

Life Satisfaction of Two-Year Post-Stroke Survivors: Effects of Socio-Economic Factors, Motor Impairment, Newcastle Stroke-Specific Quality of Life Measure and World Health Organization Quality of Life – bref of Informal Caregivers in Luxembourg and a Rural Area in Portugal

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Key Words

Cerebrovascular disease · Stroke · Life satisfaction · Quality of life · Newcastle Stroke-Specific Quality of Life · World Health Organization Quality of Life – bref · Stroke survivors · Informal caregivers · Rural

Abstract

Background: Life satisfaction of stroke survivors is known to be associated with socio-economic factors and the survivor's and his/her caregiver's quality of life, but their respective influence remains to be fully elucidated. **Purpose:** To analyse the stroke survivors' life satisfaction 2 years after the event and its relationships with quality of life, socio-economic and stroke-related characteristics, and with informal caregivers' life satisfaction and quality of life. **Methods:** Over 18 months, all stroke patients from Luxembourg and north-eastern Portugal who lived at home were identified from the Inspection Générale de la Sécurité Sociale and hospital records, respectively. The clinical diagnosis of cerebrovascular disease was confirmed. We excluded all patients who declared that stroke did not result in neurological impairments

at the time of stroke from the statistical analysis. The samples comprised 79 patients in Luxembourg and 48 in Portugal. Patients and the people they identified as their main caregivers were interviewed using validated questionnaires measuring life satisfaction, i.e. the Newcastle Stroke-Specific Quality of Life (Newsqol – 11 subscales), which identifies the areas affected by stroke among patients, and the World Health Organization Quality of Life – bref (Whoqol-bref – 4 subscales) of informal caregivers. Survivors without neurological impairment at the time of stroke were excluded. Data were analysed via multiple-regression models. **Results:** Life satisfaction was higher among women and lower among subjects with impaired motor functions. It was lower among Portuguese respondents with low-level education (<12th grade) and higher among those at work (37.6/100). In Luxembourg, retired people had more life satisfaction than did working people (–7.9/100). Controlling for socio-economic factors, life satisfaction was associated with feelings-Newsqol (slope 0.25) among Luxembourg residents, and with feelings-, mobility- and self-care-Newsqol (slopes 0.24, 0.27 and 0.33, respectively) among Portuguese respondents. Life satisfaction of patients was strongly related to that of

family caregivers among the Portuguese respondents (slope 0.66) but the relationship was moderate in Luxembourg (slope 0.28). The survivors' life satisfaction was not correlated with any Whoqol-bref domain in the Luxembourg group, but was correlated with the Whoqol-bref psychological, social relationships and environment domains among the Portuguese respondents (slopes 0.55, 0.59 and 0.51, respectively). **Conclusions:** The life satisfaction scale and the Newsqol stroke instrument, which identify areas of quality of life affected by stroke, are reliable patient-centred markers of intervention outcome. They can be used within the framework of medical follow-up (such as telephone assistance, clinical practice and prevention). Depending on the stroke survivor's and the family caregiver's habitual lifestyle and material circumstances, enhancement of a caregiver's quality of life can help maintain the patient's life satisfaction, particularly in a rural setting.

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Introduction

Cerebrovascular diseases are relevant to European public health policy due to their high prevalence and mortality, and the long-term disability that survivors often experience, necessitating increasing assistance from others [1]. Stroke is the leading cause of long-term disability in western countries [2] and the third leading cause of death in the United States, accounting for 143,600 deaths in 2005 [3]. In Luxembourg, it is a major cause of acquired handicap and the third leading cause of death [4]. Cerebrovascular diseases can have substantial socio-economic, relational and emotional impact on stroke survivors and their close relatives. Recent studies have shown that the caregivers of stroke survivors have lower than normal life satisfaction, lower health-related quality of life, a greater prevalence of stress and depression, more economic burden, and more changes in social relationships [3, 5, 6]. Stroke survivors currently represent a 'population at risk' for which the European health system is responsible. These issues pose a challenge to the everyday life of stroke survivors and their families [7, 8]. It is therefore important to learn about life satisfaction and stroke-related upheavals in daily life among stroke survivors, and to recognise potentially relevant factors. We need to consider how these people and their informal caregivers (spouses or partners) can be better prepared and monitored by medical and social services professionals.

Some socio-economic and social stratification factors, such as gender, age, education and occupation, are

well-known potential risk factors for a wide range of health-related issues (substance use, mental difficulties or disability), mortality [3, 9–12] and life satisfaction. Their role may be enhanced among stroke survivors, particularly because of possible motor function impairments and other consequences of stroke. Lower socio-economic status appears to increase the risk of stroke [13]. One study found that between 12 and 24 months after discharge from inpatient rehabilitation, life satisfaction decreased among stroke survivors [14]. Another study showed that disability remained highly prevalent 3 years after stroke [15]. Few studies on survivors' life satisfaction have focused on the influence of stroke on their quality of life, that of their family, and of their spouses or main caregivers [16, 17]. Decreased life satisfaction in stroke survivors is related to motor impairments, post-stroke depression, and restrictions on routine, leisure and work activities [18, 19]. Stroke is reported to affect health in combination with social, material and medical factors [20], but the sociocultural components of the stroke experience and the informal care setting remain to be explored. Post-stroke depression in stroke survivors is associated with quality of life, functional limitations and healthcare use [2, 21]. Investigating post-stroke life satisfaction and the effects of the previous individual characteristics on life satisfaction 2 years after the event may provide family caregivers with useful information and facilitate healthcare intervention and patient monitoring.

