Self-Reported Depression and Use of Antidepressants After Stroke: A National Survey

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Background and Purpose—Depression after stroke is often described as underdiagnosed and undertreated. However, there are few data on self-reported depression and use of antidepressants in stroke patients at large.

Materials and Methods—In the Swedish national quality assessment register, Riks-Stroke, 15,747 stroke survivors are recorded. They were asked about depressive mood and antidepressant treatment 3 months after stroke. Age-specific prevalence of antidepressant use after stroke was calculated.

Results—At 3 months after stroke, 12.4% of male and 16.4% of female stroke survivors reported that they always or often felt depressed. In a multiple logistic regression model, female sex, age younger than 65 years, living alone, having had a recurrent stroke, being dependent on others, and institutional living 3 months after stroke were independent predictors of self-reported depression. Antidepressant medication was used by 22.5% of men and 28.1% of women who had had a stroke. Of patients using antidepressant drugs, 67.5% did not report depressive mood. However, 8.4% of the entire cohort reported depressive mood but no treatment with antidepressants. When compared with the general population, approximately twice as many of the stroke patients were using antidepressant treatment.

Conclusions—In this national survey, 1 in 7 patients reported that they felt depressed and the use of antidepressant drugs after stroke was common. The widespread use of antidepressants challenges the contention that antidepressants are generally underused after stroke. However, the substantial proportion reporting depressive mood but not using treatment with antidepressants suggests that patient selection for treatment should be more precise. (Stroke. 2004;35:936-941.)

Key Words: stroke ■ depression ■ antidepressive agents

Depression after stroke is a well-defined entity that is serious and treatable. It has severe implications for quality of life1–3 and is strongly associated with excess mortality during the first years after stroke.4–6 It may be reactive to the disabilities caused by the stroke and the profound changes in basic aspects of life conferred by stroke; however, in many patients, depression after stroke also seems to have a direct physiological and anatomical correlate.3,7,8

Tricyclic antidepressants and serotonin uptake inhibitors have, in randomized controlled trials, been shown to be superior to placebo to alleviate depression after stroke.9 It is a widely held contention that depression after stroke is an underdiagnosed and undertreated condition. However, there is little information available outside the setting of research cohorts to support this sentiment. As reported later in this article, antidepressant agents are widely used in the population at large and, during the stroke-prone ages, antidepressant drugs are now used by 1 in every 10 men and 1 in every 5 women in Sweden. Rapid increases in the use of antidepressants among elderly people have been reported from many countries, including Australia,9 Italy,10 Sweden,11 United Kingdom,12 and the United States.13,14 It seems that, after all, depression is recognized and treated much more frequently today than previously. To what extent this applies to patients with depression after stroke is unknown.

Riks-Stroke, the national register for assessment of the quality of stroke care in Sweden,15 was initiated in 1994. All 84 hospitals that care for acute stroke patients participate and 20,000 patients are included each year. From 2001, questions concerning depression and use of antidepressants have been included in the 3-month follow-up. The objective of this study was to describe and analyze, in a large national cohort, self-reported depression after stroke, its risk factors, and treatment with antidepressant drugs.

Materials and Methods

Study Population

In 2002, 22,530 patients treated in 84 hospitals were registered in Riks-Stroke, the Swedish national register for quality assessment of
stroke care.\textsuperscript{15,16} Of these, 2679 (11.9\%) died during the hospital stay and another 1301 (5.8\%) died later during the 3-month follow-up.

**Outcome Variables**

Each hospital conducted a 3-month follow-up of their stroke patients and data were submitted to the Riks-Stroke national coordinating center using an Internet-based system (details are given at the Riks-Stroke web site: http://www.riks-stroke.org/files/ENGcontent-s.html). Most hospitals received the 3-month follow-up questionnaire in written form and, if necessary, the staff obtained complementary information by telephone interviews. In 27 of the 84 hospitals, a majority of the follow-up information (>50\%) was obtained by telephone interviews. Of the 15,747 patients that were followed-up in this study, 4561 (29.0\%) answered the questionnaire in writing by themselves, 3677 (23.4\%) answered in writing with help from a family member, 4658 (29.6\%) answered by telephone, 349 (2.2\%) answered during a visit to the hospital, 1559 (9.9\%) had a caregiver who answered, and 942 (6.0\%) answered in some other way.

