Prevalence and Impact of Urinary Symptoms Among Community-Dwelling Stroke Survivors

K.R. Britain, MA; S.I. Perry, PhD; S.M. Peet, PhD; C. Shaw, PhD; H. Dallosso, PhD; R.P. Assassa, MRCOG; K. Williams, BA; C. Jagger, PhD; J.F. Potter, DM, FRCP; C.M. Castleden, MD, FRCP

Background and Purpose—To establish prevalence of urinary symptoms among community-dwelling stroke survivors and how these symptoms affected lives of these survivors compared with a nonstroke population.

Methods—The present study was a community-based postal survey in Leicestershire community, UK (that excluded institutional settings), that was designed to track stroke, urinary, and bowel symptoms and the effect of such symptoms on relationships, social life, daily activities, and overall quality of life. Subjects included 14 600 people who were living in the community and ≤40 years of age, randomly selected from the Leicestershire Health Authority Register.

Results—A 70% response rate was achieved with the return of 10 226 questionnaires. Prevalence of reported stroke was 4% (n=423). Prevalence of urinary symptoms was 34% (n=3197). Overall, stroke survivors had a higher prevalence of symptoms than the nonstroke population (64% to 32%, respectively). These symptoms were reported to have more of an effect on the lives of the stroke survivors compared with the nonstroke population even when adjusted for age and sex differences. This reported impact was not related to the stroke per se but to the severity of the urinary symptoms.

Conclusions—These data show a high prevalence of urinary symptoms among community-dwelling stroke survivors. These symptoms were reported to have considerable impact on the lives of stroke survivors, which needs to be taken into account in future research and clinical practice. (Stroke. 2000;31:886-891.)

Key Words: prevalence ■ quality of life ■ stroke ■ urinary incontinence ■ urinary symptoms

Research has shown a high prevalence of urinary incontinence among stroke survivors. Rates in hospitalized stroke patients have been reported between 32% and 79% at time of admission, 25% and 28% at discharge, and 12% and 19% some months after the stroke. In comparison, prevalence of urinary incontinence in the general population is 6% and in older people, between 11% and 29%. Not only is the prevalence of urinary incontinence in the community higher in those ≤65 years of age, but it increases significantly in those in their 80s and is associated with a higher risk of death. However, these reports focus solely on the symptom of urinary incontinence, whereas other urinary symptoms (frequency, urgency, nocturia, pain, and straining) may be equally or more important for determination of the impact of urinary symptoms on the lives of stroke survivors as well as the nonstroke population. Few data specifically address the effect of urinary symptoms on the lives of stroke survivors, and to date, no information compares stroke survivors with a nonstroke population. Therefore, the aim of the present study was to address these gaps in the literature on urinary symptoms and their effect on the lives of stroke survivors in the community.

Subjects and Methods
An epidemiological, community-based postal survey was performed with a random sample of 14 600 Leicestershire residents ≤40 years of age. The sample was derived from the Leicestershire Health Authority register, although residents living in institutional settings (residential homes, nursing homes, hospital settings) were excluded. The present study forms part of the Leicestershire Medical Research Council (MRC) Incontinence Study, which assesses the prevalence and incidence of urinary symptoms in adults ≤40 years of age.

With the use of a standardized questionnaire developed by the Leicestershire MRC Incontinence Study team, data were collected for 9 months, from October 1996 to June 1997. Respondents were asked about previous stroke, urinary, and bowel symptoms and the effect of these symptoms on several domains of their lives before they were invited to take part in the trial. These “impact” questions were derived from a review of the literature and focused on areas of life shown to be affected by urinary incontinence. Demographic data and questions on general health and medical conditions were also collected.

Definition of Stroke
The postal screening question used to determine whether a person had ever had a stroke was that developed by O’Mahony et al. The exact wording was as follows: “Have you ever had a stroke (sometimes known as cerebral hemorrhage, cerebral thrombosis, brain hemorrhage, subarachnoid hemorrhage, cerebrovascular acci-
dent or a mini-stroke or TIA)" This question was reported to have a high degree of sensitivity (95%) and specificity (96%).

