Prognosis assessment in stroke patients at discharge from hospital

LENA OLAI1,2, MARIANNE OMNE-PONTEN2, LARS BORGQUIST3, KURT SVARDSUDD1

1Uppsala University, Department of Public Health and Caring Sciences, Family Medicine and Clinical Epidemiology Section, Uppsala, Sweden
2Centre for Clinical Research, Dalarna, Sweden
3Linköping University, Department of Health and Society, General Practice, Linköping, Sweden

Address correspondence to: L. Olai. Tel: +462318316 Fax: +462318375. Email: lena.olai@Ldalarna.se

Abstract

Background: accurate prognostic assessments of need of help, health and dwelling situation in stroke patients are important for patient management, rehabilitation, discharge planning, and for providing reliable information to patients and their relatives.

Objective: to analyse factors affecting the accuracy of discharge prognosis assessments.

Design: prospective study of stroke patients discharged from hospital.

Setting: two cities in central Sweden.

Subjects: three hundred and ninety stroke patients, 65 years or older, living in their own homes and having no dementia diagnosis prior to hospital admission.

Methods: at discharge, physicians, nurses, occupational therapists and physiotherapists in the Departments of Internal Medicine and Geriatrics were asked to make an individual prognosis assessment regarding patients’ need for help, health and dwelling situation at 3 and 12 months after admission to hospital.

Results: the prognosis assessments were on average accurate in 68.4% (3 months) and 61.5% (12 months), far better than chance (33.3%). There were no significant differences between staff categories. The accuracy was influenced by a number of patient linked factors, such as activity degree, household situation before admission, and Mini Mental State Examination level and need of help measured 1 week after discharge, and ranged from 22 to 89%, depending on factor combinations.

Conclusions: prognosis assessments based on clinical judgement were on average quite accurate but the accuracy varied markedly with patient linked factors. Feedback of outcome might be one way to further improve the accuracy of prognosis assessment.

Keywords: prognosis assessment, outcome, functional capacity, health situation, dwelling, stroke, elderly

Introduction

On a global level, stroke is the second largest cause of death and it remains a serious health problem for survivors after discharge from hospital [1]. Accurate assessments of the expected health and functional development are needed for clinical decision-making [2], to guide patient management and improve rehabilitation [3], for discharge planning [2, 3], and to provide appropriate prognostic information to patients and next of kin [2–4]. A number of models have been developed to improve prognosis assessments [5], some complex, others easy to use. However, in medical practice clinical judgement is most often used.

Problems inherent in clinical prognosis assessment in stroke patients is the heterogeneity of the patient group [6] and the many professional categories involved in the care of patients, possibly causing limited dissemination of important information among staff or a limited knowledge of the patient needs.
We therefore made a study of the accuracy of prognostic assessments made by four staff categories in a prospective longitudinal study of stroke patients followed from hospital discharge until 1 year after admission, and of possible accuracy determinants.

**Methods**

**Setting**

The study was performed in the cities of Falun (population 55,000) and Borlänge (population 47,000), central Sweden, with similar age and sex distributions as the national Swedish population [7]. The two cities are served by Falun General Hospital, where stroke patients were cared for in the Department of Internal Medicine, either in a stroke unit or a general internal medicine ward and afterwards possibly at a geriatric ward. Since hospital admission is free of charge for the patient virtually all patients with clinical signs and symptoms indicating stroke are admitted to hospital [8].

**Subjects**

The inclusion criteria were 65 years or older, discharged alive from the Department of Internal Medicine during the period 1 September 1999 to 31 May 2001 after an acute stroke, including intracerebral haemorrhage, brain infarction, or stroke of undetermined pathological type (ICD10 codes I61, I63, I64) [9], living in own home before admission, and no pre-admission dementia diagnosis.

