Occurrence and Predictors of Falls in People With Stroke
Six-Year Prospective Study

Lisbeth Rosenbek Minet, PhD; Elizabeth Peterson, PhD; Lena von Koch, PhD; Charlotte Ytterberg, PhD

Background and Purpose—The purpose was to investigate the occurrence of self-reported falls in people with stroke at 3, 6, and 12 months and 6 years post stroke and predictors for falls during 6 years.

Methods—A prospective study involving 121 people with stroke. Data were obtained through structured interviews and assessments. Generalized estimating equation modeling using proportional odds was used to explore the predictive value of fall history, functioning/disability, and personal factors during 6 years.

Results—The proportion of fallers constituted of 35%, 26%, 33%, and 35% of the sample at 3, 6, and 12 months and 6 years of follow-up, respectively. Higher perceived effect of stroke on activities of daily living (odds ratio, 1.37; 95% confidence interval, 1.04–1.80), falls at 3 months (odds ratio, 1.0; 95% confidence interval, 1.01–3.94), and no gait/balance disability at baseline (odds ratio, 7.29; 95% confidence interval, 1.99–26.73) were predictors for future falls. During the 6 years, the odds for a fall decreased for participants with gait/balance disability at baseline but increased for those with no gait/balance disability.

Conclusions—Results highlight the importance of performing fall risk evaluations over time among people with stroke, even when gait and balance functioning initially post stroke is good. (Stroke. 2015;46:2688-2690. DOI: 10.1161/STROKEAHA.115.010496.)

Key Words: activities of daily living ■ follow-up studies ■ gait ■ prospective studies ■ stroke

Falls are a common secondary condition after stroke.1 Risk of falls increases with the number of risk factors present.2,3 Longitudinal studies on falls from the time of stroke for periods >1 year are lacking but needed to detect patterns in poststroke falls and to inform the design of fall-preventive interventions.1 Thus, the aims were to (1) investigate the occurrence of self-reported falls at 3, 6, and 12 months and 6 years after stroke; and (2) explore the predictive value of baseline functioning/disability and personal factors on self-reported falls during 6 years.

Materials and Methods
This study is based on the Life After Stroke (LAS-1) cohort that comprised 349 people with stroke, admitted to the stroke units at Karolinska University Hospital, Stockholm, Sweden. Study participants were those included in LAS-1 who were assessed at baseline, <1 week, 3, 6, and 12 months, and 6 years after stroke. The regional ethics committee, Stockholm, Sweden, approved the study.

The dependent variable was occurrence of self-reported falls. The number of falls within the last 3 months (3-month and 6-month follow-ups) and within the last 6 months (12-month and 6-year follow-ups) was reported. A fall was defined as an unexpected event in which the individual comes to rest on lower level.1

At baseline, stroke severity was categorized by the Barthel Index (Barthel Index score: 51–100=mild stroke and 0–49=moderate/severe stroke).4 Cognitive function was screened by the Mini Mental State Examination.5 Results from a 10-m walk test were used to categorize walking ability according to the Scandinavian Stroke Scale: unable to walk, walks with aid and help of another person, walks with aid or walks without aids6 and subsequently aggregated to the variable presence (ie, unable to walk, walks with aid and help of another person, and walks with aid or absence (ie, walks without aids) of gait/balance disability. The Frenchay Activities Index7 was used to assess the frequency of social/lifestyle activities during the past 3 or 6 months. At 3 months post stroke, the 8-domain Stroke Impact Scale 3.08 was used to assess the perceived effect of stroke and recovery. The 13-item sense of coherence scale9 was used to assess the enduring and global attitude of how people view their life and how they use their resources to maintain and develop their health in stressful situations.

Statistical Analyses
A generalized estimating equation modeling using proportional odds was used for univariate analyses of differences between fallers and nonfallers and to explore the predictive value of the independent variables. Generalized estimating equation modeling using proportional odds was used to explore the predictive value of fall history, functioning/disability, and personal factors during 6 years.

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variables on the proportion of fallers during 6 years. In the model, age, sex, sense of coherence, stroke severity, cognitive function, perceived effect of stroke in 8 domains, self-rated recovery, gait/balance disability, social/lifestyle activities, and occurrences of falls ≤3 months after stroke were included as independent variables together with time (3, 6, and 12 months and 6 years) to predict falls at 6 and 12 months and 6 years after stroke. Interaction between time and independent variables was controlled for. Modeling was performed on all plausible combinations of predictors using the Enter method to identify the model with the best fit. The number of variables included was restricted to those allowed for by the sample size. Data sets included in the analysis are provided in Table I in the online-only Data Supplement. Significance level was set to 0.05.

### Results

Of the 349 participants, 121 remained at the 6-year follow-up. Of those not participating, 166 were deceased, 44 declined participation, and 18 could not be traced. The mean age at baseline of the latter 62 was 71.5 years; 50% were women and 68% had a mild stroke.

The proportion of fallers constituted of 35%, 26%, 33%, and 35% of the sample at the 3-month, 6-month, 12-month, and 6-year follow-ups. Table 1 shows the characteristics of fallers and nonfallers. The final model (Table 2) revealed that a higher perceived effect on activities of daily living and >1 self-reported falls at 3 months were independent predictors for fall between 3 months and 6 years post stroke. The variable gait/balance disability at baseline in the interaction with time was a predictor for fall between 3 months and 6 years post stroke. Among participants with gait/balance disability at baseline, the odds for a fall were lower at 6 years compared with that at 3 and 12 months, whereas among participants with no gait/balance disability at baseline, the odds for a fall were higher at 6 years compared with that at 6 and 12 months.

### Discussion

This is the first 6-year prospective study to explore the occurrence of self-reported falls and the predictive value of functioning/disability and personal factors on occurrence of self-reported falls post stroke. The occurrence of falls at 3, 6, and 12 months was similar to fall frequency previously reported among community-dwelling individuals post stroke. Although limited by plausible healthy survivor or recall bias, findings indicate that occurrence of falls in our sample did not vary considerably between 3 months and 6 years post stroke; however, within subgroups, there was a variation in fall trends over time. For participants with no gait/balance disability at baseline, the odds for a fall increased during the 6-year period, whereas for participants with gait/balance disability at baseline, the odds decreased. Participants with gait/balance disability at baseline may have improved their functioning over time or adopted strategies that prevented falls. In contrast, participants with no gait/balance disability at baseline might have been less aware of their fall risk and exposed themselves to situations that placed them at risk for a fall or deteriorated because of ageing. Thus, findings suggest that monitoring fall risk over time post stroke is important even when baseline gait/balance functioning initially post stroke is good.

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Disclosures

None.

References

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**SUPPLEMENTAL MATERIAL**

*Supplementary table. Number of respondents for each variable.*

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