One of the questions at the 3-month follow-up of the patients who had a stroke in 2002 was “Do you feel depressed?” Five fixed response alternatives were given: “never/almost never,” “sometimes,” “often,” “all the time,” and “do not know.” Patients who answered “often” or “all the time” were considered to have self-reported depression and patients who answered “do not know” were considered to be missing. The variable self-reported depression (yes/no) was the primary outcome variable in this study. One question concerned treatment of depression (yes/no/do not know). Age (64 or younger, 65 to 74, 75 to 84, and 85 or older), sex, place of living, cohabitant status, activities of daily living (ADL) performance and use of antidepressants 3 months after stroke were analyzed as co-variates. Self-reported ADL proficiency was estimated by a 3-item instrument that has been shown to correlate closely with the Barthel index.\textsuperscript{16}

**Validation of Self-Reported Depression in Riks-Stroke**

The Riks-Stroke question on depression was validated in a separate study in which 36 patients (one-third each with mild, moderate, and severe neurological deficits) were interviewed approximately 3 months after they had a stroke. Self-reported depression in Riks-Stroke was compared with depression (mild or severe) as defined by the Prime-MD instrument.\textsuperscript{15} The 2 instruments correlated reasonably well ($r_c=0.645; P<0.001$). When depression was not present according to the Prime-MD criteria (n=22), self-reported depression was not present by the Riks-Stroke classification in all instances (specificity=100\%). Of the 13 patients that had mild depression according to Prime-MD, 5 were correctly classified using Riks-Stroke criteria (sensitivity=38\%).

**Sales of Antidepressant Drugs**

Information on the sales of antidepressants (ATC code N06A) in the general Swedish population in 2002 was obtained from Apoteket AB, Stockholm (the Swedish pharmacy chain having exclusive rights to sell drugs prescribed by a physician). The sales were expressed as defined daily doses per 1000 inhabitants. Defined daily doses for antidepressant agents were those defined by the WHO Collaborating Centre for Drug Statistics Methodology (available at: http://www.whocc.no/atcddd). The point prevalence (%) of antidepressant use was then estimated as defined daily.

**Statistical Methods**

Univariate logistic regression was used to test for associations between self-reported depression and the factors of sex, age, living alone at follow-up, institutional living at follow-up, primary ADL function at follow-up, stroke subtype, level of consciousness on admission, and recurrent stroke. To simultaneously test the factors, multiple logistic regression was used. Results are presented with estimated odds ratios and corresponding 95\% confidence intervals. The use of antidepressants was analyzed using the same methods and factors. The statistical package SAS, release 8.2, was used for the analyses.

**Results**

**Missing Data**

Among the 18,550 patients still alive 3 months after stroke, 2803 (15.1\%) were lost to follow-up. Patients lost to follow-up were more often women (50.6\% versus 47.9\%), older (mean age 78 versus 76 years), living alone (54.8\% versus 45.3\%), and ADL-dependent (11.6\% versus 7.0\%) prior to their stroke. Of the 15,747 patients that were followed-up, responses to the question concerning depressive mood was missing for 1748 (11.1\%). Thus, data on self-reported depression at 3 months’ follow-up were available in 13,999 patients (Figure 1). Many of the patients with missing data on mood (945 out of 1748; 54.1\%) had not answered the questionnaire by themselves. Hence, older, ADL-dependent patients and patients not living at home were over-represented in that group. Data concerning use of antidepressants were available for 11,687 (74.2\%) of the patients who were followed-up (Figure 1). The majority (77\%) of the patients who did not answer the questions concerning antidepressants were identical with those who did not answer the depressive mood question. The remainder of the missing group did not differ substantially with respect to age (mean 74.4 versus 74.0 years), sex (53.5\% versus 52.5\% men), and proportion being ADL-independent at follow-up (76.0\% versus 75.9\%) compared with those who answered the antidepressant question.

**Self-Reported Depression**

At the 3-month follow-up, 1999 patients (14.3\%) reported that they felt depressed (12.4\% of the men and 16.4\% of the
women). Female sex, having had recurrent stroke, and not being fully conscious on admission were all associated with self-reported depression in the univariate analysis (Table 1). Being dependent on others in ADL, institutional living at 3 months after stroke, and, among those living at home, living alone, were also factors associated with self-reported depression (Table 1). Age, stroke subtype, and whether the patient had been treated in a stroke unit during the acute phase had little impact on self-reported depression.

Including the aforementioned variables, a multiple logistic regression verified the results from the univariate analysis, with the exception of lowered level of consciousness on admission that was no longer significantly associated with self-reported depression. In addition, after adjustment for co-variates, younger patients (younger than 65 years) were significantly more likely than elderly patients to report depressive mood (Table 2).

