Assessment of Functional Outcome in a National Quality Register for Acute Stroke
Can Simple Self-Reported Items Be Transformed Into the Modified Rankin Scale?

Marie Eriksson, MSc; Peter Appelros, MD, PhD; Bo Norrving, MD, PhD; Andreas Tere´nt, MD, PhD; Birgitta Stegmayr, PhD

Background and Purpose—To enable self-reporting of functional outcome in quality registers, the corresponding questions have to be easy to interpret. In scientific research, the modified Rankin Scale (mRS) is a standard assessment method. Such methods, with an outsider observer, are not feasible to use in quality registers. For several aspects, eg, comparisons between outcome in clinical studies and observational studies, we determined to see whether the functional outcome, as assessed in a quality register, can be transformed into mRS grades.

Methods—The agreement between self-reported functional outcome (including dependency, living situation, mobility, dressing and toileting) and mRS were analyzed using 555 stroke patients registered in Riks-Stroke, the Swedish quality register for acute stroke, during a 5-month period in 4 hospitals. The self-reported outcome and the mRS grades were concurrently assessed by a telephone interview performed by an experienced nurse 3 months after stroke.

Results—A translation using 5 of the questions from Riks-Stroke classified 76% of the patients to the correct mRS grade. The correlation between Riks-Stroke and mRS was 0.821 and Cohen’s $\kappa$ (weighted) was 0.853.

Conclusion—The study shows that self-reported functional outcome can be transformed into mRS grades with a high precision, making the translation useful for future comparative purposes in stroke outcome studies. (Stroke. 2007;38:1384-1386.)

Key Words: disability evaluation ■ outcome assessment ■ registries ■ stroke outcome

Functional outcome is an important issue for quality registers to cover. To enable self-reporting by patients, next-of-kin or care-givers, the corresponding questions have to be concrete, unambiguous and easy to interpret. This becomes even more important when the patient group is elderly. In scientific research, however, functional outcome is most often assessed by nursing staff during an interview either at a clinical visit or by telephone. A standard assessment method is the modified Rankin Scale (mRS).1,2 Such method, with an outsider observer, is often not feasible for quality registers that include large number of patients because of the extra cost and workload it would introduce.

For several aspects, eg, comparisons between outcome in clinical studies and observational studies, we determined to see whether the functional outcome, as assessed in a quality register, can be transformed into mRS grades.

Materials and Methods
This study includes patients who experienced a stroke between May 1 and September 30, 2005, who were admitted to one of the hospitals of Lund, Uppsala, Örebro or Umeå and were registered in Riks-Stroke, the Swedish national quality register for acute stroke care.3 Three months after stroke, an interview was performed by an experienced nurse. The interview began with the Riks-Stroke standard follow-up questionnaire and ended with additional questions to assess the patient’s mRS grade.

After the mRS assessment by the nurse, but before data-extraction, a translation of the Riks-Stroke questions into mRS grades was specified by a group consisting of physicians specialized in stroke, an epidemiologist and a statistician. Based on the information available in Riks-Stroke, it was not feasible to distinguish between the mRS-grades 0, 1 and 2; hence, those grades were merged and no effort was made to separate them. The prespecified translation was based on 5 of the Riks-Stroke follow-up questions (Table 1). After a first analysis, minor adjustments of the prespecified translation algorithm were made (Table 2).

The results are presented by frequency tables of the actual mRS versus the mRS as translated from Riks-Stroke. Spearman rank correlation coefficient and Cohen’s $\kappa$ with Fleiss-Cohen type of weights are used as summary measures.

Results
Of 783 registered patients, 651 were still alive after 3 months. Twenty-three patients could not be reached or chose not to participate. Of the remaining 628 patients, 63.6% answered
TABLE 1. Self-Reported Questions From Riks-Stroke Used in the Translation

| Riks-Stroke Questions Concerning Functional Outcome (answer alternatives and corresponding coding are shown within parenthesis) |
| Q1: Are you today dependent on a family member/next-of-kin for help/support (1= partly dependent, 2= entirely dependent, 3= no, not at all)? |
| Q2: Where are you staying now (1= in own home without community support, 2= in own home with community support, 3= living in a geriatric/rehabilitation unit)? |
| Q3: How mobile are you (1= I can move around without help both indoors and outdoors, 2= I can move arround without help indoors but not outdoors, 3= I need another person’s help to move)? |
| Q4: Do you receive help from anybody to go to the toilet (1= I can manage toilet visits without assistance, 2= I need help to go to the toilet)? |
| Q5: Do you receive help with dressing/undressing (1= I can manage dress/undress without help, 2= I need help dressing/undressing)? |

by themselves, 8.4% with some help and in 27.9% of the cases the questions were answered by a caregiver or next-of-kin. The interview failed to classify 37 patients into mRS grades. Reasons for failures were non-Swedish speaking patients, unwillingness to answer some of the questions, aphasia, dementia or other severe concomitant diseases. Ten of those together with 36 additional patients did not answer one or more of the Riks-Stroke questions used. In total, 555 patients were included in the analysis. The 96 patients who were excluded from analysis (14.7%) were more likely to have had a hemorrhagic stroke, a recurrent stroke, being diabetics, living in institution or being dependent in activities of daily living before their stroke.