Because stroke can alter the health-related quality of life of stroke survivors [22], it can be expected that their life satisfaction might be affected. However, as quality of life includes many domains (e.g. physical, psychological, relationships and environment), it is important to know what aspects are associated with the life satisfaction of stroke survivors. This can reveal to the family and healthcare professionals the specific issues that need to be addressed. In the literature, the quality of life of stroke survivors has been assessed using various generic measures (the Health-Related Quality of Life, the Sickness Impact Profile, the Nottingham Health Profile), most of which fail to cover particular important concerns, such as communication, concentration and memory [23]. Stroke-specific instruments available at the commencement of this study lack comprehensiveness, are not patient centred and their validity and reliability remain unproven [24]. A question of interest is whether the Newcastle Stroke-Specific Quality of Life Measure (Newsqol) [25], an interviewer-administered instrument assessing the areas of quality of life affected by stroke, can reveal further spe-

cific domains affected, which may be associated with stroke survivors' life satisfaction.

Stroke can also affect caregivers. Compared to controls, caregivers of stroke survivors have a lower quality of life, a greater prevalence of stress and depression, a greater economic burden, and more changes in social relationships. Increased demands on families have been shown to result in decreased mental health among informal caregivers [14, 26]. The caregiver's burden was found to be associated with low life satisfaction [27]. Advancing age and anxiety in patients and caregivers, high dependency and poor family support help identify caregivers at risk of adverse outcomes [22]. This issue underlines the cumulative role of determinant factors in the development of social inequalities in health. It is reasonable to postulate that the effect of an event such as stroke will be greater and more serious in a family already facing disadvantages in healthcare and, vice versa, that the effect of health problems will be greater when the individual confronts social disadvantage [28]. In other words, social circumstances and physical characteristics can predict vulnerability to future difficulties. The financial and psychological instability that accompanies negative life events may reveal or revive latent weaknesses that otherwise would not appear and would not affect health. The quality of life of caregivers can be explored using the short version of the World Health Organization Quality of Life – bref (Whoqol-bref), a multidimensional generic profile designed for different cultural contexts and populations [29, 30]. It was applied to caregivers in the immediate discharge period [31]. Because of the dearth of literature on the use of the Newsqol in stroke survivors and the Whoqol-bref in their caregivers, the application of these measures to identify domains related to stroke survivors' life satisfaction is crucial to address potentially modifiable issues. This is consistent with the recommendations adopted at the 'Stroke Synergium. Stroke: working toward a prioritized world agenda' [32], and more specifically, the recommendations to develop a primary healthcare system that would provide preventive care and socio-educative services.

The present study assessed the effects of socio-economic factors, motor impairment, Newsqol quality of life and Whoqol-bref of informal caregivers on stroke survivors' life satisfaction 2 years after the event in two populations with different socio-economic and cultural contexts – the Grand-Duchy of Luxembourg and a rural area in the north-east of Portugal. These populations are of interest because their socio-economic and cultural characteristics and access to healthcare would be very differ-

ent. This survey was initiated by the research unit IN-SIDE [28] in Luxembourg (the smallest country in the European Union) because of a high impact of stroke on disability and mortality [4]. It was proposed to our partner, the University of Braga, which expressed its interest in applying the same research protocol and tools to a district in the north-eastern Portugal. Southern European countries have low cardiovascular mortality and high life expectancy, with the exception of Portugal, where stroke is the principal cause of both handicap and death [4].

Methods

The survey was conducted over 18 months among all stroke patients 2 years previously; the populations were in Luxembourg (national survey), which has 502,500 inhabitants (density 190/km², area 2,600 km²), is multilingual (Luxembourgish, Portuguese, French and German) and has great cultural diversity (more than 170 different nationalities), and the Bragança district in north-eastern Portugal (148,808 inhabitants, density 23/km², area 6,608 km²). Subjects were drawn from the list compiled by the Inspection Générale de la Sécurité Sociale for the former and the hospitals for the latter; 374 Luxembourgish and 132 Portuguese patients were identified. The subjects' clinical stroke diagnoses were confirmed. The inclusion criteria were: living at home and having given signed informed consent. Because the severity of their condition was minimal, patients who declared no neurological impairment at the time of stroke onset were excluded from the statistical analysis.

The Luxembourg protocol was approved by the National Committee of Research Ethics and notified to the Committee for Data Protection of Luxembourg. A letter was sent to the stroke patients explaining the aims of the survey and inviting them to participate. They were asked to send back their written informed consent. The informal caregiver's consent was generally obtained when the research teams went to the stroke patient's home to undertake the survey.

