Coping, Problem Solving, Depression, and Health-Related Quality of Life in Patients Receiving Outpatient Stroke Rehabilitation

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Abstract
Objectives: To investigate whether patients with high and low depression scores after stroke use different coping strategies and problem-solving skills and whether these variables are related to psychosocial health-related quality of life (HRQOL) independent of depression.

Design: Cross-sectional study.

Setting: Two rehabilitation centers.

Participants: Patients participating in outpatient stroke rehabilitation (N = 166; mean age, 53.06 ± 10.19y; 53% men; median time poststroke, 7.29mo).

Interventions: Not applicable.

Main Outcome Measures: Coping strategy was measured using the Coping Inventory for Stressful Situations; problem-solving skills were measured using the Social Problem Solving Inventory-Revised: Short Form; depression was assessed using the Center for Epidemiologic Studies Depression Scale; and HRQOL was measured using the five-level EuroQol five-dimensional questionnaire and the Stroke-Specific Quality of Life Scale. Independent samples t tests and multivariable regression analyses, adjusted for patient characteristics, were performed.

Results: Compared with patients with low depression scores, patients with high depression scores used less positive problem orientation (P = .002) and emotion-oriented coping (P < .001) and more negative problem orientation (P < .001) and avoidance style (P < .001). Depression score was related to all domains of both general HRQOL (visual analog scale: β = −.679; P < .001; utility: β = −.009; P < .001) and stroke-specific HRQOL (physical HRQOL: β = −.020; P = .001; psychosocial HRQOL: β = −.054, P < .001; total HRQOL: β = −.037; P < .001). Positive problem orientation was independently related to psychosocial HRQOL (β = .086; P = .018) and total HRQOL (β = .058; P = .031).

Conclusions: Patients with high depression scores use different coping strategies and problem-solving skills than do patients with low depression scores. Independent of depression, positive problem-solving skills appear to be most significantly related to better HRQOL.

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Living with the consequences of stroke can enormously impact daily life, resulting in diminished health-related quality of life (HRQOL) in most patients. Utility scores, which range from 0 (death) to 1 (full health), are frequently used to assign value to the level of HRQOL and are in the range of .47 to .68 after stroke.1,2 HRQOL after stroke is predicted by several factors including functional constraints, age, sex, socioeconomic status, depression, and coping strategies.2,6 Particularly, problem-oriented coping strategies are positively associated with HRQOL.7,8 However, patients with stroke may use fewer active, problem-oriented coping strategies.9

Depression after stroke has an estimated prevalence of 33%.10 Depression is also related to other factors such as age, functional limitations, stroke severity, family support, and socioeconomic status.11,12 An inverse relation between depression and HRQOL has been reported.1,2 Depression is often comorbid with stroke,13 and nonpharmacological strategies, such as psychological therapies, have been shown to have a positive effect on HRQOL and depression.14,15 Further research is needed to identify effective interventions for depression and HRQOL in stroke patients.
been reported. Furthermore, depression is a known effect modifier of the relation between coping strategy and HRQOL. In a previous study, coping strategy and depression were independently associated with psychological health in patients in the chronic phase after stroke. However, coping strategies may change during rehabilitation. Therefore, we wondered whether the relations between depression, coping, and HRQOL are also present in patients receiving outpatient rehabilitation treatment. HRQOL may also change over time after stroke. Discharge from rehabilitation is a particularly challenging time with respect to HRQOL. Treatment is completed, and patients are faced with the consequences of stroke in their home environment. This can cause psychological distress and reduced HRQOL. The ability to use active behavioral coping strategies, such as problem solving, is often helpful during this phase of recovery.

Problem solving and coping are different concepts. Coping is defined as the cognitive and behavioral efforts used to manage specific stressful situations and the emotions they generate, whereas problem solving is defined as “the process of finding solutions to specific problems.” Problem solving is a coping process, but not all coping processes can be considered problem solving. Problem solving cannot be directly compared with or distinguished from other coping activities because it can serve a variety of coping functions. Problem solving is also related to depression and HRQOL in both population with a disease and healthy population.

Whether coping strategy, problem-solving skills, and depression are independently related to HRQOL in patients receiving outpatient rehabilitation treatment is unknown. The present study investigated these relations in patients participating in an outpatient stroke rehabilitation program. On the basis of the findings in a population with chronic stroke, we expected that patients with high depression scores use different coping strategies and problem-solving skills than those with low depression scores and that coping strategies and problem-solving skills are independently related to psychosocial HRQOL.

