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Clinical determinants of long-term quality of life after stroke

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Abstract

Objectives: to determine factors that independently predict health-related quality of life (HRQOL) 1 and 3 years after stroke.
Methods: subjects numbering 397, from a population-based register of first-ever strokes were assessed for HRQOL using the Short Form 36 (SF36) 1 year after stroke. Physical (PHSS) and mental health (MHSS) summary scores were derived from the eight domains of HRQOL in the SF36. Multivariate stepwise regression analyses were conducted to determine independent predictors of these scores; β coefficients with 95% CI were obtained. β coefficient is the difference between average value of the variable (e.g. male) and average value under consideration (e.g. female). Demographic and stroke risk factors, neurological impairments and cognitive impairment (MMSE <24) were included in the models. Similar analyses were undertaken on 150 subjects 3 years post-stroke.
Results: a year after stroke, independent predictors of the worst PHSS were of females (β coefficient −3.3 : 95% CI −5.7 to −0.8), manual workers (−3.2: −5.9 to −0.4), diabetes (−4.2: −7.7 to −0.8), right hemispheric lesions (−4.9: −8.7 to −1.2), urinary incontinence (−7.8: −11.6 to −4.1) and cognitive impairment (−2.7: −5.5 to −0.1); the worst MHSS were associated with being Asian (−11.8: −20.6 to −3.0), ischaemic heart disease (−2.7: −5.4 to −0.03), cognitive impairment (−3.04: −5.8 to −0.3). Subjects aged 65–75 years (5.4 : 2.5 to −8.4) had better MHSS than those <65 years. Three years post-stroke, independent predictors of worse PHSS were hypertension (−8.7: −13.5 to −3.9), urinary incontinence (−8.1: −15 to −1.1) and cognitive impairment (−8.3: −13.2 to −3.5).
Conclusions: determinants of HRQOL vary both over time after stroke and whether physical or psychosocial aspects of HRQOL are being considered. This study provides valuable information on factors predicting long-term HRQOL, which can be taken into consideration in audits of clinical practice or in future interventional studies aiming to improve HRQOL after stroke.

Keywords: *stroke, long-term outcomes, quality of life, elderly*

Introduction

Stroke remains one of the major chronic illnesses world-wide that health-care organisations will need to address for the next several decades. This is because it can affect virtually all human functions [1], and unlike other disabling conditions, the onset of stroke is sudden, leaving the individual and the family ill-prepared to deal with its sequelae [1]. The few community-based reports on the long-term prognosis of an unselected cohort have mainly looked at stroke survival, recurrence, impairment and disability [2–4]. A review of stroke outcome measures in 174 acute stroke trials showed that death was recorded in 76%, impairment in 76%, disability in 42% and handicap in only 2% [5]. Moreover it has been reported that patients' views of what constitute important outcomes are not always identical to those of health-care professionals [6]. One dimension that is rarely measured is health-related quality of life (HRQOL) which aims to assess the impact of disease from the perspective

of the patient [7]. Measurement of HRQOL after stroke would provide researchers with a more holistic picture of stroke recovery, especially because of the wide spectrum of symptoms and impairments associated with stroke [8, 9].

Knowledge of factors associated with HRQOL after stroke would provide valuable information about strategies that professionals and providers of stroke care can address to improve HRQOL for stroke patients. Long-term stroke studies have reported age [10], depression [10–13], cognitive impairment [14], disability [10–13], aphasia [11] and poor social network [12, 13] to be associated with poor HRQOL. However, there are several limitations to these studies, which make it difficult to estimate the actual total impact on HRQOL caused by stroke. For example, many studies looked at hospitalised subjects [13–17], stroke rehabilitation units [10, 12], specific age groups [4, 11, 17] or specific stroke subtypes only [14, 15]. The design of these studies was predominantly cross-sectional, so subjects were assessed at various times after stroke, and thus, were at different stages of their natural recovery. Earlier studies [11, 12, 14] used non-standardised instruments to assess HRQOL, making it difficult to interpret their results. Most studies conducted univariate analyses only, and thus were unable to determine any independent predictors of HRQOL. Apart from a recent Australian stroke study, knowledge about independent predictors of HRQOL from unselected populations is lacking [18].

