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## Mental status and health-related quality of life in an elderly population 15 years after limited cerebral ischaemia

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■ **Abstract** *Background* Stroke has a major impact on survivors. Our study was designed to describe the mental status and health-related quality of life (HR-QoL) in long-term survivors of TIA or minor ischaemic stroke (MIS) and evaluate associations of mental and physical factors with HR-QoL. *Methods* A random sample of the 10-year survivors of the Dutch TIA Trial (DTT) and the dutch participants of the European Atrial Fibrillation Trial (EAFT) were interviewed by postal ques-

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tionnaire (n = 468) and at home (n = 198). Demographic data, mental health status (depression (CES-D), cognition (CAMCOG)), and health perception (SF-36 and Euroqol) were measured. *Results* 198 long-term survivors were included; mean age was 72.5 (SD 8.7 years), 22% was depressed (CES-D  $\geq 16$ ) and 15% had cognitive dysfunction (CAMCOG < 80). The overall HR-QoL did not differ much from the norm population. Physical disability, occurrence of a major stroke and comorbidity of locomotion or the heart were independently associated with a low health perception. *Conclusions* Despite varying amounts of disability, the majority of long-term survivors of a TIA or MIS rated their quality of life as rather good. Physical factors, rather than mental status were independently related to a decrease in perceived health.

■ **Key words** mental status · health-related quality of life · cerebral ischaemia · comorbidity

### Introduction

With the increased recognition that healthcare evaluations should incorporate patients' perspectives, the focus of outcome in stroke research has shifted

from mere survival and disability to the inclusion of patient-reported health rating scales. Especially in those patients surviving with no or minor sequelae from their original TIA or minor ischaemic stroke (MIS) outcome measures other than disability grades

are particularly relevant. The International Classification of Functioning, Disability and Health (ICF) [1], published by the WHO in 2001 as a model for the description of the components of health, has been used widely as a theoretical framework for outcome research (Fig. 1). Although the ICF-frame work addresses many aspects of functioning and health it does not cover patients' subjective feelings of physical, psychological and social well-being [2]. Another construct used for research is the WHO "biopsychosocial model" of health [3], in which health is defined as a state of complete physical, mental and social well-being, and not merely the absence of diseases and infirmity. This WHO definition of health is seen by many researchers as synonymous to "Health-Related Quality of life" (HR-QoL) [4]. Although physical disability and QoL are often related, there are exceptions. A study from New Zealand, for example, found that 6 years after stroke HR-QoL (as measured with the SF-36) was relatively good [5], whereas a Finnish study showed that stroke patients with little or no physical dysfunction can experience a compromised QoL [6]. Psychological factors appear to be as important as physical disability in determining QoL [7]. To date, no precise information is available about the long-term mental status of patients with a history of TIA or MIS, nor about the relation between these mental factors, the physical factors and the patients' perception of their current health state.

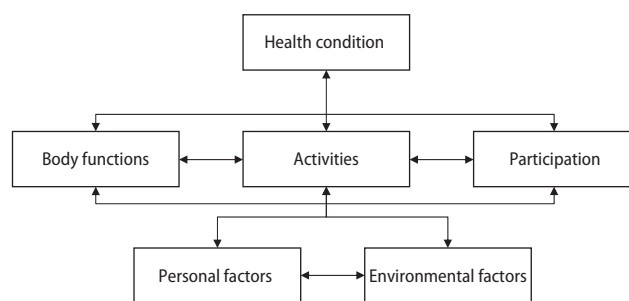
We studied a cohort of about 200 elderly with a history of transient or limited cerebral ischaemia for: (1) their mental status, (2) their HR-QoL and (3) associations of physical and mental factors with health perception.

## Subjects and methods

### Study population

LiLAC (Life Long After Cerebral ischemia) is a cohort study based on the study populations of the Dutch TIA Trial (DTT) and the European Atrial Fibrillation Trial (EAFT). Patients who had a TIA or MIS were included in these trials. A neurologist in any of the participating hospitals made the diagnosis. Important inclusion criteria were: the TIA (symptoms lasting for less than 24 h) or MIS should have been within three months before randomisation, and patients had to be independent in most of their daily activities (modified Rankin Score (mRS) 3 or less); details have been described elsewhere [8–10]. In the DTT 3150 patients were included; a cardiac origin of the ischemic event and disorders of blood coagulation were exclusion criteria. For LiLAC we included only patients from centres that had randomised 50 patients or more in the DTT ( $n = 2473$ ). In the EAFT 1007 patients were included; current (<2 years) atrial fibrillation (confirmed by electrocardiography) was a prerequisite. For LiLAC we only included the Dutch participants ( $n = 186$ ).