After receiving each stroke survivor's signed informed consent, the research teams telephoned (up to five attempts) to make an appointment at his or her home with the main caregiver identified by the survivor as 'the person who mostly takes care of me since the stroke event'. Two researchers, one per interview, conducted the face-to-face structured interviews supported by a questionnaire.

Data Collected from Stroke Survivors

The life satisfaction scale (dependent variable) is a simple measure in which respondents self-rate their life satisfaction: 'on a scale from 0 to 100, where would you place your level of satisfaction with your life?' (100 being the highest) [33].

The following types of factors were collected:

(a) The Newsqol scale [24] consists of 11 subscales (Appendix 1): mobility, self-care, pain/sensory, cognition, vision, communication, feelings, interpersonal relationships, emotion, sleep and fatigue. It is easy to administer, to complete and to score. The internal consistency, reliability, content and discriminant validity were examined [31]. For our surveys, these subscales were trans-

lated and back-translated, and proofread by native professional translators, in German, French, Portuguese, and Luxembourgish.

(b) Neurological impairments and residual disabilities were documented for the stroke-survivors in six functions: motor, sensory, vision, affect, cognition and language. This follows the American Heart Association Stroke Outcome Classification (AHA.SOC) [34], a validated system that documents stroke-related neurological impairments and disabilities in a single summary score. The number of deficiency domains affected was expressed in four categories: 'no domain impaired', 'one domain impaired', 'two domains impaired, and 'more than two domains impaired'.

(c) Socio-economic characteristics: age, sex (male or female), educational level (under 12th grade; 12th grade and above), occupation at the time of stroke onset (never employed; manual worker; employee/intermediate professional/technician; farmer; manager/liberal profession), current occupational status (working, retired or unemployed).

Data Collected from Informal Caregivers

(a) Life satisfaction and socio-economic characteristics were assessed using the same tools and procedure as for the survivors; in addition, the relationship with the care recipient (spouse/child/other) was determined.

(b) The Whoqol-bref assesses different facets of quality of life and is scored in four domains (Appendix 2): physical, psychological, environmental and social relationships [35]. It is a widely used tool with proven internal consistency, reliability, content and discriminant validity [36]. Its subscales are validated in the languages of this study: German [37], French [38] and Portuguese [39]. Its validity in Luxembourgish was confirmed by translation and back-translation, followed by review by native-speaking professional translators.

Statistical Analysis

We described the variables related to stroke survivors by percentages, means and standard deviations when appropriate, and separately for the two samples. We used the χ^2 test or Student's test to compare the socio-economic characteristics, life satisfaction and Whoqol-bref domains of the informal caregivers of the two samples. We assessed the effects of socio-economic factors and functional impairments on the survivors' life satisfaction using a multiple regression model. As the sample sizes are modest, we performed a backward selection of factors associated with survivors' life satisfaction with $p < 0.10$ separately on the two samples. Then we performed the final modelling on the two pooled samples by retaining only the factors and their interaction terms with the country that were associated with survivors' life satisfaction with $p < 0.10$. The threshold $p < 0.10$ was used only to select and reduce the number of variables to be included in the final model.

Finally, we studied the relationships of life satisfaction with each dimension of the Newsqol of survivors and with life satisfaction and each domain of the Whoqol-bref of caregivers using a multiple-regression model. This analysis was performed on the whole sample by pooling the two samples. As the socio-economic factors and motor function impairment may affect those relationships, they were included in the model as adjustment variables (results not shown).

Results

Socio-economic, demographic and stroke-related characteristics, life satisfaction and the Newsqol dimension scores of the survivors are shown in table 1. Seventy-nine Luxembourgish (mean age 65.4 years) and 48 Portuguese (mean age 69.7 years) stroke survivors were included in the analysis. Significant differences ($p < 0.001$) were observed: the first sample included more manual workers (33.3%) and employees, technicians and intermediate professionals (34.8%), whereas the second sample included more people who had never been employed (27.1%) and farmers (27.1%). At the time of the survey, language function was impaired in 34.2% of Luxembourgish and 43.8% of Portuguese survivors ($p = 0.011$). Their mean life satisfaction scores were 69 and 58 ($p = 0.002$), respectively. The scores on the Newsqol subscales (Appendix 1) were higher in the Luxembourgish than in the Portuguese sample and the difference was significant for 8 of 11 dimensions (mobility, self-care, cognition, feelings, interpersonal relationships, emotion, sleep and fatigue).

Sociodemographic characteristics, life satisfaction and Whoqol-bref domain scores of the informal caregivers are shown in table 2. The 52 Luxembourgish and 44 Portuguese informal caregivers were of similar ages (mean ages 58.7 and 60.8 years). They were mostly women and spouses (85.7 and 65.9%, $p < 0.027$). Half of the Luxembourgish were employees, technicians or intermediate professionals (50.0%) while most Portuguese caregivers had never been employed (36.4%), or were managers or professionals (25.0%). Their life satisfaction scores were similar (72 vs. 66), but all scores on the Whoqol-bref subscales (Appendix 2) were higher in the Luxembourgish group than among the Portuguese in the physical, psychological, social relationship and environmental domains.

