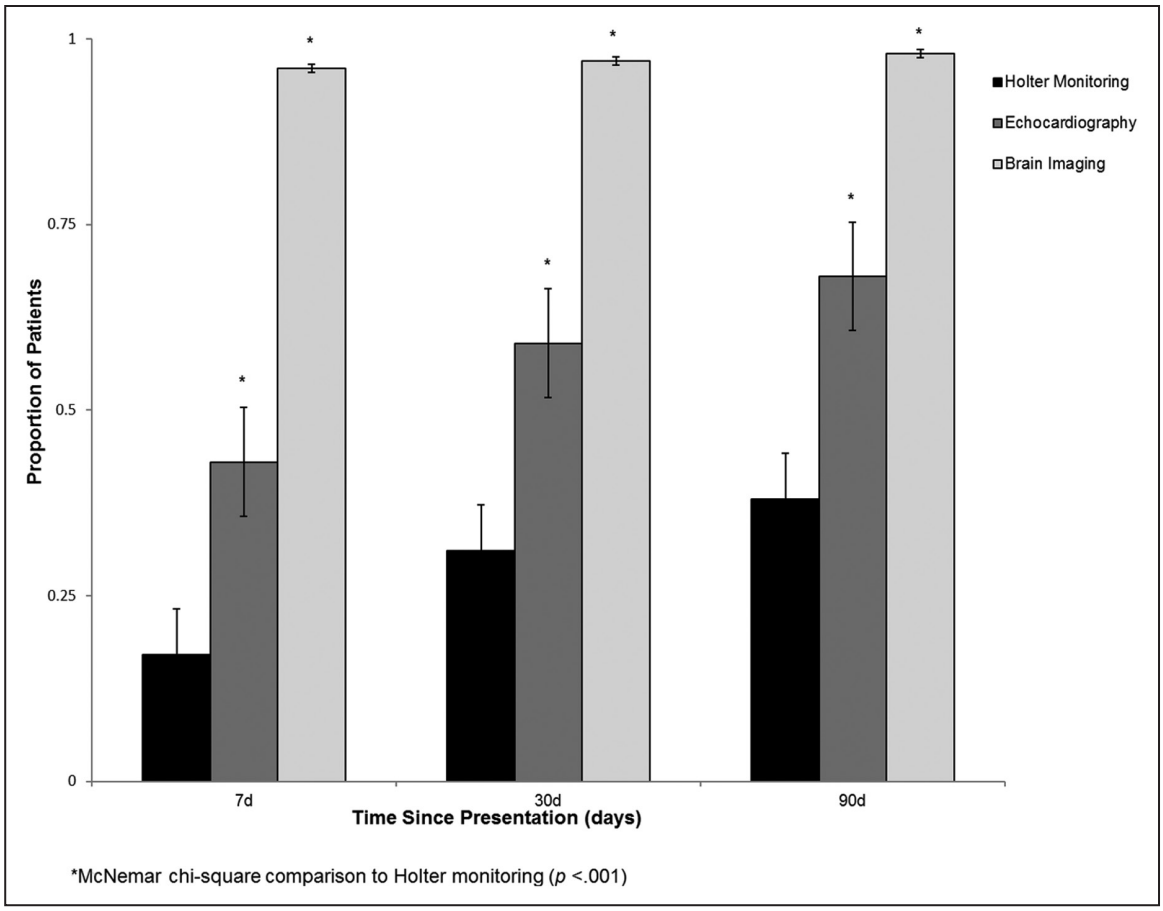

Figure. Proportion of patients undergoing at least 24 hours of Holter monitoring versus brain imaging (CT and MRI) and echocardiography (TTE or TEE) within 7, 30, and 90 days of stroke/TIA. CT indicates computed tomography; MRI, magnetic resonance imaging; TEE, transesophageal echocardiography; TIA, transient ischemic attack; and TTE, transthoracic echocardiography.

clinicians and policymakers to address the gap between recent evidence regarding the effectiveness of ECG monitoring for AF detection and real-world practices.

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