Sex Differences in the Presentation, Care, and Outcomes of Transient Ischemic Attack
Results From the Ontario Stroke Registry

Olivia L. Li, BSc; Frank L. Silver, MD; Judith Lichtman, PhD, MPH; Jiming Fang, PhD; Melissa Stamplecoski, BSc; Rebecca S. Wengle, BSc; Moira K. Kapral, MD, MSc

Background and Purpose—Little is known about whether sex differences exist in the presentation, management, and outcomes of transient ischemic attack.

Methods—We conducted a cohort study of 5991 consecutive patients with transient ischemic attack admitted to 11 stroke centers in Ontario, Canada, between July 1, 2003, and March 31, 2008 and compared presenting symptoms, processes of care, and outcomes in women and men. We used linkages to administrative databases to evaluate mortality and recurrent vascular events within 30 days and 1 year of the initial presentation, with multivariable analyses to assess whether sex differences persisted after adjustment for age and comorbid conditions.

Results—The most common presenting symptoms for both sexes were weakness, speech impairment, and sensory deficit, with headache being slightly more frequent in women. Women were less likely than men to undergo carotid imaging, carotid endarterectomy, or receive lipid-lowering therapy. One-year mortality was slightly lower in women than in men (adjusted hazard ratio, 0.77; 95% confidence interval, 0.63–0.94).

Conclusions—We found only minor sex differences in the presentation and management of transient ischemic attack, suggesting that current public awareness campaigns focusing on classic warning signs are appropriate for both women and men. Future work should focus on evaluating whether lower rates of carotid imaging, endarterectomy, and lipid-lowering therapy in women reflect undertreatment of women or are appropriate based on patient eligibility.

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Key words: ischemic attack, transient ■ registries ■ sex ■ stroke

Sex differences may exist in the presentation and management of stroke, but little is known about whether such differences exist in the setting of transient ischemic attack (TIA). We used data from a stroke registry to compare the presenting symptoms, management, and outcomes of women and men with TIA.

Methods

Data Sources and Outcomes
From the Ontario Stroke Registry, we identified consecutive patients seen in the emergency department or admitted to hospital with TIA in 11 stroke centers between July 1, 2003, and March 31, 2008. Using unique encrypted patient identifiers, we linked patients in the registry to the Canadian Institute for Health Information Discharge Abstract Database to identify carotid endarterectomies (International Classification of Diseases Tenth Revision CCI code IJE57**), subsequent hospitalizations for TIA (International Classification of Diseases Tenth Revision code G45), stroke (codes I63, I64), and myocardial infarction (codes I20–I25) and to the Ontario Registered Persons Database to identify deaths. This study was approved by the Research Ethics Board of Sunnybrook Health Sciences Center.

Statistical Analysis
We compared the symptoms and management of women and men using t tests for continuous variables and χ² tests for categorical variables. For the outcomes of death and readmission, we used Cox proportional hazard models to analyze time-to-event by sex, with adjustment for age, hospitalization for the index TIA event, dementia, prior myocardial infarction, diabetes mellitus, atrial fibrillation, number of hospitalizations in the year before the index event, and neighborhood income quintile. We used SAS version 9.3.

Results
In the study sample of 5991 patients (48.6% women), the most common presenting symptoms were weakness, speech impairment, and sensory deficit, with headache being slightly more frequent in women (Table 1). Compared with men, women were older and less likely to be independent before admission. Women were less likely than men...
to undergo carotid imaging and carotid endarterectomy and less likely to be prescribed statins, but processes of care were otherwise similar (Table 2). One-year mortality was lower in women than in men (adjusted hazard ratio, 0.77; 95% confidence interval 0.63–0.94; Table 3).