In the present study the follow-up of all patients alive at the end of the DTT and EAFT was extended to the period between March 2001 and December 2003; 1024 of the 2659 eligible patients survived



ICF = International Classification of Functioning, Disability and Health.

**Fig. 1** Schematic survey of the framework of the ICF

(Fig. 2). With a computer-generated list we contacted a random sample of survivors, aiming at 200 participants for a homevisit. From the 468 who were willing to participate we drew another random sample. All patients gave written informed consent and the ethics committee of the University Medical Centre Utrecht approved the study protocol.

### Measurements

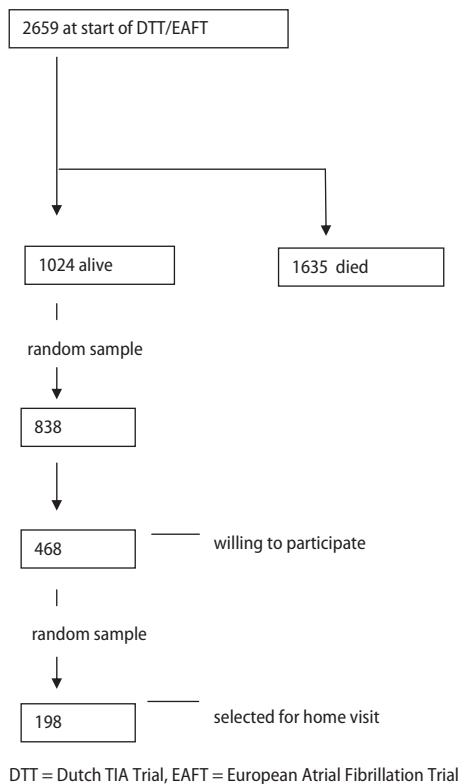
Baseline characteristics (medical history, event characteristics and data from ECG's and CT-scanning) were systematically recorded in both trials. We obtained information about living condition (independent or protected, alone or with partner), comorbidity and health perception (EuroQoL) by means of a postal questionnaire.

Comorbidity was assessed with a predefined structured list comprising a broad range of diseases within the following categories: cardiac, respiratory, diabetes, neurological, locomotor system, cancer, visual system, hearing system or otherwise (appendix 1). The list was composed on the basis of a known or assumed high burden of illness [11]. Patients also had to state whether they still received medication or therapy for a specific disease and whether they believed this disease influenced their daily functioning.

The Euroqol was used as a generic instrument [12], providing a simple, descriptive profile of health in five dimensions (mobility, self-care, social, pain, and psychological), with the possibility to create a single index score. The Euroqol also includes a visual analogue scale (VAS) on which patients rate their own health between 0 and 100. It is generally recommended to use it together with more detailed generic measures [12] such as the SF-36, which we therefore included in the structured interview for the home visit.

The homevisit-interview was undertaken by trained research assistants to get information about the mental (cognition and depression) status and HR-QoL (SF-36). The SF-36 is a short (10 minutes), valid and efficient instrument to describe health perception in 8 domains (physical functioning, physical role limitation, emotional role limitation, social functioning, mental health, vitality, pain and general health) [13]. The psychometric qualities of the SF-36 and the Euroqol have been tested in stroke populations [13, 14] and in a random Dutch population sample [15, 16].

For the evaluation of cognitive function the Dutch version of the CAMCOG was used [17]. The CAMCOG is the cognitive and self-contained part of the Cambridge Examination for Mental Disorders of the Elderly (CAMDEX) [18], a standardized instrument for the diagnosis and grading of dementia. It consists of 67 items, divided over the subscales orientation, expressive and comprehensive



**Fig. 2** Flow diagram

language, memory, attention, praxis, calculation, abstraction and perception, with a range of 0–107. It has been shown stable and reliable and also suitable to distinguish well between normal cognitive functioning and mild cognitive impairment [19]. In contrast to the MMSE it has little ceiling effect in non-demented elderly [20]. Despite its length it appeared to be feasible in elderly stroke patients [21, 22]. In most studies a cut-off point of 79/80 was used between demented patients and normal subjects [18].

For the evaluation of symptoms of depression we used the Centre for Epidemiological Studies of Depression (CES-D) scale [23]. Scores range from 0 to 60, with higher scores indicating more severe symptoms. A score of 16 or higher is considered indicative of depression [24].