Methods

Study population

Between March 2011 and August 2013, patients in outpatient stroke rehabilitation treatment at Rijndam Rehabilitation Center (The Netherlands) and in Ghent University Hospital (Belgium) were asked to participate. Patients were included if they had been diagnosed with stroke (including subarachnoid hemorrhage) and were aged 18 to 75 years, receiving outpatient rehabilitation treatment of stroke, and able to participate in group therapy. Patients were excluded if they had progressive neurological disorders, life expectancy of ≤1 year, insufficient understanding of the Dutch language, subdural hematomas, or moderate or severe aphasia (ie, score ≤20 on the short version of the Token Test), or partook in excessive drinking or drug abuse. Eligible patients were approached by their rehabilitation physician and invited to participate in an intervention study to evaluate the effectiveness of group training for patients with stroke in addition to the outpatient rehabilitation treatment.

This was a cross-sectional study of the baseline measurement of a randomized controlled trial examining the effect of problem-solving therapy, in addition to standard treatment, in patients receiving outpatient stroke rehabilitation. Outpatient stroke rehabilitation is provided during the postacute phase after stroke for most patients, but it may also be provided for delayed or recurrent stroke effects. The latter group was included in this study because these patients experience comparable problems and may benefit from a problem-solving intervention.

The study was approved by the medical ethics committee of the Erasmus University Medical Center and the ethics committee of the Ghent University Hospital. Before the study, written informed consent was obtained from all participants.

Measurement instruments

Patients were assessed by trained research psychologists at the rehabilitation center or at home. HRQOL was measured using the five-level EuroQol five-dimensional questionnaire (EQ-5D-5L) and the Stroke-Specific Quality of Life Scale (SS-QOL-12). The EQ-5D-5L is a generic questionnaire consisting of 5 questions measured on a 5-point rating scale, which can be combined into 1 utility scale representing the societal perspective of the general public. The EQ-5D-5L also includes a visual analog scale in which patients rate their health on a scale from 0 to 100. The SS-QOL-12 is a disease-specific questionnaire. The short version of the questionnaire, which has been validated, consists of 12 questions and provides a total score and 2 subscores: physical and psychosocial HRQOL. The total score and subscores are calculated as the mean scores of the items in the scale (score range, 1–5).

Coping strategy was measured using the Coping Inventory for Stressful Situations Revised: Short Form (SPSI-R:SF). The SPSI-R:SF consists of 10 questions on problem-solving skills in daily situations and contains 5 domains: positive problem orientation (PPO), rational problem solving, negative problem orientation (NPO), impulsivity/carelessness style, and avoidance style. Items are measured on a 5-point rating scale (range, 0–4). Domain scores are calculated as the sum score of the items. The total score is the sum of the items in the positive domains (PPO, rational problem solving) and the reverse score of the items in the negative domains (NPO, impulsivity/carelessness style, avoidance style). Higher domain scores indicate more use of the coping strategy. The questionnaire has been validated in the Dutch population.

Problem-solving skills were measured using the Social Problem Solving Inventory—Revised: Short Form (SPSI-R:SF). The SPSI-R:SF consists of 10 questions on problem-solving skills in daily situations and contains 5 domains: positive problem orientation (PPO), rational problem solving, negative problem orientation (NPO), impulsivity/carelessness style, and avoidance style. Items are measured on a 5-point rating scale (range, 0–4). Domain scores are calculated as the sum score of the items. The total score is the sum of the items in the positive domains (PPO, rational problem solving) and the reverse score of the items in the negative domains (NPO, impulsivity/carelessness style, avoidance style). Higher domain scores indicate more use of that problem-solving skill, and a
higher total score indicates better problem-solving skills in general. The short version is considered reliable and valid.32,33

Depression was measured using the Center for Epidemiologic Studies Depression Scale (CES-D), which consists of 20 items (score range, 0–3). A higher total score indicates more depressive symptoms, and a score of ≥16 is considered the cutoff value of the high depression score.34 The score ranges from 0 to 60 and is internally consistent and valid in the Dutch population.35

The short version of the Token Test was used to measure the presence and severity of aphasia. The score ranges from 0 to 36 and has been validated35; a higher score indicates better performance. A score of ≤28 indicates mild aphasic features and ≤20 indicates the presence of moderate aphasia; a score of ≤20 was used as an exclusion criterion for participation in the present study.