The associations between the life satisfaction and socio-economic and demographic characteristics and impaired neurological functions among stroke survivors were analysed with a multiple-regression model and are shown in table 3. Life satisfaction was higher among women than among men, and lower among the survivors who had impaired motor functions. The effect of the level of education varied according to the country: in Portugal, survivors with a low educational level had a much lower life satisfaction score ($-30.7/100$); in Luxembourg, this effect was moderate ($-30.7 + 27.4 = -3.3/100$). The effect of occupational status varied with the country: Portuguese working people had a higher life satisfaction score

(+37.6/100) than the Luxembourgers (37.6 – 45.5 = –7.9/100). In Luxembourg, unemployed people had a lower life satisfaction (4.2 – 20.1 = –16.0/100) than retired people.

The relationships of life satisfaction of stroke survivors with each Newsqol dimension, and with life satisfaction and each Whoqol-bref domain of caregivers are presented in table 4. The life satisfaction of the Luxembourgish patients was related only to the feelings domain. Among Luxembourg survivors, life satisfaction was only related to the Newsqol feelings domain (slope 0.26). Among Portuguese survivors, life satisfaction was similarly related to the Newsqol feelings domain (slope 0.24) and also to the Newsqol mobility and self-care domains (slopes 0.27 and 0.33, respectively). There was a strong relationship between the life satisfaction of patients and that of caregivers in Portugal (slope 0.66) while it was rather moderate in Luxembourg (slope 0.28). The Luxembourg survivors' life satisfaction was not correlated with any Whoqol-bref domain whereas the Whoqol-bref psychological, social relationships and environment domains were correlated with the Portuguese survivors' life satisfaction (slopes 0.55, 0.59 and 0.51, respectively).

Discussion

Our research is original and is the first study to analyse life satisfaction of stroke survivors 2 years after the event and its relationships with socio-economic factors, motor function impairment and a wide range of quality of life domains measured by the Newsqol stroke instrument, as well as their associations with the life satisfaction and quality of life of their informal caregivers as measured with the Whoqol-bref. The Newsqol stroke instrument appears to reveal specific domains that may predict the survivor's life satisfaction while the life satisfaction and Whoqol of caregivers appear important to consider in developing patient-centred approaches and home-based rehabilitation programmes.

The main finding of our study is that, after controlling for socio-economic factors, the life satisfaction of stroke survivors from Luxembourg and northeastern Portugal was linked with certain stroke-related quality of life domains. An important result is the similar association, observed in both Luxembourg and Portugal, between stroke survivors' life satisfaction and the Newsqol feelings domain score, which measures feelings that can be generated by stroke, including a lack of independence, life change, depression, uselessness, and having less control over one's life. This may suggest a high impact of psycho-

Table 1. Socio-economic and stroke-related characteristics, life satisfaction and Newsqol of stroke survivors¹ (means ± SDs or %)

	Luxembourg stroke survivors (n = 79)	Portugal stroke survivors (n = 48)	p
Age	65.4 ± 14.0	69.7 ± 9.8	0.065
Sex			
Female	44.4	41.7	0.771
Male	55.7	58.3	
Educational level			
Under 12th grade	81.9	91.5	0.146
12th grade and above	18.1	8.5	
Occupation at the time of the stroke ²			
Never employed	11.6	27.1	<0.001
Manual worker	33.3	16.7	
Employee, technician or intermediate professional	34.8	16.7	
Farmer	4.3	27.1	
Manager or professional	15.9	12.5	
Occupational status at the time of stroke			
Working	33.3	47.9	0.184
Retired	47.2	31.3	
Unemployed	19.4	20.8	
Current occupational status			
Working	15.1	8.3	0.335
Retired	56.2	68.8	
Unemployed	28.8	22.9	
Neurological impairments at the time of stroke (AHA.SOC)			
One impaired domain	19.0	12.5	0.520
Two impaired domains	21.5	18.8	
More than two impaired domains	59.5	68.8	
Neurological impairments at the time of the survey (AHA.SOC)			
Motor functions	39.2	62.5	0.201
Visual functions	21.5	12.5	0.201
Sensory functions	50.6	43.8	0.452
Language functions	34.2	43.8	<0.01
Memory functions	36.7	35.4	0.883
Life satisfaction (0–100)	69 ± 18	58 ± 21	<0.01
Newsqol dimensions (0–100) ³			
Mobility	80.5 ± 24.1	61.9 ± 24.8	<0.001
Self-care	84.5 ± 24.0	60.1 ± 31.2	<0.001
Pain	75.8 ± 28.3	66.7 ± 29.0	0.091
Cognition	72.9 ± 23.9	60.1 ± 32.3	<0.05
Vision	83.5 ± 25.0	77.6 ± 27.8	0.231
Communication	78.8 ± 22.6	75.4 ± 29.9	<0.482
Feelings	74.1 ± 25.2	47.6 ± 31.1	<0.001
Interpersonal relationships	87.9 ± 16.6	77.2 ± 21.4	<0.01
Emotion	70.2 ± 25.9	37.6 ± 23.3	<0.001
Sleep	73.0 ± 24.2	57.8 ± 28.7	<0.01
Fatigue	77.1 ± 24.5	66.4 ± 25.4	<0.05

¹ National survey of Luxembourg and district survey in northeastern Portugal.

