Assessment of Functional Outcome in a National Quality Register for Acute Stroke

Can Simple Self-Reported Items Be Transformed Into the Modified Rankin Scale?

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**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

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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...
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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Using the prespecified translation from Riks-Stroke questions into mRS, 371 of the 555 patients (66.8%) were correctly classified, 17 patients (3.1%) were underestimated (ie, given a too-low score) and 167 patients (30.1%) overestimated (ie, given a too-high score). Thirty patients (5.4%) were misclassified with >1 grade. The corresponding Spearman correlation was 0.784 and Cohen’s weighted \( \kappa \) was 0.775.

After minor adjustments of the translation algorithm, 423 patients (76.2%) were correctly classified. Fifty-three patients (9.5%) were underestimated and 79 (14.2%) overestimated. Fourteen patients (2.5%) were misclassified with >1 grade. The Spearman correlation increased to 0.821 and the Cohen’s weighted \( \kappa \) increased to 0.853. The major difficulty with the translation is to discriminate category 2 from 3, and 4 from 5. In total, only 39 patients (7.0%) were misclassified from 2 to 3 to 4 to 5 or vice versa. The results are presented in detail in Table 3. The agreement was lower in the subgroup of patients 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.
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\textsuperscript{1,5} but not as high as the structured interview mRS.\textsuperscript{5}

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.\textsuperscript{6,7}

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.

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Disclosures

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References

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