Impact of Living Alone on the Care and Outcomes of Patients With Acute Stroke

Mathew J. Reeves, PhD; Marla Prager, BS; Jiming Fang, PhD; Melissa Stamplecoski, MS; Moira K. Kapral, MD

Background and Purpose—Outcomes among patients living alone at stroke onset could be directly affected by reduced access to acute therapies or indirectly through the effects of social isolation. We examined the associations between living alone at home and acute stroke care and outcomes in the Registry of the Canadian Stroke Network.

Methods—Between 2003 and 2008, 10,048 patients with acute stroke (87% ischemic, 13% hemorrhagic) who were living at home were admitted to 11 Ontario hospitals. Outcomes included arrival ≤2.5 hours of onset, thrombolytic treatment, discharge home, 30-day and 1-year mortality, and 1-year readmission. The effects of living alone versus living with others were determined using multivariable logistic regression.

Results—Overall, 22.8% (n=2,288) of patients were living alone at home before stroke. Subjects living alone were significantly older (mean, 74.6 versus 71.5 years), more likely to be women (61.5% versus 41.4%), widowed (53.7% versus 12.3%), or single (21.5% versus 3.8%). Patients living alone were less likely to arrive within 2.5 hours (28.3% versus 40.0%; adjusted odds ratio, 0.54; 95% confidence interval, 0.48–0.60), to receive thrombolysis (8.0% versus 14.0%; adjusted odds ratio, 0.52; 95% confidence interval, 0.43–0.63), or to be discharged home (46.0% versus 54.7%; adjusted odds ratio, 0.65; 95% confidence interval, 0.58–0.73). There were no significant associations between living alone and mortality or readmission.

Conclusions—Patients living alone had delayed hospital arrival, less thrombolytic therapy, and were less likely to return home. Greater understanding of the inter-relationships among living alone, social isolation, access to stroke care, and outcomes is needed. (Stroke. 2014;45:00-00.)

Key Words: living arrangements ■ social isolation ■ stroke care

There is growing interest in the relationships between social isolation and health.1,2 Measuring social isolation is a complex undertaking requiring consideration of both structural (eg, marital status, living arrangements) and functional (eg, emotional and perceived support) aspects of social relationships.3 Despite recognized limitations living alone is a commonly used proxy for social isolation.1,3 Although living alone has been associated with delayed hospital arrival after stroke,4 assessments of the broader impact of living alone on patients with acute stroke are lacking. Using data from the Registry of the Canadian Stroke Network, we examined the associations between living alone at home before stroke and access to acute stroke care and clinical outcomes.

Methods

Registries Design
Details of the Registry of the Canadian Stroke Network have been described elsewhere.5 Between 2003 and 2008, the registry enrolled consecutive patients with acute stroke admitted to 11 Ontario hospitals. Data on demographics, living circumstances (living alone versus living with others), past medical history, stroke severity (Canadian Neurological Scale [CNS]),6 EMS (Emergency Medical Services) use, in-hospital care, and discharge status were abstracted by trained personnel. Deaths and readmissions after discharge were determined by linking to provincial administrative databases.

Data Analysis
The analysis was limited to 10,048 acute stroke admissions (87% ischemic, 13% hemorrhage) living at home before stroke. Separate multivariable logistic regression models were used to quantify the independent associations between living alone (versus living with others) and the outcomes of early arrival (≤2.5 hours), intravenous thrombolysis (among all patients with ischemic stroke and among those who arrived ≤2.5 hours), discharge to home, 30-day mortality, 1-year mortality, and 1-year readmission. Age, sex, stroke type, stroke severity, past medical history, and EMS use were included in all models.

Results
Overall, 22.8% of the study population was living at home alone before admission. Those living alone were older, more likely to be women, widowed, divorced, single, and to smoke but were less likely to have diabetes mellitus, dyslipidemia, or dementia (Table 1). Patients living alone were more likely to have ischemic stroke, milder stroke severity (as indicated by higher Canadian Neurological Scale scores) but were more likely to arrive by EMS (Table 1).
Table 1. Demographic and Clinical Characteristics Associated With Living Alone or Living With Others at Home