² The last occupational activity of unemployed and retired people as well as that of people in vocational training at the time of the event was recorded.

³ 0 = Worse quality of life; 100 = best quality of life.

Table 2. Socio-economic characteristics, life satisfaction and Whoqol-bref domains of the informal caregivers (means \pm SDs or %)

	Luxembourg informal caregivers (n = 52)	Portugal informal caregivers (n = 44)	p
Age	58.7 \pm 13.8	60.8 \pm 12.2	0.430
Sex			
Female	67.3	81.8	0.161
Male	32.7	18.2	
Educational level			
Under 12th grade	68.6	81.8	
12th grade and above	31.4	18.2	0.162
Occupation at the time of stroke ¹			
Never employed	16.0	36.4	<0.05
Manual worker	14.0	15.9	
Employee, technician or intermediate professional	50.0	18.2	
Farmer	4.0	4.5	
Manager or professional	16.0	25.0	
Occupational status at the time of stroke			
Working	46.0	47.7	0.587
Unemployed	32.0	38.6	
Retired	22.0	13.6	
Relationship with stroke survivor			
Spouse	85.7	65.9	<0.05
Daughter/son/other	14.3	34.1	
Life satisfaction (0–100)	72 \pm 17	66 \pm 16	<0.097
Whoqol-bref (0–100)			
Physical	75.0 \pm 14.9	68.1 \pm 19.6	<0.05
Psychological	69.1 \pm 17.3	59.3 \pm 14.6	<0.01
Social relationships	76.5 \pm 13.9	69.7 \pm 9.7	<0.01
Environment	71.8 \pm 16.7	56.1 \pm 12.8	<0.001

¹ Last occupation for unemployed and retired people as well as for those in vocational training at the time of the event.

logical difficulties other than the emotion domain associated with stroke.

Another interesting result is that stroke patients' life satisfaction was not associated with any of the Newsqol physical, sensory, cognitive and communication domains among the Luxembourgers, whereas significant links were observed with the Newsqol mobility and self-care domains among the Portuguese. Therefore, the main effects of stroke on life satisfaction were functional limitations on activities of daily living based on mobility (walking, managing stairs, bending down or standing) and self-care (preparing food, shopping, using transport, getting washed or getting dressed, and combed). These findings are of interest and have not been previously reported (in terms of stroke-specific quality of life measures). Conse-

Table 3. Associations between life satisfaction (range 0–100) and socio-economic characteristics, and impaired neurological functions among stroke survivors: regression coefficients and 95% confidence intervals (shown in parentheses)

	Estimate	p ¹
Intercept	79.4 (59.4; 99.4)	<0.0001
Sex		
Female	10.2 (1.8; 18.6)	<0.05
Male	0	
Country		
Luxembourg	-5.8 (-28.5; 16.9)	0.6143
Portugal	0	
Educational level		
Under 12th grade	-30.7 (-51.1; -10.3)	<0.01
12th grade and above	0	
Occupational status		
Working	37.6 (16.6; 58.6)	<0.01
Unemployed	4.2 (-9.8; 18.1)	
Retired	0	
Impaired motor functions		
Yes	-9.3 (-17.1; -1.5)	<0.05
No	0	
Country \times education		
Luxembourg		
Under 12th grade	27.4 (3.7; 51.1)	<0.05
12th grade and above	0	
Portugal		
Under 12th grade	0	
12th grade and above	0	
Country \times occupational status		
Luxembourg		
Working	-45.5 (-70.4; -20.6)	<0.001
Unemployed	-20.1 (-37.3; -3.0)	
Retired	0	
Portugal		
Working	0	
Unemployed	0	
Retired	0	

¹ F test (type III).

quently, psychological difficulties and reductions in mobility and self-care as a result of stroke may need to be assessed and the Newsqol may be an appropriate tool with which to produce indicators to be considered in healthcare programmes for stroke survivors with disabilities [16].