If a patient could not be interviewed a proxy (usually the spouse) provided answers. For most measurement instruments proxy ratings have shown to be valid and reliable.

Finally, the research assistant evaluated the functional dependence in self-care and mobility of the patient by means of the modified Rankin Score [25].

#### ■ Data analysis

The primary aim of the data analysis was the description of long-term mental status and HR-QoL of survivors of limited cerebral ischemia. Therefore, descriptive statistics (parametric and non-parametric) were used according to the characteristics of the measurement instruments. Where available, scores were compared with standard norm scores for the Dutch population of the same age. Associations of independent variables with perceived health

were tested with the independent samples *t*-test. Variables that had a statistically significant association with perceived health (VAS-score;  $p < 0.05$ ) were entered into a multivariate linear regression model.

## Results

Of the 838 patients who were contacted (Fig. 2) 468 agreed to participate, 126 refused, 39 had died and 205 did not respond. Those who did not respond, died or refused to participate were older (62 years vs. 57 years), more often female (41% vs. 35%) and had more often a minor stroke rather than a TIA (64% vs. 58%), or white matter lesions on baseline CT scan (7% vs. 3%). The other characteristics presented in Table 1 did not differ between participants and non-participants. Those who were willing to participate were contacted again in a random fashion until 198 patients had been actually visited at home (Fig. 2).

#### ■ Demographics

The mean age at the time of the home visit was 72.5 years (SD 8.7). Patients who participated in the home visit were younger, more often had had a TIA and had fewer vascular risk factors at baseline than the average participant in the LiLAC study (Table 1). After a mean follow-up of 15.6 years (SD 1.1) only 5–7% of the responding survivors were institutionalised; the majority was living with a partner (Table 1).

#### ■ Mental status

In eight patients the data on cognitive functioning were not sufficient for analysis: four because of visual problems, two because of writing problems, and two for unknown reasons. Therefore 190 patients remained in the analysis of the CAMCOG data. The median total score was 91 (Interquartile Range (IQR) 84–95); no one reached the maximum score. Lowest scores were obtained for the domains abstract thinking, perception and memory.

41 of 190 (21.5%) patients were depressed (CES-D score 16 or higher). The median score of all participants on the CES-D was 13 (IQR 10–16) (Table 1).

#### ■ Co-morbidity

About 147 (75%) participants reported one or more co-existing diseases, most often in the category cardiac disease (36%) or problems with locomotion (35.4%) (Table 1, Appendix).

**Table 1** Characteristics of different groups

characteristic	Total (n=2659)	Home visits (n=198)
At baseline		
Female	35.5	32.8
Age at randomisation (m, SD)	65.6 (10.1)	56.9 (8.7)
Minor stroke vs TIA	69.8	55.1
Diabetes	8.3	3.6
Intermittent claudication	5.1	2.1
Hypertension	42.1	34.9
Myocardial infarction	10.4	7.2
Modified Ranking Score $\geq 2$	24.2	13.2
Any infarct on CT scan	41.4	26.6
White matter lesions	11.6	2.7
At follow up		
New vascular event	55.4	26.7
Age at homevisit (m, SD)	NA	72.5 (8.7)
Institutionalized	NA	5.2
Living alone	NA	31.1
Comorbidity	NA	
Cardiac		36.4
Respiratory		16.7
Diabetes		17.0
Neurologic*		12.1
Locomotion		35.4
Cancer		3.9
Visual		10.1
Auditive		15.2
Other		21.7
Depression (CES-D $\geq 16$ )	NA	21.5
Cognitive dysfunction (CAMCOG < 80)	NA	15.3
Modified Rankin Score $\geq 2$	NA	25.8

N = number of patients. Figures are percentages unless otherwise stated. m = mean, SD = standard deviation, NA = not available. \*only diseases other than TIA or stroke were counted.

### Health-related quality of life

The mean VAS score was 72.5 (SD 19.1) and mean Euroqol index score 0.72 (0.26) (Table 2). The majority of patients experienced problems in the dimensions mobility (61%) and pain/discomfort (63%) of the Euroqol, while only a few reported problems in self-care (15%). These percentages were higher than in the Dutch norm population (age group 70–79 years). The VAS-score, index score and the scores on the SF-36 dimensions did not differ significantly from norm scores for age (Table 2).

Both mental and physical factors were related to health perception (Table 3). Factors independently related to a poor perception of health (VAS-score) in the multivariate analysis were functional dependence in self-care and mobility by means of the modified Rankin Score (mRS)  $>2$ , the presence of comorbidity and the recurrence of a major stroke (Table 4).