This longitudinal study aimed to determine factors that independently predicted HRQOL 1 and 3 years after stroke using a population-based stroke register.

Methods

Stroke subjects were recruited from the South London Stroke Register, which is a longitudinal, population-based register of first-ever strokes in subjects of all age groups covering a multi-ethnic, inner-city population of 234,533. For this study, subjects who sustained their strokes between 1 January 1995 until 31 December 1997 were included. The detailed methodology of the register has been reported earlier [19]. Consent was obtained from the Guy's & St Thomas' Ethics Committee according to the revised Helsinki Declaration of 1983. Stroke was defined according to the WHO criteria [20]. 'Hot pursuit' of cases and multiple sources of notification were used to achieve a high level of case ascertainment. Data collected on initial assessment included patient demography, risk factors, premorbid disability using Barthel Index, and indicators of initial stroke severity. Strokes were classified using the Oxfordshire Community Stroke Project Classification (OCSP) [21].

Subjects were followed up at 1 and 3 years after stroke. HRQOL was evaluated using the UK version of the Medical Outcomes Study 36 item Short-Form Health Survey (SF-36) [22]. The HRQOL assessments were done by asking the subjects themselves, thus excluding those who were too confused or dysphasic to undergo these assessments themselves. Eight domains of health status are assessed: Physical Functioning–PF; Role Physical–RP; Bodily Pain–BP; General Health–GH; Vitality–VT; Social Functioning–SF; Role Emotional–RE; and Mental Health–MH. Each domain is scored between 0 and 100. These domains were then computed to produce two summary scales representing physical and mental health [23]. Domains for physical health summary scale (PHSS) include PF, RP, BP and GH. Mental health summary scale (MHSS) includes VT, SF, RE and MH. The summary scales are based on norms with a mean of 50 and a standard deviation of 10. SF36 has reliably been previously used to evaluate HRQOL long-term after stroke and in all age groups [24].

Owing to unavoidable practical problems with the register, SF-36 assessments at the 3-year follow-up were administered only for subjects registered between 1 January 1995 and 29 February 1996. Thereafter, for subjects registered between 1 January 1997 and 31 December 1997, HRQOL was assessed using the shorter version of SF-36 and SF-12 [25]. Thus, there were fewer SF-36 assessments ($n = 99$) done at 3 years. As the 12 items in the SF-12 have been adopted from the SF-36 verbatim and SF-12 and SF-36 summary scores are replicable and reproducible [8], the responses given to the specific 12 items in the SF-36 version by the earlier group of subjects ($n = 99$), were combined with those obtained from the SF-12 in the latter group ($n = 51$) to obtain a larger cohort with SF-12 assessments at 3 years after stroke ($n = 150$ out of 294 survivors, 51%). This cohort was used to calculate the mean PHSS and MHSS at 3 years.

To identify the independent predictors of PHSS and MHSS at 1 and 3 years after stroke, multivariable analyses were conducted using backward stepwise regression analyses. All factors in Table 1 were included. Coefficients (β) with 95% confidence intervals were thus obtained for those factors that were significant in these models. Coefficient (β) is the average difference between people at reference value of the variable (e.g. males) and people with the value under consideration (e.g. female). Thus, for example in Table 2, females on average, score 3.26 points less on the PHSS of SF36 than males.

Results

There were 946 subjects registered between 1 January 1995 and 31 December 1997. Case-fatality rates at 1 and 3 years after stroke were 42% (397) and 54% (507) respectively. Of 549 subjects alive 1 year after stroke, SF-36 data were available for 397 subjects (72.3%). Data were unavailable for the remaining 152 subjects (27.7%) because they were lost to follow-up ($n = 56$), unable to complete SF36 ($n = 83$), or were registered retrospectively ($n = 13$).