The relationships between life satisfaction and the socio-economic characteristics and impaired motor functions of patients revealed in this study also deserve attention. The motor impairment was consistent with the mobility and self-care limitations reported. We found that life satisfaction was better among women than among men, which calls for further research on stroke severity,

Table 4. Relationships of stroke survivor's life satisfaction with each Newsqol domain and with life satisfaction and each Whoqol domain of caregivers: slope and 95% confidence interval (in parentheses) computed via a multiple-regression model¹

	Luxembourg (n = 79)		Portugal (n = 48)	
	slope	p	slope	p
Newsqol of stroke survivors ²				
Mobility	0.12 (-0.08; 0.32)	0.243	0.27 (0.03; 0.51)	<0.05
Self-care	0.06 (-0.14; 0.26)	0.536	0.33 (0.12; 0.54)	<0.01
Pain	0.11 (-0.07; 0.29)	0.235	0.09 (-0.13; 0.31)	0.432
Cognition	0.13 (-0.06; 0.33)	0.182	0.03 (-0.17; 0.22)	0.797
Vision	0.10 (-0.10; 0.30)	0.333	0.10 (-0.11; 0.31)	0.330
Communication	0.08 (-0.12; 0.29)	0.430	0.16 (-0.04; 0.36)	0.125
Feelings	0.26 (0.07; 0.45)	<0.01	0.24 (0.01; 0.46)	<0.05
Interpersonal relationships	0.15 (-0.14; 0.45)	0.315	0.10 (-0.18; 0.38)	0.493
Emotion	0.15 (-0.03; 0.34)	0.107	0.09 (-0.17; 0.35)	0.491
Sleep	0.17 (-0.04; 0.37)	0.112	0.14 (-0.08; 0.36)	0.221
Fatigue	0.11 (-0.08; 0.30)	0.254	0.05 (-0.20; 0.29)	0.710
Caregivers ²				
Life satisfaction	0.28 (0.00; 0.56)	<0.05	0.66 (0.36; 0.96)	<0.0001
Whoqol-bref				
Physical health	0.04 (-0.34; 0.43)	0.827	0.13 (-0.16; 0.43)	0.376
Psychological	0.13 (-0.19; 0.46)	0.408	0.55 (0.16; 0.94)	<0.01
Social relationships	0.18 (-0.24; 0.61)	0.396	0.59 (0.01; 1.18)	0.045
Environment	0.04 (-0.29; 0.36)	0.822	0.51 (0.06; 0.95)	<0.05

All variables range from 0 to 100.

¹ Controlling for socio-economic characteristics and neurological impairment. ² Each factor was analyzed separately.

symptoms and potential risk factors, such as health-related behaviours, nutrition or leisure. Women are protected from cerebrovascular diseases relative to men because of female sex hormones, oestrogen, progesterone and possibly because of the mechanisms of ischaemic cell death in the female and male brain [40]. One systematic review of the literature on the knowledge of stroke risk factors and warning signs performed in 2008 reported that women had a better knowledge of stroke than men in most studies [41]. Women are more likely than men to report non-specific 'somatic' symptoms and change in mental status [42]. Our results contradict those of a study on the life satisfaction of Europeans [43] which reported that the difference between the life satisfaction of men and women is small in all countries. However, married people are more satisfied than those who are separated, divorced or widowed, and slightly more satisfied than single people in all country groups. This indicates that the emotional and social aspects of living in partnership are important to subjective well-being; in our samples, most patients live in couples.

The effects of a low educational level and occupational status differed greatly between Luxembourgers living

in an urban context and Portuguese people living in a rural area. Indeed, a low educational level was much more associated with lower life satisfaction for the Portuguese than for the Luxembourgers; having a job was associated with greater life satisfaction only for the Portuguese. We have no definite explanation for these findings, but it should be noted that stroke survivors in Luxembourg had more life satisfaction and better scores on all Newsqol domains than did their Portuguese counterparts. Some hypotheses arise: (a) more Portuguese survivors were working (a greater proportion were farmers), and the ability to maintain their occupational activity may be important to them; (b) access to social and medical aids as well as healthcare may be easier in Luxembourg, a country with a high gross domestic product per inhabitant (105,044 vs. 21,903 USD in Portugal in 2009) [44]; (c) access to healthcare and prevention may be less easy in rural northeastern Portugal, and (d) the proportion of retired people was greater among survivors in Luxembourg although they were younger overall than the Portuguese survivors.

This highlights the interactions between the social conditions of individuals and the socio-economic context of

the population in terms of individual physiology and pathology [45]. Financial and psychological instability alongside negative life events may reveal or revive latent weaknesses that otherwise would not appear and affect health and life [14, 46]. The life conditions of the Portuguese patients and family caregivers correspond more to those in the rural world in general. People in such settings live in a socio-economic context with fewer facilities accessible or available, and fewer services that enable patients to live at home under acceptable conditions and lessen the care-giving burden. Our results are consistent with the literature according to which stroke knowledge is related to the country, age, education and medical history [41].

In our study, the self-rated life satisfaction of stroke survivors in Luxembourg (mean score 69/100) and their informal caregivers (mean score 72/100) was lower than that of their national indicators in the European Quality of Life Survey [33]. In 2007, the life satisfaction in Luxembourg was 78, close to that in the EU-27 (70/100), and behind Denmark, Finland and Sweden [33]. The Portuguese survivors' life satisfaction score (mean score 58/100) was also lower than the national figure (62/100), preceding Bulgaria, Hungary and Latvia [33]. Indeed, the socio-economic profiles between our study samples differed: most Luxembourg survivors were retired, manual workers or in middle-class occupations and the Portuguese were retired, farmers or in middle-class jobs. Social, cultural, financial deprivations lead to diminished well-being [47]. In contrast, their caregivers' life satisfaction (mean score 66/100) was a few points better than the national Portuguese score. This difference may be partly explained by socio-economic and demographic characteristics: caregivers were rather older (mean age 61 years), worked as managers or professionals or had never been employed, and one third of Portuguese informal caregivers were the survivor's daughter or son.