Definitions of Urinary Symptoms
Urinary symptoms explored were urinary incontinence, urgency, frequency, nocturia, straining, and pain. These were decided on after exploration of the literature and discussion among clinical specialists. Six clinically significant urinary symptoms were defined as follows:

- **Urinary incontinence**: Leakage several times a month or more or leakage most of the time when a person laughs, coughs, or exercises.
- **Urgency**: Overwhelming need to pass urine or difficulty holding urine most of the time when a person feels the urge to go.
- **Frequency**: Passing urine ≥1 times per hour during the daytime.
- **Nocturia**: Getting up at night to pass urine ≥2 times.
- **Straining**: Having to strain to pass urine “most of the time.”
- **Pain**: Feeling pain in the bladder “most of the time.”

Definitions of Impact of Urinary Symptoms
“Impact” was defined as the effect of urinary symptoms on a range of physical, functional, and psychosocial domains. Severity of impact in each domain was recorded as “a lot,” “a little,” or “not at all” (see Appendix). In a broader sense, impact was also defined as whether a subject felt symptoms were a severe or moderate problem and whether the subject used pads, appliances, or aids as a means of managing these symptoms.

Statistical Methods
Responders and nonresponders (who were excluded from further analysis) to the stroke question were compared by Mann-Whitney U test for age (continuous variable) and χ² tests for sex (binary variable). Comparisons between the stroke and nonstroke population on binary and nominal variables (ethnicity and general health) were made with χ² tests. Confounding factors, such as age, sex, and disability in the relationship between stroke, urinary symptoms, and impact of those symptoms have been examined with multivariate logistic regression models and χ² tests.

In the univariate analysis, missing data were excluded on individual variables; therefore, different denominators are reported for each variable. A small number (n=36) of respondents were excluded from analysis because they did not report any clinically significant urinary symptoms but did indicate that these symptoms had “a lot” of impact on quality of life. Fifteen percent (n=471) of respondents who reported experiencing clinically significant urinary symptoms were excluded from multivariate analysis because of missing data on ≥1 of the 8 impact questions (3% had missing data on all 8 questions). To ensure that exclusion of missing data did not inflate differences found between the stroke and nonstroke samples, further analysis was performed to include respondents with missing data on ≥1 of the impact questions in the logistic regression model. However, the results reported in the present article remained unchanged by further analysis.

Results
Response Rate
Of 15,904 questionnaires mailed, 1304 (8.2%) were excluded because the person no longer lived at the address, had moved to a residential or nursing home, or was deceased. Of the remaining 14,600 questionnaires mailed, 10,226 were returned (70%); of these, 10,121 (99%) could be analyzed. Response rates were lowest in the youngest and oldest age groups (ie, 40 to 49 years and ≥80 years) and slightly lower in men. Analysis has been performed on 9963 individuals who responded to the stroke question (excluding 1.5% missing data).

Comparison of Responders and Nonresponders
Nonresponders to the stroke question were compared with responders, and although no significant sex differences were found, nonresponders were significantly older (P<0.0001). Forty-four percent of nonresponders were male compared with 46% of the responders. Mean age of nonresponders was 67 years (range, 40 to 98 years) compared with the mean age of the responders, 60 years (range, 40 to 99 years). However, mean age of the nonresponders was lower than those who had had a stroke and slightly higher than those who had not (mean age, 71 and 59 years, respectively).

Comparison Between Stroke and Nonstroke Population
Fifty-three percent of the stroke sample was men compared with 45% of the nonstroke sample (P<0.005). Stroke survivors on a whole represented a significantly older group than the nonstroke population (mean age, 71 versus 59 years). Stroke survivors also reported their general health to be poorer than the nonstroke population: 63% of stroke survivors compared with 23% of the nonstroke population rated general health as either fair or poor. A larger proportion of the stroke group reported having difficulties with daily activities (difficulties with getting around the house or dressing, or having a long-term health problem that affects daily activities): 66% and 24%, respectively (Table 1).