Potential selection biases

Univariate comparisons between subjects who had HRQOL data (SF-36) 1 year post-stroke ($n = 397$) and those who did not ($n = 152$) showed no differences in terms of age, gender, ethnicity, social status, pre-stroke disability (BI), history of diabetes, atrial fibrillation, transient ischaemic

attacks, distribution of OCSP subtypes, stroke laterality and visuo-spatial neglect. However, compared to those included, the excluded group had higher rates of visual field defects, dysphasia and dysphagia. Similar differences were also observed between those who had 3-year HRQOL data available ($n = 150$) and those who did not ($n = 144$).

HRQOL 1 year after stroke

Table 1 shows the univariate comparisons of the two summary scales at 1 year after stroke. In terms of PHSS, males were better than females ($P = 0.025$), non-manual workers better than manual workers ($P = 0.033$), diabetics were worse than non-diabetics ($P<0.001$) and those with premorbid Barthel Index <15 were worse than those with BI 15–20 (0.021). Initial impairments associated with worse PHSS included dysphagia, visuo-spatial neglect, urinary incontinence and cognitive impairment. Subjects aged over 75 reported better mean MHSS than those under 65 ($P = 0.004$).

Multivariable analyses (Table 2) showed female sex (coefficient [β], −3.26), manual workers (β, −3.15), diabetes (β, −4.23), urinary incontinence (β, −7.83) and cognitive impairment (β, −2.70) independently predicted worse PHSS. Compared to TACI, PACI had better PHSS (β, 5.95). Factors independently predicting MHSS (Table 3) revealed that being older was associated with better MHSS: subjects aged 65–75 (β, 5.41) and over 75 (β, 6.29) had better MHSS than those <65 years. Other predictors of poor MHSS were being Asian (β, −11.8), ischaemic heart disease (β, −2.72) and cognitive impairment (β, −3.04).

HRQOL three years after stroke

Univariate analyses were conducted to examine determinants of HRQOL at 3 years after stroke (Table 1). Multivariable analyses showed worse PHSS was independently associated with hypertension (β, −8.72), urinary incontinence (β, −8.07) and cognitive impairment (β, −8.32), but age >75 (β, 6.7) and being Caribbean/African (β, 6.3) was associated with better PHSS (please see the table as Appendix 1 in the supplementary data on the journal website (http://www.ageing.oxfordjournals.org/). Similar analyses for MHSS at 3 years found no significant factors except hypertension (β, −4.8).

Discussion

This is a large population-based study that has determined independent predictors of long-term HRQOL in an unbiased community-based sample of first-ever strokes, using SF-36, which is a well-validated, widely used assessment tool. The study shows that the determinants of HRQOL vary over time after stroke, and differ for physical and psychosocial aspects of HRQOL. Poor physical health (using PHSS) 1 year after stroke is independently associated with being female, a manual worker, and having diabetes mellitus, right hemispheric lesions, urinary incontinence, and cognitive impairment. Three years after the stroke, factors predicting adverse PHSS included hypertension, cognitive impairment and urinary incontinence, but being aged over 75 and Caribbean/African, were associated with better PHSS. Poor mental health 1 year after stroke is independently associated with being under 65 years, being Asian, having ischaemic heart disease and cognitive impairment.

There are certain limitations to this study that must be considered. First, several data on HRQOL were missing. However, this lower level of data completeness in terms of HRQOL assessments using SF-36 assessments is not unique to this study. Missing data included data on subjects who were too confused or dysphasic. These 'missing' data may have introduced a bias so that the frequency of poor HRQOL may have been under-estimated. Second, although widely used, SF-36 is not a stroke-specific measure, but a generic measure that was developed to assess HRQOL outcomes that are affected by any disease or treatment. SF-36 may thus not be sensitive or specific enough to detect the psychological domains of mental health that are relevant to stroke [24]. Third, SF-12 was used for some subjects instead of SF-36, though the summary scores produced by either of them have been shown to be replicable [8]. Finally, there are other potential determinants of HRQOL that were not examined in this study such as depression, the role of informal carers, the quality of stroke care given to these subjects, and the quality and quantity of social support available.