Our findings demonstrate, but only for the Portuguese, that the greater the survivors' life satisfaction, the better are the informal caregivers' life satisfaction and their quality of life; this observation is in line with previous studies [14, 16, 17, 48]. The quality of life domains of the informal caregivers concerned their psychological status (enjoyment of life and ability to concentrate), their social relationship (satisfaction with sexual life), and their environmental situation (enough money, information needed in daily life, satisfaction with health service access and transport).

These findings support the hypothesis of interdependence in the way stroke affects both care-recipient and caregiver. Ostwald [16] found that in the USA a stroke

survivor's life satisfaction had an impact on the spouse caregiver, and that the relationship between the couple (mutuality) predicted the spouse's life satisfaction. The association of the survivors' life satisfaction with the Whoqol psychological, social relationships and environment domains of caregivers among the Portuguese but not the Luxembourgers may be partly explained by the fact that in Luxembourg stroke survivors had more life satisfaction and better scores for all Newsqol domains than did Portuguese stroke survivors, and possibly also by the socio-economic differences previously stated concerning the populations and geographical areas explored. Moreover, the Whoqol environment domain was much better among caregivers in Luxembourg than in Portugal. This difference may be attributed to the socio-economic situations of the general populations of the two countries (as regards their gross domestic product per inhabitant). Therefore, it can be assumed that the Whoqol environment domain of stroke survivors (not measured in this study) was better for Luxembourgers than for the Portuguese, who were also older.

The lack of a relationship between stroke survivors' life satisfaction and family caregivers' the Whoqol environment domain in Luxembourg may be partly explained by greater life satisfaction and quality of life for both patients and caregivers. It may be noted that the proportion of spouses was higher among Luxembourg caregivers (85.7 vs. 65.9%, $p < 0.05$).

Our results suggest differences in social and medical opportunities between an urban population, focussed on community professional-oriented services and support, and a rural population, much more dependent on domestic care. Home-based rehabilitation requires stroke survivors to find new ways, within their families, of solving problems, communicating and dealing emotionally with others. Individual or community interventions should redefine their contents accordingly [49]. Our findings bring to light some contrasting aspects of the literature: they suggest that despite the socio-economic differences between care settings, stroke is a life-threatening and potentially disabling event as well as an important family issue, particularly for spouses [50].

The participation rates (26.5 and 38%) appear small, but they are similar to those in the recent literature (27%) [51]. We must acknowledge that it is difficult to conduct a study 24 months after a cerebrovascular accident. Appreciable proportions of patients have died, live in institutions, have had to move to another residence (for example, they now live with their son or daughter), or failed to respond. Our decisions to confirm all clinical diagnoses

and exclude all patients who declared that stroke did not result in neurological impairments at the time of stroke were unusual insofar as they are very expensive, but we know that after a few months what was diagnosed as a stroke may turn out to be another pathology [52].

Several limitations to our study remain. First, informed consent was requested by mail, which may have reduced the response rate. Second, the interview took place at the patient's home and some people find such intimacy uncomfortable. Third, those who agreed to take part were likely to be motivated people, willing to share their opinions. Furthermore, the surveys were cross-sectional and declarative; responses were subjective and dependent on the situation at the time.

Practical Implications

Our research contributes to the understanding of the impact – 2 years after the event – of cerebrovascular disease on the survivor's life satisfaction and its associations with quality of life in two different socio-economic contexts. Some divergences observed in our results may be attributable to the contributions of socio-economic and

cultural determinants – the differences between urban lifestyles with higher expectations of institutional services, and rural lifestyles more reliant on family support.

This study supports the use of a self-rated life satisfaction scale for both patients and caregivers, and of two specific quality of life measures. The life satisfaction scale and especially the Newsqol stroke instrument, which identify the areas of stroke-affected quality of life, are reliable patient-centred markers of intervention outcome for practitioners, psychologists and nursing practitioners, and public health experts. Furthermore, they can be used within the framework of medical follow-up (such as telephone assistance [32], clinical practice and prevention) and in the evaluation of intervention. Their precise roles will vary according to the urban/rural context. As our study considers support aimed at sustaining rehabilitation at home (group discussion, counselling of caregiver or family, associations for caregiving assistance), these findings may help facilitate the appropriate development of such interventions. Indeed, enhancement of a caregiver's well-being can help maintain the survivor's life satisfaction, particularly in a rural setting.