Prevalence of Urinary Symptoms Among Stroke and Nonstroke Population
Overall, 34% of respondents reported ≥1 clinically significant urinary symptom (n=3197), and prevalence of reported stroke was 4% (n=423). Prevalence of stroke with urinary symptoms in the whole population was 2.5% (n=249). The stroke group reported a significantly higher prevalence of urinary symptoms than the nonstroke population, 64% (n=249 of 391) compared with 33% (n=2948 of 9071; P<0.0001). Prevalence of specific urinary symptoms among community-dwelling stroke survivors was as follows: nocturia, 49% (199 of 409); urinary incontinence, 33% (127 of 382); urgency, 19% (78 of 403); frequency, 15% (62 of 410); straining, 3.5% (14 of 402); and pain, 2.5% (10 of 397). All were found to be significantly more prevalent in the stroke than the nonstroke population (Table 2). Even when age and sex were controlled for, in a multivariate logistic regression model, the difference in prevalence was found to be significant (odds ratio [OR] 2.45; 95% CI 1.96 to 3.06). When disability was introduced into the model, people who reported disability were 2.89-fold more likely to experience urinary symptoms than those who reported no difficulties with mobility (OR 2.89; 95% CI 2.60 to 3.20). All 4 explanatory factors (sex, age, stroke, and disability) were significant contributing factors to reports of urinary symptoms. A quadratic term for age was also added to the model because it significantly improved the fit; stroke survivors were 1.77-fold more likely to experience urinary symptoms than the nonstroke population (OR 1.77; 95% CI 1.40 to 2.24).

Comparison of Stroke and Nonstroke Subjects Who Experienced Urinary Symptoms
When subjects who experienced urinary symptoms were examined, 49% of stroke survivors with symptoms versus
38% in the nonstroke population were found to be men. Stroke survivors who experienced urinary symptoms had a mean age of 72 years versus 64 years in the nonstroke population. Similarly, stroke survivors who reported urinary symptoms reported more difficulties with daily activities than the nonstroke population (78% compared with 41%), which suggests a higher level of disability in this population (Table 1).

Reported Impact of Urinary Symptoms in Stroke and Nonstroke Subjects

In univariate analysis, more stroke survivors with symptoms reported significant impact on lifestyle than did the nonstroke population (Table 3). For example, urinary symptoms affected sleep in 23% of stroke survivors compared with 9% of the nonstroke population. Twice as many stroke survivors than nonstroke subjects felt that their urinary symptoms were a moderate-to-severe problem (83 of 246 and 470 of 2897, respectively; P<0.0001). More than 3 times as many stroke survivors with symptoms used aids to help manage urinary symptoms (22% or 45 of 206 compared with 6% or 126 of 2119; P<0.0001), and 24% (46 of 189) of stroke survivors reported using pads to cope with urinary symptoms “most of the time” compared with 9% (197 of 2114) of nonstroke subjects (P<0.0001) (Table 1).

TABLE 3. Impact of Urinary Symptoms on Lives of Stroke and Nonstroke Populations Identified as Experiencing Symptoms

<table>
<thead>
<tr>
<th>Impact</th>
<th>Stroke Survivors (n=249)</th>
<th>Nonstroke Population (n=2948)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfere with sleep</td>
<td>23 (51)</td>
<td>9 (241*)</td>
</tr>
<tr>
<td>Bother</td>
<td>13 (30)</td>
<td>7 (199)</td>
</tr>
<tr>
<td>Interfere with daily activities</td>
<td>12 (24)</td>
<td>3 (83*)</td>
</tr>
<tr>
<td>Affect quality of life</td>
<td>12 (26)</td>
<td>4 (97*)</td>
</tr>
<tr>
<td>Cause physical discomfort</td>
<td>12 (24)</td>
<td>3 (78*)</td>
</tr>
<tr>
<td>Cause upset/distress</td>
<td>11 (23)</td>
<td>4 (98*)</td>
</tr>
<tr>
<td>Interfere with social life</td>
<td>10 (20)</td>
<td>4 (103*)</td>
</tr>
<tr>
<td>Affect relationships</td>
<td>6 (11)</td>
<td>2 (42*)</td>
</tr>
</tbody>
</table>

Each comparison significant to P<0.0001 (Pearson χ² test).