Evaluating the associations at two time points (1 and 3 years), and on two different aspects of HRQOL (physical and mental health), has fulfilled an earlier recommendation by King [13] and provided information on the fluctuations of HRQOL and its associations over time. The variations in associations of PHSS and MHSS found in our study may be due to these scales essentially measuring different domains of HRQOL, that is, physical and mental health. Thus, factors that are associated with one aspect of HRQOL may not necessarily be associated with the other. Hence, these results confirm that a multidimensional approach is essential for complete assessment of HRQOL.

Contrary to previous studies [11, 18, 26], this study showed that age was inversely associated with mental health at 1 year after stroke and with physical health at 3 years after stroke. Our finding that younger subjects reported worse mental health and physical health may be due to either younger subjects being less able to cope psychosocially with the stroke than older subjects, or they may have higher expectations of health, reflecting one of the definitions of HRQOL as the gap between our expectations of health and our experience of it [27].

Females, as predictors of poor HRQOL, have been previously described [18, 28]. Lower subjective well-being in women may be due to a socio-cultural effect of women routinely taking responsibility for household management until they reach an advanced age [28]. Hence, once they are disabled by stroke, it may be more difficult for their male partners to look after them, hence reducing their HRQOL. Lower socio-economic status and poor HRQOL has also

Table 1. Physical (PHSS) and Mental Health (MHSS) summary scales at 1 year and 3 years after stroke