To further investigate the implied association between younger age and depression, a separate analysis was performed with the least severely affected patient group, ie, those who were ADL-independent and were living at home without community service at the follow-up. Also, in this subgroup, younger patients were significantly more likely to report that they felt depressed than were older patients, thereby verifying the overall results from the multiple logistic regression (data not shown).

**Antidepressant Medication**

At the follow-up, answers were available for self-reported depression and use of antidepressant drugs in 11 292 patients. As shown in Table 3, approximately half (49.1%) who reported depressive mood were using antidepressants. The 943 patients who felt depressed but were not using drug treatment represent 8.4% of the entire population. However,
TABLE 2. Odds Ratio Estimates of Self-Reported Depression Using Multiple Logistic Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>95% CI for OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1.30</td>
<td>1.17–1.44</td>
</tr>
<tr>
<td>Age (ref. 64–74)</td>
<td>0.68</td>
<td>0.59–0.80</td>
</tr>
<tr>
<td>75–84</td>
<td>0.64</td>
<td>0.55–0.73</td>
</tr>
<tr>
<td>≥85</td>
<td>0.61</td>
<td>0.51–0.73</td>
</tr>
<tr>
<td>Recurrent strokes</td>
<td>1.13</td>
<td>1.02–1.27</td>
</tr>
<tr>
<td>Impaired consciousness on admission</td>
<td>1.09</td>
<td>0.93–1.28</td>
</tr>
<tr>
<td>Stroke subtype (ref. ischemic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>0.84</td>
<td>0.71–1.00</td>
</tr>
<tr>
<td>Undetermined</td>
<td>0.91</td>
<td>0.70–1.18</td>
</tr>
<tr>
<td>Stroke unit care</td>
<td>1.06</td>
<td>0.94–1.20</td>
</tr>
<tr>
<td>ADL-dependent at follow-up</td>
<td>2.34</td>
<td>2.05–2.67</td>
</tr>
<tr>
<td>Living situation at follow-up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At home, alone</td>
<td>1.48</td>
<td>1.30–1.67</td>
</tr>
<tr>
<td>In institution</td>
<td>1.73</td>
<td>1.48–2.05</td>
</tr>
</tbody>
</table>

ref. indicates reference category.

of those treated with antidepressant drugs, less than one-third (911 of 2806; 32.5%) reported depressive mood. In the subgroup of patients reporting depressive mood, being a woman, living in an institution, and being ADL-dependent significantly increased the likelihood of using an antidepressant (data not shown).

When patients who used antidepressants were compared with those who were depressed but did not report the use of antidepressants, it emerged that patients with severe stroke sequelae (living in an institution and ADL-dependent) were more likely to use antidepressive drugs (Table 4). Patients in the oldest age category (85 years or older) were significantly less likely to report use of antidepressants.

In comparisons of the use of antidepressants in stroke patients versus the general populations, we used data on all 11 687 patients with information on drug use, ie, we also used data on use of antidepressants from 395 who had not responded to the question on mood (Figure 1). Use of antidepressants was much more common in stroke patients as compared with the general population (Figure 2). The difference was most evident among younger stroke patients. Among men, the relative use of antidepressants in stroke patients versus general population decreased from 4.5 in the 45- to 64-year-old group to 1.3 in the 85 and older age group.

TABLE 3. Reported Use of Antidepressant Drugs vs Self-Reported Depression in 11 292 Stroke Patients at 3-Month Follow-up

<table>
<thead>
<tr>
<th>Use of Antidepressants</th>
<th>Yes (n=2806)</th>
<th>No (n=8486)</th>
<th>Total (n=11 292)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-reported depression</td>
<td>911</td>
<td>943</td>
<td>1854</td>
</tr>
<tr>
<td>No self-reported depression</td>
<td>1895</td>
<td>7543</td>
<td>9438</td>
</tr>
</tbody>
</table>

TABLE 4. Odds Ratio Estimates of Use of Antidepressants Using Multiple Logistic Regression*