**Table 2** Health-related quality of life

	Patients	Pop Norms*
Euroqol		
VAS-score (mean, SD)	73 (19)	76 (21)
Reporting any problems in		
Mobility (%)	61	43
Self-care (%)	15	9
Usual activities (%)	35	23
Pain/discomfort (%)	63	42
Anxiety/depression (%)	25	12
SF-36 (mean, SD)		
Physical Functioning	68 (37)	70 (27)
Role Physical	78 (38)	70 (41)
Bodily Pain	79 (25)	81 (24)
General Health	63 (23)	64 (18)
Vitality	72 (22)	69 (22)
Social Functioning	89 (20)	83 (23)
Role Emotional	94 (22)	82 (35)
Mental Health	84 (16)	79 (14)

\*figures present Dutch population norms for the same age group, except for the Euroqol VAS-score (UK-population norms).

### Discussion

In this study of patients with transient or minor ischaemic stroke we found that after an average period of 15.6 years, one out of five of the surviving patients (mean age 72.5, SD 8.7 years) visited at home was depressed, 15% had cognitive dysfunction, and 5.3% suffered from both conditions. Yet, patients' own health rates were generally similar to that of a norm population. A negative health perception was associated with functional dependence in self-care and mobility, the occurrence of a major stroke and comorbidity affecting locomotion or the heart.

We used a patient-centred approach to describe the health status of our elderly population. The importance of obtaining patients' own views on QoL has been emphasised [26] and therefore we used the VAS-score of the Euroqol as outcome measure in the multivariate regression analysis. Moreover, standardised measurement instruments were used to describe the mental status and HR-QoL, which facilitates interpretation of data and allows comparison with other studies. In addition, we studied associations of both physical and mental factors with perceived health.

Our patients experienced considerably more problems in the five dimensions of the EuroQol than the general Dutch population [15]. The mean VAS was only slightly lower than that of a UK norm population [27]. The SF-36 was used for evaluating long-term QoL after stroke in the Auckland population

**Table 3** Associations of patient or disease characteristics with health perception that reached statistical significance

Characteristic	Present?	N	Health Perception											
			Euroqol					SF-36						
			VAS	PF	RP	BP	GH	VT	SF	RE	MH			
Age >= 60	Yes	75	-	55.1	-	73.0	-	-	-	-	-	-	-	-
	No	123	-	75.2	-	81.5	-	-	-	-	-	-	-	-
Minor stroke	Yes	113	-	-	-	-	-	-	-	-	-	-	-	-
	No	85	-	-	-	-	-	-	-	-	-	-	-	-
Any Infarct	Yes	50	66.6	-	-	-	-	-	-	-	83.3	-	-	-
	No	138	74.3	-	-	-	-	-	-	-	91.4	-	-	-
White matter Lesions	Yes	5	-	-	-	-	-	-	-	-	-	-	-	-
	No	183	-	-	-	-	-	-	-	-	-	-	-	-
Recurrent stroke	Yes	36	59.5	-	-	-	-	56.3	-	65.2	-	-	-	-
	No	162	75.3	-	-	-	-	64.9	-	74.8	-	-	-	-
Comorbidity locomotion	Yes	70	64.2	54.4	63.9	69.1	54.7	64.2	85.5	80.2	-	-	-	-
	No	116	77.9	76.4	86.3	84.4	67.6	77.0	92.6	86.4	-	-	-	-
Comorbidity Cardiac	Yes	72	64.2	57.3	68.4	73.6	54.4	65.8	-	-	-	-	-	-
	No	113	78.4	75.2	82.4	83.0	69.5	77.5	-	-	-	-	-	-
Living alone	Yes	60	-	-	-	-	-	-	-	-	-	-	-	-
	No	134	-	-	-	-	-	-	-	-	-	-	-	-
Functional dependent*	Yes	51	55.3	34.0	60.3	68.9	47.6	66.7	77.5	-	-	-	-	-
	No	147	78.8	80.0	84.2	81.9	67.9	77.8	93.4	-	-	-	-	-
Depression	Yes	41	65.1	-	65.3	-	52.4	60.8	82.4	84.1	-	-	-	-
	No	157	74.3	-	81.7	-	65.6	75.6	91.2	96.3	-	-	-	-
Cognitive dysfunction	Yes	29	60.3	49.8	-	-	-	63.8	-	-	-	-	-	-
	No	161	74.0	73.5	-	-	-	75.0	-	-	-	-	-	-

Means are presented if differences between groups are statistically significant ( $p < 0.05$ , independent samples t-test). VE = vascular event, PF = physical functioning, RP = role physical, BP = bodily pain, GH = general health, VT = vitality, SF = social functioning, RE = role emotional, MH = mental health \* = Modified Rankin Scale Score > 2 at homevisit.