The modified Rankin Scale was used to measure the level of independence and as a substitute measure of stroke severity. The scale ranges from 0 (complete independence) to 5 (complete dependence) and is valid in the Dutch population.36

Demographic and clinical information (eg, side and type of stroke) was obtained from patient records and structured interviews by the research psychologist before the measurement. Education level was classified in a 7-level system: 1 refers to some years of basic primary education and 7 refers to a university degree or higher.37

Statistical analysis

The sample size required for the randomized controlled trial to detect treatment effects in HRQOL was 132 patients.26 For this cross-sectional analysis, we used the rule of thumb that at least 10 patients are needed for each determinant in regression models.8,39

Patient characteristics and responses to the questionnaires were evaluated using descriptive statistics. Potential differences between patients with high and low depression scores with regard to patient characteristics, HRQOL, coping strategies, and problem-solving skills were analyzed using independent samples t tests for continuous variables and chi-square tests for categorical variables.

To assess whether the variables measuring HRQOL, coping strategy, problem-solving skills, and depression were interrelated, correlation coefficients were calculated and checked for multicollinearity. Relations between these variables and the following potentially confounding variables were also checked: age, sex, living without a partner, education level (dichotomized into high school or more vs less than high school), time poststroke (dichotomized into ≤1y vs >1y), side (left vs right), type of stroke (ischemic vs hemorrhagic), aphasia severity, and level of independence (independency ≤2 vs dependency >2).

To investigate the relative contribution of variables significantly related to at least one of the HRQOL domains (P<.01), multivariable regression analyses were performed for each HRQOL domain. We assumed that HRQOL could depend on depression score, coping strategy, and problem-solving skills. Variables were entered into the regression model using a blockwise procedure. In block 1, depression score was entered into the model. In block 2, coping was added to the model to estimate its additional value and whether the contribution of depression score on HRQOL changed. In block 3, problem-solving variables were added to the model. In block 4, potentially confounding variables were added to the model. For each block, the variance explained (R² change) and its significance were estimated.

$P$ values <.05 (2-sided) were considered statistically significant. The model assumptions of normality, linearity, and homoscedasticity were checked.

The analyses were repeated in the patient subgroup within the first year of stroke, excluding patients with delayed stroke effects, to assess whether this altered the results.

Analyses were performed with SPSS version 21.0.4

Results

Study population

Of 293 eligible patients approached, 166 provided informed consent. Reasons for nonparticipation were lack of time, logistical problems, or lack of interest. The EQ-5D-5L, SS-QOL-12, SPSI-R:SF, CES-D,
and Token Test were completed by all patients, but 1 CISS score was missing. No patient was excluded on the basis of the results of the Token Test.

Table 1 lists the patient characteristics and mean outcome scores. The time poststroke varied (median, 7.29mo; interquartile range, 4.90–10.61mo), but 83.7% were within the first year of stroke. Based on the CES-D cutoff criteria, 39.2% of the study population reported high depression scores. Time poststroke was not related to depression (table 2).

Patients with and without depression

Several significant differences were found by comparing patients with high and low depression scores (see table 2). Those with high depression scores were younger and more frequently women, living without a partner, and had ischemic stroke. Patients with high depression scores assigned a lower value to all HRQOL domains, used more emotion-oriented coping strategies, NPO, and avoidance style, and used PPO and total positive problem-solving skills less frequently.

Multivariable regression analysis

Pearson correlation coefficients showed no indication of multicollinearity. Depression score, emotion-oriented coping, PPO, NPO, avoidance style, age, time poststroke, and modified Rankin Scale score were significantly related to at least 1 HRQOL domain. These variables were further analyzed using multivariable regression analyses in which the 5 outcomes of generic and disease-specific HRQOL were entered as dependent variables (table 3). Sex, living without a partner, education level, side and type of stroke, and severity of aphasia were not related to any HRQOL domains and were not entered into the regression model.

Regression models were built from 4 blocks of variables. Block 1 showed that the depression score was significantly related to all HRQOL domains. In block 2, the value of coping strategy was studied in addition to the depression score. Emotion-oriented coping was not independently related to HRQOL. In block 3, the value of problem-solving skills was analyzed in addition to coping strategy and depression score. PPO was significantly related to psychosocial HRQOL and total HRQOL, independent of the depression score and coping strategy. In block 4, all relations were adjusted for age, time poststroke, and modified Rankin Scale score. These variables did not alter the relations between depression score, problem-solving skills, and HRQOL (see table 3).

The same significant relations were found in the subgroup of patients within the first year of stroke, except that age and modified Rankin Scale score were not significantly related to the visual analog scale and physical HRQOL, respectively.

Discussion

This study supported the hypothesis that patients with high and low depression scores receiving outpatient stroke rehabilitation use different coping strategies and problem-solving skills. In line with other reports, 39.2% of the patients had high depression scores after stroke. A meta-analysis reported a 30% to 36% prevalence of depression after stroke in general and a prevalence of 36% and 34% for rehabilitation-based studies mainly assessing depression in the mid- and long-term phases after stroke, respectively. In line with other studies, our results show that patients with high depression scores poststroke are younger, more often women, living without a partner, and diagnosed with ischemic stroke. In the present study, patients with high depression scores after stroke assigned lower values to all HRQOL domains. They also used more emotion-oriented coping, NPO, and avoidance style and less PPO and total positive problem-solving skills less frequently.