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TABLE 1. Details of Stroke and Nonstroke Populations

<table>
<thead>
<tr>
<th></th>
<th>All Stroke Survivors (n=423)</th>
<th>All Nonstroke (n=9540)</th>
<th>Stroke Survivors With CSUS (n=249)</th>
<th>Non-Stroke With CSUS (n=2948)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age, y (mean)</td>
<td>71 (40–94)</td>
<td>59 (40–99)**</td>
<td>72 (40–92)</td>
<td>64 (40–98)**</td>
</tr>
<tr>
<td>Male</td>
<td>53 226</td>
<td>45 4340‡</td>
<td>49 123</td>
<td>38 1122†</td>
</tr>
<tr>
<td>Female</td>
<td>47 197</td>
<td>55 5200‡</td>
<td>51 126</td>
<td>62 1822†</td>
</tr>
<tr>
<td>Living alone</td>
<td>27 114</td>
<td>18 1737*</td>
<td>28 69</td>
<td>24 711¶</td>
</tr>
<tr>
<td>Owned/mortgaged</td>
<td>67 281</td>
<td>81 7702*</td>
<td>64 160</td>
<td>74 2160‡</td>
</tr>
<tr>
<td>White</td>
<td>91 380</td>
<td>93 8852§</td>
<td>89 219</td>
<td>92 2694§</td>
</tr>
<tr>
<td>South Asian</td>
<td>8 35</td>
<td>5 519§</td>
<td>11 26</td>
<td>7 200§</td>
</tr>
<tr>
<td>Needed help completing</td>
<td>27 112</td>
<td>6 591*</td>
<td>37 91</td>
<td>12 345*</td>
</tr>
<tr>
<td>Self-reported depression</td>
<td>23 88</td>
<td>13 1145*</td>
<td>28 63</td>
<td>20 550§</td>
</tr>
</tbody>
</table>

CSUS indicates clinically significant urinary symptoms.

*P<0.0001, †P<0.0005, ‡P<0.005, §P<0.05 (all Pearson χ² test).

**P<0.0001 (Mann-Whitney U test).

¶P=NS.

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TABLE 2. Prevalence of Individual Urinary Symptoms in Stroke and Nonstroke Populations

<table>
<thead>
<tr>
<th>Clinically Significant Urinary Symptom</th>
<th>Stroke Survivors</th>
<th>Nonstroke Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nocturia</td>
<td>49 199</td>
<td>19 1783</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>33 127</td>
<td>14 1280</td>
</tr>
<tr>
<td>Urgency</td>
<td>19 78</td>
<td>7 627</td>
</tr>
<tr>
<td>Frequency</td>
<td>15 62</td>
<td>7 689</td>
</tr>
<tr>
<td>Strain</td>
<td>3.5 14</td>
<td>0.5 45</td>
</tr>
<tr>
<td>Pain</td>
<td>2.5 10</td>
<td>0.4 33</td>
</tr>
</tbody>
</table>

Each comparison significant to P<0.0001 (Pearson χ² test).
When age and sex were controlled for by use of a multivariate logistic regression model, with a lot of impact as the outcome, analysis still showed that stroke survivors were 2.40-fold as likely to feel that their urinary symptoms had an impact on their lives than were subjects who had not had a stroke (OR 2.40; 95% CI 1.74 to 3.30). Surprisingly, neither sex nor age was found to be significant in this relationship. When disability was introduced into the relationship, only stroke and disability were found to be significant: for disability, OR 3.03 and 95% CI 2.44 to 3.77; for stroke, OR 1.73 and 95% CI 1.24 to 2.41.