**Table 4** Results of multivariate linear regression analysis with health perception (VAS-score)

Variable	Multivariate regression	
	B( $\beta$ coefficient)	95% CI
Recurrent stroke	-8.2	-14.3 to -2.2
Comorbidity cardiac	-8.6	-13.5 to -3.7
Comorbidity locomotion	-5.4	-10.6 to -0.1
Rankin Scale Score > 2	-18.6	-24.5 to -12.7

6 and 21 years after stroke [5, 28]. Six years after stroke these patients scored lower than population norms in the dimensions vitality, physical functioning, general health, and social functioning, while the SF-36 profile of the 21-year survivors was broadly similar to that of the general population. The researchers concluded that the overall QoL was relatively good. Our population also rated their QoL approximately the same as its reference group [29]. It is known that psychological adaptation among patients with chronic medical conditions is effective [30], and, like in the Auckland studies, we conclude that this occurred in our elderly population too. In contrast, HR-QoL (SF-36) in young patients (15–45 year) with ischaemic stroke was still appreciably compromised in a hospital-based study from Iowa, 6 years after stroke [31].

We found a univariate association between depressive symptoms and perceived health (VAS-score), in agreement with other studies [26, 32, 33]. However, depression did not prove an independent determinant of a poor health perception in the multivariate analyses. Association between cognitive dysfunction and health perception has been assumed [7], but in a recent studies from Amsterdam and Edingburgh cognitive impairment was not an independent explanatory factor for poor QoL or satisfaction with life in old age, respectively [34, 35]. The association we found between physical disability and decreased QoL has been established before [33, 34, 36].

A potential limitation in the interpretation of our results is that we were dealing with a highly selected cohort of patients, in that they (1) were referred to hospital, (2) consented to participate in a trial, (3) survived for an average period of about 15 years, and (4) consented to participate in the home visit. Although survivors who participated in the home visit did not appreciably differ in baseline cardiovascular risk factors from those who declined, they probably

represent the surviving fittest. We therefore believe that the health problems perceived by our study group represent the lower limit of the true range of problems in the elderly with a history of limited cerebral ischaemia.

In an aging population, with an increase in cardiovascular and co-existing diseases, this information can be useful for medical professionals and health-care officials.

Another limitation is that we were not able to record all the reasons for non-response; cognitive impairment or depression may have played a role, each possibly related to the outcome measure we studied.

We acknowledge that the accuracy of the diagnosis TIA is limited, but this would apply to future patients with TIA(like) symptoms as well, hence we do not think that this issue hinders the generalisability of our findings.

When patients were not communicative, information from proxies was used. Generally there is good agreement between QoL assessment by patients and family caregivers [37], but the caregivers' responses in some domains should be interpreted with care [38]. The advantages of including proxy responses probably outweigh the resulting loss of information when they are excluded.

In a study of specific events in this cohort we found that patients continue to have an elevated risk of death and new vascular events, and should continue to pay attention to lifestyle and drug compliance [10]. It now seems that the surviving fittest, are able to maintain acceptable levels of health status and subjective well-being, despite certain limitations in their daily activities. Although mental factors did not influence quality of life in multivariate analysis, it did in the univariate analysis, therefore we suggest that it is important to detect and manage symptoms of depression in these patients. In addition, intervention strategies should be focused on the prevention of recurrent stroke and treatment of coexisting diseases of the heart and locomotor system.

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## Appendix

Structured list of coexistent diseases

Category	Diseases
Cardiac	Heart failure Myocardial infarction Arrhythmia Angina Other
Pulmonary	Asthma Chronic bronchitis COPD Other
<i>Diabetes</i> Neurological <sup>a</sup>	Stroke before 1990/1993 Stroke after 1990/1993 Multiple sclerosis Amyotrophic lateral sclerosis Polyneuropathy Other
Locomotor system	Amputation of lower extremity (Rheumatoid) arthritis/arthrosis Hip or knee replacement Chronic back pain Other
<i>Cancer</i> Visual system	Total blindness Very low vision Blindness of one eye
Auditive system	Total deafness Very bad hearing
<i>Other</i>	

<sup>a</sup>In the analyses on comorbidity only neurologic diseases other than stroke were counted

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