		One year after stroke					Three years after stroke				
		Subjects, *n* (%)	PHSS mean (sd)	*P*-value	MHSS mean (sd)	*P*-value	Subjects, *n* (%)	PHSS mean (sd)	*P*-value	MHSS mean (sd)	*P*-value
Age group	<65	135 (34.0)	38.1 (13.0)	0.608	43.6 (12.8)	0.004	54 (36.0)	39.4 (12.6)	0.246	48.6 (10.1)	0.037
	65–75	133 (33.5)	36.6 (11.9)		47.7 (11.5)		53 (35.3)	38.6 (10.5)		49.4 (9.9)	
	>75	129 (32.5)	36.5 (12.2)		48.6 (11.3)		43 (28.7)	35.2 (11.0)		44.4 (10.2)	
Gender	Male	212 (53.4)	38.3 (12.4)	0.025	46.1 (12.4)	0.464	84 (56.0)	38.7 (11.6)	0.333	49.3 (9.6)	0.031
	Female	185 (46.6)	35.6 (12.2)		47.2 (11.8)		66 (44.0)	36.9 (11.5)		45.6 (10.7)	
Ethnicity	White	307 (77.3)	37.8 (12.4)	0.145	46.6 (12.2)	0.150	114 (76.0)	37.7 (11.3)	0.379	47.7 (10.4)	0.237
	Caribbean/African	76 (19.1)	34.3 (11.7)		47.7 (11.4)		30 (20.0)	38.4 (12.5)		49.0 (9.4)	
	Asian	8 (2.0)	35.4 (13.1)		36.2 (12.7)		6 (4.0)	34.8 (9.6)		39.2 (6.7)	
	Others	6 (1.5)	35.2 (15.8)		46.5 (8.2)						
Socio-economic status											
	Non-manual	109 (28.1)	39.3 (12.3)	0.033	46.9 (11.6)	0.982	42 (28.0)	37.9 (11.3)	0.694	48.0 (10.5)	0.797
	Manual	280 (71.9)	36.4 (12.3)		46.6 (12.3)		106 (72.0)	37.7 (11.6)		47.6 (10.2)	
Past Medical History											
Hypertension	Yes	285 (71.8)	36.3 (12.1)	0.081	47.2 (11.5)	0.415	101 (67.3)	36.4 (11.2)	0.029	47.2 (10.5)	0.360
	No	112 (28.2)	38.9 (12.8)		45.1 (13.5)		49 (32.7)	41.0 (11.8)		48.8 (9.6)	
Diabetes mellitus	Yes	62 (15.6)	31.0 (9.8)	<0.001	45.4 (10.9)	0.230	12 (8.0)	30.9 (8.7)	0.026	42.5 (10.9)	0.075
	No	335 (84.4)	38.2 (12.5)		46.8 (12.3)		138 (92.0)	38.5 (11.6)		48.1 (10.1)	
TIA	Yes	82 (20.7)	35.4 (12.0)	0.176	46.2 (11.6)	0.591	37 (24.7)	37.9 (11.3)	0.969	46.0 (11.6)	0.415
	No	315 (79.3)	37.5 (12.4)		46.7 (12.2)		113 (75.3)	37.9 (11.6)		48.3 (9.7)	
Atrial fibrillation	Yes	73 (18.4)	36.6 (11.5)	0.784	47.2 (12.5)	0.469	27 (18.0)	35.5 (11.2)	0.271	50.1 (10.2)	0.141
	No	324 (81.6)	37.2 (12.6)		46.5 (12.0)		123 (82.0)	38.4 (11.6)		47.2 (10.2)	
Ischaemic heart disease	Yes	116 (29.2)	35.3 (11.5)	0.080	47.3 (12.2)	0.031	47 (31.3)	34.3 (10.4)	0.011	47.2 (11.9)	0.865
	No	281 (70.8)	37.8 (12.6)		44.9 (11.6)		103 (68.7)	39.6 (11.7)		47.9 (9.4)	
Premorbid Barthel In.	<15	6 (1.5)	25.7 (7.5)	0.021	32.2 (9.2)	0.006	2 (1.3)	27.7 (2.6)	0.154	45.8 (12.6)	0.756
	15–20	391 (98.5)	37.2 (12.3)		46.8 (12.0)		148 (98.7)	38.1 (11.5)		47.7 (10.2)	
Residential Status	Living alone	104 (27.1)	40.2 (12.3)	<0.001	47.7 (12.5)	0.386	40 (27.4)	38.9 (11.4)	0.572	48.2 (10.9)	0.595
	Living with someone	242 (62.8)	37.3 (12.1)		46.3 (11.8)		99 (67.8)	37.9 (11.8)		47.5 (10.1)	
	Residential/Nursing Home	39 (10.1)	30.6 (11.6)		47.6 (11.7)		7 (4.8)	35.0 (11.1)		52.1 (6.9)	
Laterality of stroke											
	Absent	78 (19.6)	42.1 (12.8)	<0.001	48.0 (11.1)	0.764	40 (26.7)	41.7 (12.3)	<0.001	49.1 (9.1)	0.638
	Right (Left hemiparesis)	172 (43.3)	34.5 (10.8)		46.1 (12.5)		64 (42.7)	33.7 (10.2)		47.0 (10.9)	
	Left (Right hemiparesis)	140 (35.3)	37.6 (12.9)		46.4 (12.1)		46 (30.6)	40.4 (10.9)		47.3 (10.2)	

(*Continued*)

Table 1. (*Continued*)