This higher prevalence of reported impact in stroke survivors may be explained by the severity of urinary symptoms, because the stroke survivors experience more-severe symptoms. For example, a higher percentage of stroke survivors, 26% (59 of 228), reported daily urinary incontinence compared with 14% (396 of 2805) of the nonstroke population (P, 0.0001), and 6% (14 of 227) of stroke survivors compared with 1% (31 of 2783) of the nonstroke population reported that the amount of urine lost left them soaked (P, 0.0001). Multivariable analysis with logistic regression was performed to further investigate the level of severity of symptoms and their influence on reported impact (Table 4). These data highlight that the severity of the urinary symptoms, not the stroke per se, influences whether a person feels an impact on quality of life. Stroke survivors have a high prevalence of urinary symptoms, which are reported to be more severe than those of the nonstroke population. Twice as many stroke survivors with urinary symptoms reportedly experienced ≥3 symptoms compared with the nonstroke population (26% and 13%, respectively; P < 0.0001). Disability was also shown to influence whether a person felt an impact (OR 1.67; 95% CI 1.26 to 2.20). Although again stroke survivors reported higher levels of disability, once disability entered the model, the presence of stroke was not significant (OR 1.23; 95% CI 0.79 to 1.93). However, the number of urinary symptoms experienced may also influence the level of impact those symptoms are felt to have on a person’s life.

**Discussion**

There has been a dearth of good epidemiological data on the prevalence of urinary symptoms in a community-dwelling population of stroke survivors. We believe this to be the first article that examines the prevalence of clinically significant lower urinary tract symptoms in community-based stroke survivors.

Current literature on the prevalence of urinary incontinence in stroke survivors has reported it to be between 12% and 79%,15–24 with the highest prevalence derived from an assessment in hospital at the acute stage.18 These studies derived their samples from people admitted to hospital and subsequently may form a sample of people who experience more severe urinary symptoms (eg, daily urinary incontinence). Prevalence estimates among stroke survivors are extremely variable because of the different definitions of urinary incon-

<table>
<thead>
<tr>
<th>Table 4. Multivariable Logistic Regression Model to Investigate the Effect Severity of Urinary Symptoms Has on Reporting of Impact on Quality of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor</strong></td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Sex</td>
</tr>
<tr>
<td>Stroke</td>
</tr>
<tr>
<td>Disability</td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Nocturia</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Pain</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Straining</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Urgency</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Incontinence</td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

Response levels were severe, mild, and rarely.
Brocklehurst et al. have argued that urinary incontinence is a transient symptom for most stroke survivors who experience this at time of admission to hospital. However, the present study shows that a large percentage of community-dwelling stroke survivors experience this symptom. Overall, 33% of community-dwelling stroke survivors reported experiencing urinary incontinence several times a month or more, and 17% reported daily incontinence. This prevalence is similar to that reported by Tilvis et al., who found that 37.6% of stroke survivors experienced incontinence. Urinary incontinence was found to be most common in hospitalized patients or those with severe depression, previous stroke, or dementia. Urinary incontinence is more prevalent with age, but the high prevalence of incontinence in the stroke population cannot be attributed only to age. These data have shown a still-significant difference in prevalence between stroke survivors and the nonstroke population. Our prevalence estimate would have been much higher had we included subjects institutionalized in residential and hospital settings. A census of adults ≥65 years of age who live in residential and nursing home settings reported a prevalence of urinary incontinence of 21.5%. Such reports varied depending on the setting, and the prevalence was found to be highest in nursing homes (29.7%). Prevalence of urinary incontinence among stroke survivors in residential care was not reported.

The present study has compared stroke survivors and a nonstroke population in a community setting and has found that a high percentage of stroke survivors report clinically significant urinary symptoms. Although confounding factors such as advancing age, sex, and disability will inevitably affect this relationship, when controlled for, stroke was still found to be independently associated with a higher prevalence of urinary symptoms.