Out of 432 potential participants 42 died in the Department of Internal Medicine. The 390 survivors constitute the study population (Appendix 1 available online at www.ageing.oxfordjournals.org). One week after discharge 351 patients were interviewed by a registered nurse. A second (n = 324) and a third (n = 297) interview were performed 3 and 12 months after admission. Approximately 95% of the eligible subjects participated in each interview. Reasons for non-participation are given in Appendix 1. For some non-participants, data on dwelling and functional capacity could be obtained from other sources. Forty interviews were performed in duplicate with excellent agreement (κ = 0.95). In addition, the nearest next of kin, indicated by the patient, received a questionnaire at the time of the first interview, of whom 261 (75.4%) of the eligible responded.

**Data collection**

The following variables were used as measures of pre-morbid state. Data on independence regarding transfer, personal hygiene and dressing immediately prior to the stroke incident were obtained for 365 subjects from the national stroke register [10]. Information on community home help during the year before admission was obtained by scrutinizing the Social Service records, and on help from next of kin by patient interviews and nearest next of kin questionnaire. Information on appointments and home calls with primary health care centre (PHCC) staff, hospital admissions, outpatient appointments, and co-morbidity, was obtained by

scrutinising PHCC and hospital patient records. At the first patient interview activity degree prior to admission was measured with the Activity Score subscale of the Gothenburg Quality of Life instrument [11], which includes a list of 34 specified activities with response alternatives 'performed often or regularly' (=2), 'occasionally' (=1) or 'never' (=0). The scores were then summed to an overall total score. In addition, information on education, marital status and co-habitation was sought.

Remaining functional ability was estimated from a Katz ADL [12] assessment and a Mini Mental State Examination (MMSE) [13] at the first patient interview.

At each transfer between the stroke unit, internal medicine or geriatric wards and at discharge from the hospital, the patient's physician, nurse, occupational therapist and physiotherapist were asked to assess the prognosis regarding 'need of help', 'health situation', and 'dwelling' at three and 12 months after admission to hospital, based on their own clinical judgement, or to leave items blank in case of inability to make an assessment. Altogether more than 50 assessors participated, the exact number unknown because of granted anonymity.

The outcomes to be forecasted were given in three levels based on data from the second or third patient interview or register data. The staff was asked to indicate for each of three outcomes at what level they thought the patient would be at 3 and 12 months. For the outcome variable 'need of help', the three levels were 'no need of help' (Katz ADL degree A), 'need of some help' (Katz B–E), and 'completely dependent' (Katz F–G). For the outcome variable 'health situation' the levels were 'completely recovered', 'unchanged situation or better but no full recovery', and 'deteriorated or deceased'. For the outcome variable 'dwelling' the levels were 'living in own apartment or house', 'living in special housing', and 'living in nursing home'.

Finally, the basis for the assessments was sought. Possible responses were medical, nursing, or rehabilitation state, tests, discharge planning information, expected support from next of kin, experience, intuition, other (open-ended alternative), or combinations.

Altogether 1470 assessment forms (1385 completed) for 292 subjects were obtained, of whom 117 had assessments made on two occasions. In 85 patients no assessments were made because of staff inability to make an assessment, in most cases due to few days in the ward, and in 13 patients because of death in the geriatric ward. The average number of staff category assessments was 3.6 per patient and assessment occasion. The inter-staff agreement (Spearman’s correlation coefficients pair-wise across all combinations) at 3 and 12 months was 0.60–0.63 for 'need of help', 0.36–0.42 for 'health situation' and 0.70–0.76 for 'dwelling'. All subjects gave oral informed consent and the Research Ethics Committee of Uppsala University approved the study.