		One year after stroke					Three years after stroke				
		Subjects, *n* (%)	PHSS mean (sd)	*P*-value	MHSS mean (sd)	*P*-value	Subjects, *n* (%)	PHSS mean (sd)	*P*-value	MHSS mean (sd)	*P*-value
OCSP subtypes											
	TACI	35 (8.8)	29.9 (8.2)	0.004	46.3 (12.3)	0.223	13 (8.7)	32.0 (6.0)	0.227	45.1 (11.5)	0.848
	PACI	93 (23.4)	39.3 (11.8)		46.9 (11.8)		32 (21.3)	37.2 (11.1)		49.0 (10.1)	
	POCI	63 (15.9)	38.3 (12.6)		47.9 (12.0)		28 (18.7)	37.7 (11.2)		49.2 (10.4)	
	LACI	125 (31.5)	35.7 (12.2)		46.3 (12.7)		46 (30.7)	37.7 (12.2)		47.2 (10.7)	
	PICH	44 (11.1)	37.6 (12.7)		45.1 (11.1)		15 (10.0)	40.2 (10.9)		47.6 (8.5)	
	SAH	18 (4.5)	41.2 (15.3)		42.0 (12.4)		9 (6.0)	46.2 (14.1)		46.0 (10.6)	
	Unknown	19 (4.8)	39.1 (13.3)		51.3 (11.0)		7 (4.7)	38.8 (13.5)		46.6 (10.0)	
Initial impairments											
Dysphagia	Yes	130 (32.7)	34.1 (10.4)	0.001	45.2 (12.0)	0.067	47 (31.3)	36.4 (10.8)	0.390	49.0 (10.4)	0.230
	No	267 (67.3)	38.5 (13.0)		47.3 (12.1)		103 (68.7)	38.6 (11.9)		47.1 (10.1)	
Dysphasia	Yes	66 (16.6)	39.3 (13.7)	0.166	46.1 (12.0)	0.570	21 (14.0)	41.7 (11.3)	0.073	50.6 (9.4)	0.229
	No	331 (83.4)	39.6 (12.1)		46.7 (12.1)		129 (86.0)	37.3 (11.5)		47.2 (10.3)	
Visuo-spatial neglect	Yes	63 (15.9)	32.9 (10.1)	0.004	45.3 (12.2)	0.413	15 (10.0)	31.2 (6.9)	0.016	44.9 (9.1)	0.188
	No	334 (84.1)	37.9 (12.6)		46.8 (12.1)		135 (90.0)	38.6 (11.7)		48.0 (10.3)	
Incontinence	Yes	47 (11.8)	28.1 (8.5)	<0.001	45.5 (13.3)	0.504	23 (15.3)	29.8 (7.1)	<0.001	46.1 (9.8)	0.334
	No	350 (88.2)	38.3 (12.3)		46.7 (11.9)		127 (84.7)	39.4 (11.6)		48.0 (10.3)	
Cognitive status											
MMSE<24 (impaired)		122 (32%)	33.1 (11.3)	<0.001	44.9 (11.9)	0.061	29 (30.5)	32.4 (8.6)	<0.001	44.3 (10.7)	0.200
MMSE 24–30		259 (68%)	39.1 (12.4)		47.4 (12.1)		66 (69.5)	41.6 (11.7)		47.6 (9.9)	

OCSP, Oxfordshire Community Stroke Project; TACI, total anterior circulatory infarction; PACI, partial anterior circulatory infarction; POCI, posterior circulatory infarction; LACI, lacunar infarction; PICH, primary intracerebral haemorrhage; SAH, subarachnoid haemorrhage.

been previously described [13, 18] and may be due to the fact that the social network and resources available are limited compared to non-manual workers. This study examined associations between stroke risk factors including diabetes, hypertension and ischaemic heart disease and HRQOL long-term after stroke. These associations may be due to the additive effects of the conditions themselves, and emphasise the hypothetical potential of improving HRQOL after stroke by managing the risk factors more effectively after stroke.

This study found right hemispheric lesions to be significantly associated with poor PHSS at 1 year after stroke. This confirms previous reports that also found HRQOL to be worse in those with right-sided lesions [26]. This may be due to neurological disturbances associated with right-sided lesions including neglect, anosognosia and spatial disorientation which may have devastating effects on social functioning and thus on HRQOL. This is further supported by the fact that visuo-spatial neglect was also associated with lower PHSS at both time points (Table 1).