Appendix 1. Newsqol by Buck et al. [25]

Mobility

- 1 Do you get around in a wheelchair because of the stroke?
- 2 Because of the stroke, do you have any difficulty walking half a mile?
- 3 Because of the stroke, do you have any difficulty walking up or down high life satisfaction?
- 4 Because of the stroke, do you walk with a stick or frame or by holding onto things?
- 5 Do you feel as if you walk slowly because of the stroke?
- 6 Do you have difficulty managing stairs on your own because of the stroke?
- 7 Do you have difficulty bending down because of the stroke?
- 8 Do you find that you are unsteady on your feet because of the stroke?
- 9 Because of the stroke, do you have difficulty standing for any length of time?

Self-care

- 10 Do you have difficulty with housework because of the stroke?
- 11 Because of the stroke, do you have difficulty with cooking?
- 12 Because of the stroke, do you have difficulty preparing food, for example cutting a slice of bread or cutting up vegetables?
- 13 Do you have difficulty managing the shopping because of the stroke?
- 14 Because of the stroke, do you have difficulty using public transport?
- 15 Do you have difficulty getting washed by yourself because of the stroke?

- 16 Because of the stroke, do you have difficulty getting dressed by yourself, including things like zips and buttons?
- 17 Do you have difficulty getting in/out of the bath or shower on your own because of the stroke?

Pain/sensory

- 18 Do you have any pain because of the stroke?
- 19 How often do you have pain because of the stroke?
- 20 Because of the stroke, do you have difficulty picking up small things?

Vision

- 21 Do you have problems with your eyesight because of the stroke?
- 22 Do you have any difficulty with reading because of your eyesight (because of the stroke)?

Cognition

- 23 Do you find it difficult to concentrate for long because of the stroke?
- 24 Because of the stroke, are there times when you forget what you have said or what people say to you?
- 25 Because of the stroke do you find it difficult to solve problems or make decisions?
- 26 Would you say you keep forgetting things because of the stroke?
- 27 Because of the stroke, do you find it difficult to think clearly?

Appendix 1 (continued)

Communication

- 28 Do you feel as though your speech is slurred at all because of the stroke?
- 29 Do you find it difficult to make yourself understood because of the stroke?
- 30 Because of the stroke, are there times when you have difficulty expressing yourself?
- 31 Do you have any difficulty with writing because of the stroke?

Feelings

- 32 Do you feel less independent than you were, because of the stroke?
- 33 Has the stroke changed the way you feel about yourself?
- 34 To what extent would you say your life has changed because of the stroke?
- 35 Do you feel depressed because of the stroke?
- 36 Does the stroke make you feel useless at all?
- 37 Do you feel you have less control over what is happening in your life because of the stroke?

Interpersonal relationships

- 38 Because of the stroke, do you argue more with close friends or family?
- 39 Has the stroke put any strain on your relationship with your spouse or partner?
- 40 Does the stroke interfere with your sex life and if so, how much?
- 41 Are you short-tempered because of the stroke?
- 42 Are you less tolerant because of the stroke?
- 43 Because of the stroke, have you become nervous about meeting people?

Emotion

- 44 Do you get more emotional because of the stroke?
- 45 Do you sometimes cry at the least thing because of the stroke?
- 46 Are you worried that you could have another stroke?
- 47 Because of the stroke, do you worry about becoming dependent on other people?

Sleep

- 48 Do you have problems sleeping at night because of the stroke?
- 49 Do you have difficulty getting off to sleep because of the stroke?
- 50 Because of the stroke, do you sometimes wake up too early?
- 51 Do you find you need a lot of rest because of the stroke?
- 52 Do you ever feel exhausted because of the stroke?
- 53 Do you feel that you lack energy because of the stroke?

Fatigue

- 54 Because of the stroke, are there days when you feel you could sleep all the time?
 - 55 Do you doze off during the day because of the stroke?
 - 56 Because of the stroke, do you feel that you can't be bothered with things at times?
-

Appendix 2. Short version of the World Health Organization's Quality of Life (Whoqol-bref) by Skevington et al. [30]

Physical

- To what extent do you feel that physical pain prevents you from doing what you need to do?
- Do you need any medical treatment to function in your daily life?
- Do you have enough energy for everyday life?
- How satisfied are you with your sleep?
- How well are you able to get around?
- How satisfied are you with your ability to perform your daily living activities?
- How satisfied are you with your capacity for work?

Psychological

- How much do you enjoy life?
- To what extent do you feel your life to be meaningful?
- How well are you able to concentrate?
- Are you able to accept your bodily appearance?
- How satisfied are you with yourself?
- How often do you have negative feelings such as blue mood, despair, anxiety, depression?

Social relationships

- How satisfied are you with your personal relationships?
- How satisfied are you with your sex life?
- How satisfied are you with the support you get from your friends?

Environment

- How safe do you feel in your daily life?
 - How healthy is your physical environment?
 - Have you enough money to meet your needs?
 - How available to you is the information that you need in your day-to-day life?
 - To what extent do you have the opportunity for leisure activities?
 - How satisfied are you with the conditions of your living place?
 - How satisfied are you with your access to health services?
 - How satisfied are you with your transport?
-

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