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (%)</th>
<th>Living Alone (%)</th>
<th>Living With Others (%)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean±SD), y</td>
<td>72.2±13.16</td>
<td>74.6±12.68</td>
<td>71.5±13.21</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Women</td>
<td>4620 (46%)</td>
<td>1406 (61.5%)</td>
<td>3214 (41.4%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Married/common</td>
<td>6255 (62.3%)</td>
<td>89 (3.9%)</td>
<td>6166 (79.5%)</td>
<td>...</td>
</tr>
<tr>
<td>Widowed</td>
<td>2185 (21.7%)</td>
<td>1228 (53.7%)</td>
<td>957 (12.3%)</td>
<td>...</td>
</tr>
<tr>
<td>Divorced/separated</td>
<td>557 (5.5%)</td>
<td>353 (15.4%)</td>
<td>204 (2.6%)</td>
<td>...</td>
</tr>
<tr>
<td>Single</td>
<td>789 (7.9%)</td>
<td>493 (21.5%)</td>
<td>296 (3.8%)</td>
<td>...</td>
</tr>
<tr>
<td>Unknown</td>
<td>262 (2.6%)</td>
<td>125 (5.5%)</td>
<td>137 (1.8%)</td>
<td>...</td>
</tr>
<tr>
<td>Past medical history</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke/TIA</td>
<td>3090 (30.8%)</td>
<td>683 (29.9%)</td>
<td>2407 (31.0%)</td>
<td>0.287</td>
</tr>
<tr>
<td>Depression</td>
<td>468 (4.7%)</td>
<td>111 (4.9%)</td>
<td>357 (4.6%)</td>
<td>0.6168</td>
</tr>
<tr>
<td>Hypertension</td>
<td>6904 (68.7%)</td>
<td>1608 (70.3%)</td>
<td>5296 (68.2%)</td>
<td>0.0654</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>3540 (35.2%)</td>
<td>698 (30.5%)</td>
<td>2842 (36.6%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>2526 (25.1%)</td>
<td>512 (22.4%)</td>
<td>2014 (26.0%)</td>
<td>0.0005</td>
</tr>
<tr>
<td>Dementia</td>
<td>672 (6.7%)</td>
<td>115 (5.0%)</td>
<td>557 (7.2%)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Smoking</td>
<td>1844 (18.4%)</td>
<td>502 (21.9%)</td>
<td>1342 (17.3%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Stroke type</td>
<td>0.0025</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic</td>
<td>8764 (87.2%)</td>
<td>2038 (89.1%)</td>
<td>6726 (86.7%)</td>
<td>...</td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>1284 (12.8%)</td>
<td>250 (10.9%)</td>
<td>1034 (13.3%)</td>
<td>...</td>
</tr>
<tr>
<td>Level of consciousness on admission</td>
<td>0.0016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alert</td>
<td>8589 (85.5%)</td>
<td>1998 (87.3%)</td>
<td>6591 (84.9%)</td>
<td>...</td>
</tr>
<tr>
<td>CNS (mean±SD)</td>
<td>7.9±3.23</td>
<td>8.1±3.11</td>
<td>7.85±3.27</td>
<td>0.0015</td>
</tr>
<tr>
<td>EMS use</td>
<td>6762 (67.3%)</td>
<td>1588 (69.4%)</td>
<td>5174 (66.7%)</td>
<td>0.0144</td>
</tr>
</tbody>
</table>

CNS indicates Canadian Neurological Scale; EMS, Emergency Medical Services; and TIA, transient ischemic attack. α2 or t test.

The median onset-to-arrival time was 10.5 hours (interquartile range, 2.0–24.7) for patients living alone when compared with 4.5 hours (interquartile range, 1.4–15.6) for those living with others. This translated to a substantially lower proportion of patients living alone arriving within 2.5 hours (Table 2). Patients living alone were also substantially less likely to be treated with thrombology and to be discharged to home when compared with those living with others. These differences remained statistically significant after multivariable adjustment, with the exception of thrombolysis treatment among subjects who arrived ≤2.5 hours, which became marginally significant (P=0.07; Table 2). There were no significant differences in mortality or readmissions by living status after adjustment.

Discussion

We found that subjects living alone at home were much less likely to arrive early to the hospital than those living with others, and that this delay translated into substantially lower thrombolysis treatment rates; among all ischemic stroke admissions, only 8% of patients who lived alone received thrombolysis treatment when compared with 14% of those living with others. We are aware of only 1 other study that has reported on thrombolysis treatment by living status; the Swedish stroke registry also demonstrated that treatment rates were ≈50% lower in patients who lived alone.7 Our study also found that even among patients who arrived within 2.5 hours that thrombolysis treatment rates were lower in those living alone (27% versus 35%). Examination of the reasons documented for nontreatment (including no consent available, delayed decision, physician decision) did not find any significant differences by living status; thus, the lower treatment rate in living alone patients was apparently not related to the lack of critical information typically provided by a family member.

Our findings that just >22% of patients were living alone and that they were older and disproportionately women are consistent with previous literature.5 Data from the 2011 Canadian census indicate that one quarter of the population ≥65 years old report living alone, and that women are nearly twice as likely to live alone than men (31.5% versus 16.0%). These data indicate that the negative impact of living alone on patients with stroke will be greater in women.

Our data have several limitations. First, we did not collect data on other psychosocial measures, including social isolation, social support, or loneliness. Second, we do not know whether the subjects were actually alone at the time of stroke onset and whether the stroke was witnessed by a bystander. Third, longer term outcomes were limited to mortality and readmissions and did not include functional status.

Examining the effect of living alone and social isolation on health and disease will become increasingly important as the numbers of individuals living alone continue to increase. Living alone will remain one of the most common and important social factors that can affect the care and outcomes of...
patients with stroke. Further research is required to understand the complex inter-relationships among living alone, social isolation, and access to acute stroke care, so that interventions that could ameliorate the adverse effects of living alone can be identified.

Sources of Funding
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Disclosures
None.

References
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