Of the 555 patients, 305 (55%) were men. The mean age was 72 years for men and 76 years for women. The majority, 489 (88.1%) had experienced an ischemic, 48 (8.6%) a hemorrhagic and 18 (3.2%) a stroke of unknown type. Before their stroke, 509 (91.7%) were independent in activities of daily living (mobility, dressing and toilet). In this study, 458 (82.5%) were first-ever strokes.

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TABLE 2. Translation Algorithm From Riks-Stroke Questions Into mRS Grades

<table>
<thead>
<tr>
<th>mRS Grade</th>
<th>Definition of Adjusted Translation Using Riks-Stroke Questions (all criteria should be fulfilled)</th>
<th>Answer Codes (defined in TABLE 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>Q1: not, or only partly, dependent of next of kin for help/support</td>
<td>1*, 3</td>
</tr>
<tr>
<td></td>
<td>Q2: living in own home without community support</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Q3: can move around without help both indoors and outdoors</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Q4: can manage toilet visits without assistance</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Q5: can manage to dress/undress</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Q1: entirely dependent on next of kin for help/support</td>
<td>2, (1†)</td>
</tr>
<tr>
<td></td>
<td>Q2: not living in own home without community support or</td>
<td>2, 3, 5, 6, 7</td>
</tr>
<tr>
<td></td>
<td>Q3: cannot move around without help outdoors</td>
<td>2*</td>
</tr>
<tr>
<td></td>
<td>Q3: can move around without help at least indoors</td>
<td>1, 2*</td>
</tr>
<tr>
<td></td>
<td>Q4: can manage toilet visits without assistance</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Q5: can manage to dress/undress without help</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Q3: can not move around without help indoors or</td>
<td>3, (2†)</td>
</tr>
<tr>
<td></td>
<td>Q4: need help to go to the toilet or</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Q5: need help dressing/undressing</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Q2: not living at home</td>
<td>3, 5, 6, 7</td>
</tr>
<tr>
<td></td>
<td>Q3: need another person’s help to move</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Q4: need help to go to the toilet</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Q5: need help dressing/undressing</td>
<td>2</td>
</tr>
</tbody>
</table>

*This alternative was not present in the prespecified translation, but is included in the adjusted version.
†This alternative was present in the prespecified translation, but is excluded from the adjusted version who did not answer the questions by themselves (weighted $\kappa=0.656$, agreement 59.2%).

Discussion

This report describes a successful translation from the self-reported Riks-Stroke outcome questions into mRS grades.

TABLE 3. Frequency Table of the Actual mRS Grade vs the Adjusted Translation From Riks-Stroke Questions

<table>
<thead>
<tr>
<th>Adjusted mRS-translation</th>
<th>0–2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>284</td>
<td>35</td>
<td>12</td>
<td>0</td>
<td>331</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>41</td>
<td>7</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>18</td>
<td>64</td>
<td>25</td>
<td>108</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>34</td>
<td>41</td>
</tr>
<tr>
<td>Total</td>
<td>312</td>
<td>95</td>
<td>89</td>
<td>59</td>
<td>555</td>
</tr>
</tbody>
</table>
The level of agreement between the translated scores and the actual mRS scores is high, similar to the estimated interobserver agreement achieved using the mRS but not as high as the structured interview mRS.

The adjusted translation was derived from the data, and the exact level of agreement should be verified in an independent study. However, because only minor modifications were made from the prespecified algorithm, it is reasonable to assume that the agreement using the adjusted version is at least as good. It should be recognized that the algorithm used did not permit separation of mRS grades 0, 1 and 2.

The mRS grades were obtained over the phone rather than assessed at a clinical evaluation. This procedure simplified the study design and made it feasible to include a large number of patients. Moreover, a single nurse could perform all the interviews, thereby avoiding possible problems with inter-observer variability. Assessing mRS grades using telephone interviews is suggested to be a reliable method.

Patients who did not answer the questions themselves were clustered to mRS grades 4 to 5 (75%). The difficulties to discriminate between those grades explain the lower agreement in this subgroup.

Concerns were raised that two interviews regarding functional outcome, close in time, could be confusing for these patients. Hence, the same person performed both the Riks-Stroke and the mRS assessments during the same interview. This ensured that there was no change between the assessments, but it may also have introduced a bias. However, this potential bias should be no more serious than the bias introduced by an investigator’s previous knowledge of the patient.

In conclusion, the study shows that self-reported functional outcome can be transformed into mRS grades with a high precision, making the translation-algorithm useful for future comparative purposes in stroke outcome studies.

**Acknowledgments**

We wish to thank Britt-Inger Eklund who performed the telephone interviews.

**Sources of Funding**

Riks-Stroke is funded by the Swedish National Board of Health and Welfare, Norrlandska Strokefonden, Vårdalsstiftelsen, King Gustaf V’s and Queen Victoria’s Foundation and the Swedish Medical Research Council. AstraZeneca financially supported the employment of a research nurse during the study.

**Disclosures**

A.T. has received a modest sum from AstraZeneca for his position in an advisory board dealing with health economy issues.

**References**

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Stroke. 2007;38:1384-1386; originally published online February 22, 2007;
doi: 10.1161/01.STR.0000260102.97954.9c

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/38/4/1384

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