Discussion

Although some studies have found a higher prevalence of nontraditional stroke symptoms in women, our results are consistent with other studies that have reported no major sex differences in presenting symptoms.1–4 This suggests that the current public awareness campaigns focusing on traditional warning signs are appropriate for both women and men, although healthcare providers should also be aware that 1 in 5 women with TIA may have headache as a concurrent presenting symptom. Our findings that women with TIA tend to be elderly, have premorbid functional impairment, and live alone have also been seen in studies of stroke patients, and may contribute to the poorer poststroke functional outcomes that have been observed in women compared with men.1,2

The lower use of carotid imaging, carotid revascularization, and lipid lowering therapy in women than in men has also been previously described in patients with stroke and may be in part attributable to sex differences in patient preferences or in eligibility for treatment, specifically a greater prevalence of both carotid stenosis and coronary artery disease in men.2,7–11 Further study is needed to determine whether all of the observed differences can be ascribed to appropriate patient selection or whether there is underuse of these interventions in women.

Studies of sex differences in prognosis after stroke/TIA have generally reported a lower risk of death and recurrent vascular events in women than in men,6,12,13 and we also found lower adjusted 1-year mortality in women. Theoretical explanations for this survival advantage in women include the protective effects of estrogen14 and sex differences in stroke/TIA cause, care-seeking behaviors, or adherence to medications.

The limitations of our study include lack of information on patient preferences that might have influenced treatment, and an inability to evaluate outcomes, such as long-term functional status, quality of life, or depression, all of which may be differentially affected in women and men. Presenting symptoms were ascertained from chart abstraction using predefined categories and did not include some nontraditional symptoms. Our patients were seen at specialized stroke centers and had universal access to healthcare, and this may have attenuated potential sex differences in care.
Table 3. Outcomes of Women and Men With Transient Ischemic Attack

<table>
<thead>
<tr>
<th></th>
<th>Women, n=2912</th>
<th>Men, n=3079</th>
<th>Adjusted Hazard Ratio* Women vs Men (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes at 30 d, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIA</td>
<td>2.1</td>
<td>2.8</td>
<td>0.79 (0.56–1.10)</td>
</tr>
<tr>
<td>Stroke</td>
<td>2.6</td>
<td>2.9</td>
<td>0.88 (0.64–1.20)</td>
</tr>
<tr>
<td>MI</td>
<td>0.3</td>
<td>0.5</td>
<td>0.88 (0.38–2.02)</td>
</tr>
<tr>
<td>Any of TIA, stroke, or MI</td>
<td>5.1</td>
<td>6.1</td>
<td>0.85 (0.68–1.06)</td>
</tr>
<tr>
<td>Death</td>
<td>1.3</td>
<td>1.1</td>
<td>1.11 (0.68–1.83)</td>
</tr>
<tr>
<td>Death, TIA, stroke, or MI</td>
<td>6.4</td>
<td>6.9</td>
<td>0.92 (0.75–1.13)</td>
</tr>
<tr>
<td>Outcomes at 1 y, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIA</td>
<td>4.3</td>
<td>4.1</td>
<td>1.11 (0.86–1.44)</td>
</tr>
<tr>
<td>Stroke</td>
<td>4.8</td>
<td>5.2</td>
<td>0.90 (0.71–1.13)</td>
</tr>
<tr>
<td>MI</td>
<td>2.2</td>
<td>2.9</td>
<td>0.99 (0.70–1.41)</td>
</tr>
<tr>
<td>Any of TIA, stroke, or MI</td>
<td>10.7</td>
<td>11.4</td>
<td>0.95 (0.82–1.12)</td>
</tr>
<tr>
<td>Death</td>
<td>6.5</td>
<td>7.2</td>
<td>0.77 (0.63–0.94)</td>
</tr>
<tr>
<td>Death, TIA, stroke, or MI</td>
<td>16.0</td>
<td>16.7</td>
<td>0.93 (0.81–1.05)</td>
</tr>
</tbody>
</table>

CI indicates confidence interval; MI, myocardial infarction; and TIA, transient ischemic attack.

*Adjusted for age, hospital admission, dementia, prior myocardial infarction, diabetes mellitus, atrial fibrillation, number of hospitalizations in the year before the index event, and neighborhood income quintile.

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Disclosures
Dr Silver has served as a speaker for Boehringer Ingelheim Canada and Servier Canada and as a Canadian study coordinator for Boehringer Ingelheim Canada. The other authors report no conflicts.

References
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