<table>
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<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>95% CI for OR</th>
</tr>
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<tbody>
<tr>
<td>Female</td>
<td>1.15</td>
<td>0.98–1.35</td>
</tr>
<tr>
<td>Age (ref. 64–74)</td>
<td>0.96</td>
<td>0.76–1.22</td>
</tr>
<tr>
<td>75–84</td>
<td>0.88</td>
<td>0.71–1.09</td>
</tr>
<tr>
<td>≥85</td>
<td>0.52</td>
<td>0.39–0.68</td>
</tr>
<tr>
<td>Recurrent strokes</td>
<td>1.05</td>
<td>0.88–1.24</td>
</tr>
<tr>
<td>Impaired consciousness on admission</td>
<td>1.15</td>
<td>0.90–1.47</td>
</tr>
<tr>
<td>Stroke subtype (ref. ischemic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>0.97</td>
<td>0.74–1.27</td>
</tr>
<tr>
<td>Undetermined</td>
<td>0.96</td>
<td>0.65–1.41</td>
</tr>
<tr>
<td>Stroke unit care</td>
<td>1.08</td>
<td>0.90–1.31</td>
</tr>
<tr>
<td>ADL-dependent at follow-up</td>
<td>1.53</td>
<td>1.25–1.87</td>
</tr>
<tr>
<td>Living situation at follow-up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At home, alone</td>
<td>0.81</td>
<td>0.67–0.97</td>
</tr>
<tr>
<td>In institution</td>
<td>1.38</td>
<td>1.10–1.73</td>
</tr>
</tbody>
</table>

ref. indicates reference category.

*Comparing patients who used antidepressants (n=2806) with those who reported depressive mood but did not use antidepressants (n=943).

Among women, the corresponding relative use was 2.7 and 1.2, respectively. Use of antidepressant drugs was more common in women than in men of all ages among stroke patients and in the general population (Figure 2).

Discussion

The strength of this study is that it is a very large study population using stroke patients in an entire country during a 1-year period. The most important weakness is that it is based on self-reported data and not on strict diagnostic criteria for depression and confirmed use of antidepressants.

A single question to screen for depression in large cohorts (as in the Riks-Stroke register) has been shown to be quite specific in diverse populations, including patients who have had strokes. In the present study, the prevalence of self-reported depression at 3 months after stroke was 12% in men and 16% in women. This is considerably lower than the 32% to 53% reported at 3 to 4 months after stroke in previous studies that have used strict diagnostic criteria applied either by a psychiatrist or by a questionnaire. These high-prevalence estimates include minor and major depression, and the Riks-Stroke estimates are more in agreement with the 10% to 20% prevalence of major depression reported after stroke. Comparison of the responses to the simple Riks-Stroke question on depressive mood with Prime-MD, an established instrument to screen for depression, although not validated specifically in stroke patients, indicated that the Riks-Stroke question had a high specificity but a low sensitivity for detecting depression. The proportion of patients in the Riks-Stroke register reporting that they always or often felt depressed 3 months after stroke is therefore probably an underestimate of the true prevalence of depression after stroke.

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Our prevalence rates are thus likely to reflect only more severe states of depression after stroke (major depression). The high specificity implies that analyses of clinical factors associated with depression after stroke are not confounded by a large proportion of patients without depressive mood. It should be emphasized that the diagnosis of depression may be difficult when aphasia, anosognosia, and other cognitive dysfunctions are present after stroke. The diagnostic precision is likely to be less in a large-scale study using a simple question than in the clinical setting. Although the absolute prevalence rates of depression after stroke should be taken as crude estimates, the diagnostic imprecision would occur across age and sex subgroups. Relative differences between groups of stroke patients are likely to be more accurate.

Extensive validation studies indicate that Riks-Stroke covers approximately 70% of all acute stroke patients in Sweden.16 Less than 5% of acute stroke patients, mostly those already in institutional care, are not admitted to hospital.22–25 Patients with the most severe strokes dying early after onset are underrepresented in Riks-Stroke,16,23 but this should not affect the present results at 3-month follow-up. Old age and not being admitted to a stroke unit also predict non-inclusion into the Riks-Stroke register.16,23 The effect of these selection factors on the results presented here is probably not great. The mean age in the Riks-Stroke patients (76 years) is as high, or higher than, as reported from population-based epidemiological studies in Sweden22–25 and high age has, per se, little impact on the prevalence of self-reported depression.26 Our results also indicate that stroke unit care has no major impact on the occurrence of depression after stroke; therefore, any over-representation in the Riks-Stroke register of patients treated in stroke units should not introduce any major bias.

Antidepressant treatment was reported by one quarter of the patients at 3 months after stroke. In other settings, the accuracy of self-reported antidepressant use has been reported to be good.27 In the present cohort of stroke patients of relatively old age (mean 76 years), underreporting rather than over-reporting of drug use is likely. Some of the previous studies on a limited number of patients have used strict diagnostic criteria for depression, such as DSM-III or DSM-IV, whereas this study reports on self-reported depression. With the frequent use of antidepressant medication, it is likely that most of the decisions to prescribe these drugs are based on general clinical impression and what patients report rather than on strict diagnostic criteria.