Compared to total anterior, partial anterior circulatory infarctions were associated with better PHSS at 1 year after stroke, but there were no differences between total anterior infarctions and intracerebral haemorrhages. This lack of difference has also been previously reported [18, 26], despite the fact that subjects with haemorrhagic strokes usually have more severe strokes compared to cerebral infarctions [21, 26]. These findings are likely to be due to the greater stroke severity in total anterior infarctions and are similar to other studies [26, 29] that examined HRQOL in terms of lesion size and position, and found on univariate analyses that compared to subjects with non-lacunar infarctions, those with lacunar infarctions had better HRQOL. Urinary incontinence was independently associated with poor PHSS after stroke. These results not only confirm that incontinence is a good indicator of initial stroke severity, but they also reflect the strong associations incontinence has with long-term outcomes including HRQOL. Cognitive impairment was also associated with poor PHSS and poor MHSS after stroke. This is contrary to Kwa's study [14] which reported cognitive impairment not to be associated with HRQOL, but that study used a unidimensional visual analogue scale to assess HRQOL and acknowledged that further studies were required to explore these associations.

We conclude that determinants of HRQOL vary over time after stroke and differ for physical and psychosocial aspects of HRQOL. This study provides valuable information on factors predicting long-term HRQOL, which can be taken into consideration in audits of clinical practice or in future interventional studies aiming to improve the quality of life after stroke.

Table 2. Multiple backward stepwise regression analysis to determine factors independently associated with PHSS at 1year after stroke

Variable		Co-efficient	95% Confidence interval	*P*-value
Age group	<65	0	—	
	65–75	−0.36	−3.28 to 2.56	0.809
	>75	−0.52	−3.69 to 2.65	
Gender	Male	0	—	
	Female	−3.26	−5.70 to −0.81	0.009
Ethnicity	White	0	—	0.673
	Caribbean/ African	−1.90	−5.03 to 1.22	
	Asian	0.67	−8.95 to 10.3	
Socio-economic status	Non-manual	0	—	
	Manual	−3.15	−5.94 to −0.37	0.027
Diabetes mellitus	No	0	—	
	Yes	−4.23	−7.67 to −0.79	0.016
OCSP subtypes	TACI	0	—	0.226
	PACI	5.95	1.09 to 10.8	
	POCI	3.41	−1.94 to 8.75	
	LACI	3.30	−1.32 to 7.94	
	PICH	5.10	−0.30 to 10.5	
	SAH	4.44	−3.35 to 12.2	
Laterality of stroke				
	Absent	0	—	0.046
	Right (Left hemiparesis)	−4.97	−8.73 to −1.21	
Urinary incontinence	No	0	—	<0.001
	Yes	−7.83	−11.6 to −4.06	
Cognitive impairment (MMSE <24)	No	0	—	
	Yes	−2.70	−5.52 to −0.13	0.047

Table 3. Multiple backward stepwise regression analysis to determine factors independently associated with MHSS at 1year after stroke

Variable		Co-efficient	95% confidence interval	*P*-value
Age group	<65	0	—	
	65–75	5.41	2.45 to 8.38	<0.001
	>75	6.29	3.13 to 9.45	
Ethnicity	White	0	—	—
	Caribbean/ African	3.08	−0.04 to 6.20	0.010
	Asian	−11.8	−20.6 to −2.97	
Ischaemic heart disease	No	0	—	0.048
	Yes	−2.72	−5.41 to −0.030	
Cognitive impairment (MMSE <24)	No	0	—	0.033
	Yes	−3.04	−5.83 to −0.25	

Conflict of interest statement

There are no conflicts of interest to declare.

Key points

- Long-term HRQOL remains low up to 3 years after stroke in stroke subjects regardless of demographic factors, risk factors, stroke subtypes or initial impairments.
- Determinants of HRQOL vary both over time after stroke as well as whether the physical or psychosocial aspects of HRQOL are being considered.
- This study found that PHSS 1 year after stroke is independently associated with being female, a manual worker, and having diabetes mellitus, right hemispheric lesions, urinary incontinence, and cognitive impairment.
- Poor mental health (MHSS) 1 year after stroke is independently associated with being under 65 years old, being Asian, having ischaemic heart disease and cognitive impairment.
- This study provides valuable information for professionals and providers of stroke care to address in their attempts to improve HRQOL for future stroke patients.

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