Furthermore, coping strategy, problem-solving skills, and depression were related to psychosocial and total HRQOL measured using the SS-QOL-12. The regression models explained 53.2% and 45.6% of the variance for the domains psychosocial and total HRQOL, respectively. We conclude that these domains are well explained by psychosocial variables.

Depression score had the strongest relation with HRQOL. In addition to the depression score, PPO was an independent predictor of HRQOL, which is in line with other studies. Depression scores were younger and more frequent women, living without a partner, and diagnosed with ischemic stroke. In the present study, patients with high depression scores after stroke assigned lower values to all HRQOL domains, used more emotion-oriented coping strategies, NPO, and avoidance style and less PPO and total positive problem-solving skills less frequently.
Coping, depression, and problem solving in relation to HRQOL: outcomes of the multivariable regression analyses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Visual Analog Scale</th>
<th>Utility*</th>
<th>Physical HRQOL</th>
<th>Psychosocial HRQOL</th>
<th>Total HRQOL</th>
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<tr>
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<td>.100</td>
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<td>.008</td>
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<td>.494</td>
<td>.002</td>
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<td>.006</td>
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<td>PPO</td>
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<td>.020</td>
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<td>AS</td>
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<td>.929</td>
<td>.005</td>
<td>.511</td>
<td>-.029</td>
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<td>R² change</td>
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<td>.013</td>
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<tr>
<td>Depression score</td>
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<td>.001</td>
<td>.341</td>
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<td>.122</td>
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<td>R² total</td>
<td>.195</td>
<td>.387</td>
<td>.224</td>
<td>.532</td>
<td>.456</td>
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</table>

Abbreviations: AS, avoidance style; mRS, modified Rankin Scale.
* Measured using the EQ-5D-5L.
1 Measured using the SS-QOL-12.
2 Measured using the CES-D.
3 Measured using the CISS.
4 Measured using the SS-QOL-12.
5 Measured using the SPS-1-RSF.
6 Measured using the mRS.

The utility scores found in our population were relatively high compared with other studies. This difference might be attributed to the fact that our study population was selected from patients actively participating in an outpatient rehabilitation program for stroke, which excluded patients with more severe stroke still being treated in the inpatient rehabilitation clinic.

### Study limitations

Some study limitations should be addressed. Most patients in our study population had a right hemisphere stroke. This might be attributed to the fact that patients with language comprehension problems (mostly left hemisphere strokes) were not eligible for the present study. In patients with left hemisphere stroke, the problems of depression may be more pronounced. Also, the time poststroke varied. Most patients received postacute outpatient rehabilitation for delayed effects of stroke, explaining the range of times poststroke. Excluding the latter subgroup did not alter the results. This finding underlines the need for early recognition of potential problems in daily life that may occur a considerable time after rehabilitation treatment.

Although we did not measure stroke severity, we did measure level of independence, that is, a functional outcome that may be
even more relevant. To assess the predictive value of depression, coping strategy, and problem solving on HRQOL, a multivariable linear regression analysis was used, which assumed a causal relation between the independent and dependent variables. On the basis of the literature, we assumed that HRQOL depends on psychosocial variables. However, because we used a cross-sectional study design, it is uncertain whether this assumption holds. This needs to be confirmed in a prospective follow-up study (which is currently in progress). Another limitation is that selection bias may have occurred since 43% of eligible patients declined to participate. Furthermore, only part of the population with stroke was referred to rehabilitation centers. Elderly patients with stroke are often discharged to nursing homes (25%) and are not represented in this study. Therefore, our results can only be generalized to patients who are treated in an outpatient rehabilitation center after stroke.

Conclusions
This study supports the hypothesized relation between coping strategy, depression, and HRQOL in patients receiving outpatient rehabilitation treatment of stroke, as found earlier in patients in the chronic phase after stroke. Moreover, problem-solving skills had additional value for maintaining better HRQOL. The domains PPO, NPO, avoidance style, total problem solving, and emotion-oriented coping are significantly associated with depression. Of these, PPO appears to be independently related to HRQOL. These results suggest that training patients in effective problem-solving skills while participating in outpatient rehabilitation programs after stroke could be beneficial in improving both HRQOL and symptoms of depression.

Keywords
Coping skills; Depression; Quality of life; Rehabilitation; Stroke

Supplier
a. IBM Corp.

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