The type of antidepressant drugs used was not recorded in Riks-Stroke. In Sweden, selective serotonin reuptake inhibitors (SSRIs) account for 76% and other newer drugs for 18% of the total sales of antidepressant drugs (data from Apoteket AB). In view of the adverse reaction profiles of tricyclic antidepressants in elderly people, it is reasonable to assume that only a minority of stroke patients are treated with this class of drugs. The limited data available from randomized trials on SSRIs in the treatment of depression after stroke suggest a moderate beneficial effect, but a considerable proportion of patients with depression after stroke may also recover spontaneously.3 The two-thirds using antidepressant treatment not reporting depressive mood in the present study may thus be because of spontaneous recovery, effect of drug treatment, or poor ability of the Riks-Stroke question to detect mild forms of depression.

One third of the patients using antidepressant treatment reported depressive mood, suggesting insufficient response to the treatment. Riks-Stroke does not include information on when antidepressant drug treatment was initiated or doses used in individual patients. It is therefore possible that, in some patients, treatment times were too short or the dosages were too low for the medication to be fully effective. Even in randomized trials, treatment failures are common.3 Because antidepressants are widely used in elderly people in Sweden, it is also possible that many depressive or dysthymic people with poor response to antidepressants were already using drug treatment before stroke. Moreover, adversity of antidepressant drugs may have caused early termination of the treatment, an issue that has not been addressed in large clinical trials.

A sizable proportion of patients (8%) reported depressive mood but were not using antidepressant therapy at 3 months after stroke. This may reflect: (1) failure to accurately
diagnose depression after stroke; (2) a wait-and-see attitude among physicians after diagnosing depression after stroke; or (3) inadequate follow-up of stroke patients after discharge from hospital.

We conclude that in a nationwide stroke population survey, female sex, age younger than 65 years, living alone or in an institution, and being ADL-dependent were factors associated with self-reported depression after stroke. One quarter of all stroke patients were using antidepressant therapy at 3 months after stroke. This raises concerns that clinical practices to detect and treat depression after stroke are still suboptimal. Studies using more detailed methodology to assess diagnostic criteria for depression after stroke and the timing, intensity, and effect of treatment in routine clinical practice are warranted.

Appendix
The Riks-Stroke Collaboration includes Alingsås Hospital; Arvika Hospital; Avesta Hospital; Bolnäs/Söderhamn Hospital; Borås Hospital; Danderyd Hospital; Enköping Hospital; Fagersta Hospital; Falköping Hospital; Falun Hospital; Finspång Hospital; Gällivare Hospital; Gävle/Sandvik Hospital; Halmstad Hospital; Helsingborg Hospital; Huddinge Hospital; Stockholm; Hudiksvall Hospital; Härnösand Hospital; Hässleholm Hospital; Höganäs Hospital; Kalmar Hospital; Karlskrona Hospital; Karlshamn Hospital; Karlstad Hospital; Kristianstad Hospital; Kärnsjukhuset/Skövde; Kalix Hospital; Karlskoga Hospital; Kiruna Hospital; Kristinehamn Hospital; Kulöberg Hospital; Sjukhuset/Katrineholm; Kungsång Hospital; Köping Hospital; Länskrona Hospital; Lidköping Hospital; Lindesberg Hospital; Linköping University Hospital; Ljungby Hospital; Ludvika Hospital; Lund University Hospital; Lycksele Hospital; Malmö University Hospital; Mariestads Hospital; Mora Hospital; Motala Hospital; Målersjukhuset; Eskilstuna; Norrköping Hospital; Norrtälje Hospital; Nyköping Hospital; NÄL Hospital; Trollhättan; Örskarhamn Hospital; Piteå Hospital; Ryhov Hospital, Jönköping; Sahlgrenska University Hospital; Sahlgrenska, Mölndal; Ostra; Sala Hospital; Skene Hospital; Simrishamn Hospital; Skellefteå Hospital; Sollefteå Hospital; St Göran Hospital; Stockholm; Sunderbyn Hospital; Luleå-Boden; Sundsvall Hospital; Södersjukhuset, Stockholm; Säffle Hospital; Södertälje Hospital; Trelleborg Hospital; Torsby Hospital; Uddevalla Hospital; Umeå University Hospital; Uppsala University Hospital; Varberg Hospital; Växjö Hospital; Västerås Hospital; Västerås Hospital; Växjö Hospital; Värnamo Hospital; Västervik Hospital; Ystad Hospital; Angelholm Hospital; Örebro University Hospital; Örnsköldsvik Hospital; Östersund

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