A high proportion of stroke survivors in the community are experiencing >1 clinically significant urinary symptom. This finding has not been highlighted before, given that previous research has tended to focus on urinary incontinence alone. Further research into when urinary symptoms begin in relation to the stroke would be valuable to assess the cause of symptoms within this population. Such research could provide an insight into the progression of urinary symptoms (for example, under what conditions a person who gained bladder control after stroke might develop this symptom again some months or even years later).

The impact that urinary symptoms have on quality of life is especially important to decisions regarding level of treatment and types of care that stroke survivors living in the community need. Urinary symptoms that are considered severe according to clinical definition (for example, if the patient leaks urine continuously or gets up 4 times per night to pass urine), may not necessarily be considered by the patient to have a huge impact on quality of life.

Although no previous research that specifically examines the impact of urinary symptoms in a stroke population has been reported, the literature provides data on the general impact of urinary incontinence on the lives of women. These data suggest that about one third perceive incontinence to be problematic. Between 1% and 5% of the population report some restrictions to daily activities that can be attributed to urinary incontinence. Our study has shown that age, sex, disability, and severity of symptoms have the greatest impact and that once these symptoms are considered, little difference is seen between stroke and nonstroke populations with symptoms.

It might not be surprising that people who have had a stroke tend to be older and more disabled and, therefore, experience more-severe levels of urinary incontinence and other lower urinary tract symptoms. A clinician might hypothesize that as a result of other health comorbidities, a stroke survivor’s health priorities, or felt impact, might not include urinary symptoms. However, the present study suggests that, in stroke management, urinary incontinence should be seen not only as a diagnostic indicator but as a symptom that can have considerable impact on lifestyle.

The present study has not examined the type or severity of stroke, which invariably influences the presence of urinary incontinence. It has not investigated drug use, which again may influence the presence of urinary symptoms. For example, community-dwelling stroke survivors might be prescribed diuretics, which would influence frequency of nocturia. The present study has not differentiated between stroke survivors who experience urinary symptoms before stroke and those who experience them at or after stroke. However, regardless of severity of stroke and drug use, the present data have shown that community stroke survivors have reported high levels of impact of urinary symptoms on quality of life that need to be addressed.

Conclusions

The present study has found a high prevalence of urinary symptoms among community-dwelling stroke survivors that cannot be attributed only to sex, age, or disability. Although stroke survivors with urinary symptoms were more likely than people who had not had a stroke to report an impact on quality of life, impact was not related to the stroke per se but to severity of urinary symptoms experienced. The stroke group also reported more severe symptoms. Research now needs to focus on improving patient quality of life by treating...
or managing urinary incontinence and other lower urinary tract symptoms, given that this does not appear to have been a main focus of stroke management to date.

Studies are also needed that test the hypothesis of Barer that achieving continence or dryness in social situations could lead to more-favorable stroke outcomes overall. Research now needs to address how improvement of continence can be achieved, the impact of continence on a stroke survivor’s quality of life, and the temporal relationship between the incidence of urinary symptoms and stroke. The effect that achievement of stroke survivor continence would have on carers of the stroke survivors who are experiencing clinically severe urinary symptoms is also an important area that needs investigation. As the present study has suggested, urinary symptoms are perceived to be a problem to stroke survivors. We now need to find treatments that would be effective within this group. We argue that the first step is to evaluate existing interventions for urinary symptoms and apply them specifically to a stroke population.

Appendix

APPENDIX. Impact of Urinary Symptoms Question Used in the Postal Questionnaire

If you had urinary symptoms, please tick box A Lot, A Little, or Not at All. Then, please tick box A Lot, A Little, or Not at All for the other questions.

Do your urinary symptoms:
- Interfere with your daily activities?
- Interfere with your social life?
- Cause you any physical discomfort?
- Affect your relationships with other people?
- Affect your sleep?
- Affect your overall quality of life?
- Affect your daily activities?
- Affect your relationships with other people?
- Affect your sleep?
- Affect your overall quality of life?
- Bother you?
- Cause you any physical discomfort?
- Interfere with your social life?
- Upset or distress you?

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References

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