**Statistical considerations**

Data were analysed with the SAS programme package [14]. Assessment accuracy was measured as number of accurate
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Table 1. Socio-economic data and pre-morbid state during 12 months before admission to hospital

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>Mean</td>
<td>%</td>
</tr>
<tr>
<td><strong>Age at admission to hospital, years</strong></td>
<td>224</td>
<td>79.8</td>
</tr>
<tr>
<td><strong>Socio-economic data, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
<td>133</td>
<td>59.4</td>
</tr>
<tr>
<td>Junior secondary/vocational school</td>
<td>30</td>
<td>13.4</td>
</tr>
<tr>
<td>College/university</td>
<td>12</td>
<td>5.4</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>22</td>
<td>9.8</td>
</tr>
<tr>
<td>Married/co-habitating</td>
<td>56</td>
<td>25.0</td>
</tr>
<tr>
<td>Widowed/divorced</td>
<td>110</td>
<td>49.1</td>
</tr>
<tr>
<td>Living alone</td>
<td>110</td>
<td>49.1</td>
</tr>
<tr>
<td><strong>Pre-morbid state, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer</td>
<td>189</td>
<td>84.4</td>
</tr>
<tr>
<td>Personal hygiene</td>
<td>202</td>
<td>90.2</td>
</tr>
<tr>
<td>Dressing</td>
<td>199</td>
<td>88.8</td>
</tr>
<tr>
<td>Community home helpa</td>
<td>73</td>
<td>32.6</td>
</tr>
<tr>
<td>Help from next of kin</td>
<td>93</td>
<td>41.5</td>
</tr>
<tr>
<td>PHCC visits/home callsb</td>
<td>202</td>
<td>90.2</td>
</tr>
<tr>
<td>Hospital in-patient admissions (days)</td>
<td>47</td>
<td>21.0</td>
</tr>
<tr>
<td>Hospital out-patient visits</td>
<td>45</td>
<td>20.1</td>
</tr>
<tr>
<td><strong>Medical history, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous cerebro-vascular events</td>
<td>79</td>
<td>35.3</td>
</tr>
<tr>
<td>Hypertension</td>
<td>94</td>
<td>42.0</td>
</tr>
<tr>
<td>Heart disease</td>
<td>122</td>
<td>54.5</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>46</td>
<td>20.5</td>
</tr>
</tbody>
</table>

*aOn average 1.58 visits per day for women and 1.13 for men among those concerned.

*bOut of which 37.4 district nurse home calls for women and 46.1 for men among those concerned.

assessments in relation to total number of assessments done and expressed as a percentage, 33.3% representing chance given the assumption of no knowledge among the staff of the outcome distribution in this patient category.

The analysis of factors influencing the prognosis assessment accuracy was performed with univariate logistic regression with accuracy of individual assessments (yes or no) as the dependent variable and potentially influencing factors as independent variables. Factors affecting at least one outcome were then entered in final multivariate analyses.

Optimism and pessimism were measured as the proportion of inaccurate assessments more favourable or less favourable than the real outcome. Only two-tailed tests were used. To account for multiple testing P-values <0.005 were regarded as significant.

Results

Characteristics of the study population

Mean age was 78.7 years, and 224 (57.4%) were females, Table 1. More than half had only compulsory schooling, half of the men were married and half of the women were widows. Before admission to hospital half of the women and one-third of the men were living alone in their own homes. Pre-morbid state is shown in Table 1. The majority could dress, maintain their personal hygiene, transfer without assistance, had some form of help and had contacts with PHCC staff during the past 12 months before admission to hospital. More than one-fifth had contacts with the hospital as in- or outpatients. One-third had a previous cerebro-vascular event. A history of hypertension, heart disease or diabetes mellitus was common.

Forty-four percent of the women and 51% of the men were cared for in the stroke unit, the remaining in general internal medicine wards. The average time spent in these wards was 7 days, inter-quartile range 3–9, 43% were discharged from the hospital and the remaining patients were transferred to a geriatric ward where they stayed on average for another 30 days, inter-quartile range 14–41. The dominant diagnosis was cerebral infarction, 88%, equal for men and women. In 97%, a computerised tomography scan was performed. Remaining functional ability measured 1 week after discharge showed that slightly more than half were in Katz grade A, one-fourth were classified as grade F or G, and the remaining were in grades B–E. Mean MMSE-level was 23.3.
made the assessment more difficult, by the factors living alone before admission and need of help at discharge and positively, i.e. facilitated the assessment, by activity degree before admission and hypertension history. The accuracy of ‘health situation’ assessments was affected negatively by ward speciality (stroke unit), and positively by pre-morbid state (activity degree), and remaining functional ability. The accuracy of ‘dwelling’ assessments was affected negatively by patient age, living alone before admission, and need of help at discharge, and positively by activity degree before admission and MMSE-level at discharge.

Combinations of determinants affected the assessment accuracy markedly. In the example shown in Appendix 2 (available online at www.ageing.oxfordjournals.org) the accuracy of the assessments of ‘health situation’ at 3 months ranged from 22% for independent subjects with low MMSE score, to 89% for dependent subjects with high MMSE score. The corresponding range for 12 months was 23 to 77%.

The overall most common bases for the assessments were rehabilitation status (78.2%), medical status (74.5%), nursing status (60.7%), experience (38.0%), intuition (23.0%), and expected support from next of kin (17.9%).

**Discussion**

Prognosis assessments at discharge from hospital regarding the course of events three and 12 months after admission to hospital were thus far more accurate than expected by chance. The accuracy was influenced by a number of patient linked factors, with a somewhat different set up for each outcome. Combinations of these factors affected assessment accuracy markedly.

The study was performed as a prospective longitudinal cohort study of consecutive patients surviving the internal medicine or stroke unit phase of hospital care. There were no differences in age, sex and diagnosis distribution between the study group and national stroke patient data [15]. Some of the interviews were recorded in duplicate with excellent agreement. All forms were validated or tested with satisfactory results before the data collection period began. We have therefore no reason to believe that the results are affected by selection or other bias.

A large number of prognostic models involving a variable number of predictors have been proposed. Most of the 83 models reviewed by Counsell and Dennis [3] had potentially serious deficiencies in internal and statistical validity, many had limited generalisability, and none had been adequately validated. Few studies have addressed the issue of clinical judgement versus formal decision support. Counsell and Dennis [3] found no model markedly better than clinical judgement [16]. They reported 65% accurate prognosis assessments in inpatients, approximately the same level as our 56–78%.

The 3 and 12-month results in the present study were fairly consistent.

Several of the measures used in this study such as living alone, pre-morbid state, event severity and the
Table 3. Adjusted odds ratios for factors influencing the accuracy of prognosis assessment. Significant ratios are in bold text

<table>
<thead>
<tr>
<th>Factor</th>
<th>3 months OR (95%CI)</th>
<th>12 months OR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need of help at discharge</td>
<td>0.78 (0.59–1.03)</td>
<td>0.78 (0.59–1.03)</td>
</tr>
<tr>
<td>Health situation at discharge</td>
<td>1.41 (1.23–1.61)</td>
<td>1.41 (1.23–1.61)</td>
</tr>
<tr>
<td>Dwelling at discharge</td>
<td>1.02 (0.99–1.05)</td>
<td>1.02 (0.99–1.05)</td>
</tr>
</tbody>
</table>

Conclusions

The accuracy of prognosis assessments at discharge from hospital regarding the course of events 3 and 12 months after admission to hospital was far better than expected by chance. The accuracy was influenced by patient linked factors, such as activity and household situation before admission, and MMSE-level and need of help at discharge.

Key points
- Prognostic assessments regarding 'need of help', 'health situation', and 'dwelling' in elderly stroke patients performed by four staff categories were far more accurate than expected by chance.
- There was a considerable variation in the accuracy of assessments, 22 to 89%, due to individual factor combinations.
- Feedback might be one way to further improve the accuracy of prognosis assessment.

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Declaration of conflicts of interests

None of the authors has any conflict of interest regarding the content of this report.
References


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