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Research Paper

Importance of an individual's evaluation of functional status for health-related quality of life in patients with multiple sclerosis

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Abstract

Background: Quantifying the clinical impact of multiple sclerosis (MS) is one of the most important determinants for optimizing individual patient care. Useful clinical measures for MS can be evaluated from different perspectives.

Objective/Hypothesis: This cross-sectional study compared physical disability and functional status as assessed by a neurologist and by a patient and explored how they are associated with the health-related quality of life (HRQoL).

Methods: We collected data from 223 patients. One neurologist scored functional disability using the Kurtzke's Expanded Disability Status Scale (EDSS) and patients evaluated their functional status using the Incapacity Status Scale (ISS). HRQoL was assessed using the Physical and Mental Component Summary (PCS, MCS) of the Short Form-36 Health Survey (SF-36). Multiple linear regressions were applied to analyze the data.

Results: Total EDSS and ISS scores correlated significantly ($r = .67$; $p \leqslant .001$). Regression analyses showed that EDSS was significantly related to PCS, but not to MCS. After adding ISS into the analysis the association between EDSS and PCS became non-significant. ISS contributed significantly to the explained variance in both models. The final model explained 49% of the total variance for PCS and 15% for MCS.

Conclusions: Functional disability as measured by a neurologist (EDSS) is associated with PCS, but not with MCS, whereas functional disability as measured by patients (ISS) is significantly associated with both HRQoL dimensions. Neurologists should target their attention more on patients' evaluations of their functional status in order to detect the most bothersome problems that are affecting a patient's quality of life.

Keywords: Multiple sclerosis; Incapacity Status Scale; Expanded Disability Status Scale; Health-related quality of life; Neurological impairment

Multiple sclerosis (MS) is the most common chronic neurological disease of the central nervous system (CNS) in young adults in European countries, with approximately 1 in 10,000 people affected.[1–5] The disease may lead to a wide spectrum of physical and non-physical disabilities among young and middle-aged adults. Symptoms of the disease begin mostly between ages 20 and 50 years, with a peak at age 33 years.[1–5] MS symptoms may be mild, such as numbness in the limbs, or severe, such as paralysis or loss of vision. The progress, severity and specific symptoms of MS are unpredictable and vary from death within a few weeks after clinical onset to asymptomatic cases accidentally discovered at autopsy in old age.

Quantifying the clinical impact of multiple sclerosis (MS) is one of the most important determinants for optimizing individual patient care. In addition to measures of disease severity, measures of functional status may provide useful

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information to aid in prognostic stratification and help guide treatment decisions. Functional status refers to the ability to perform daily activities to meet basic self-care needs and to maintain health and well-being. It reflects functional capacity – what an individual is capable of doing – and functional performance – what an individual actually does in daily life. Functional status may be affected by impairments in physical, sensory, cognitive or social function.[6] Useful clinical measures of functional status for MS can be evaluated from different perspectives. In the first approach information is based on neurological examination by a physician. Examples in this category include the Expanded Disability Status Scale (EDSS) and related instruments.[7–9] Neurologists evaluate a patient's physical impairment and functional status using the EDSS,[10] which is the most widely used method of clinical and research assessment in MS. The rating system was recommended by Kurtzke and combines the assessment of impairment. Other multi-item measures for neurologists have been developed, but none has been as widely as the EDSS.[10–13] The second approach focuses on information provided by the patient or a family member. Measures of disability and handicap, such as disease-specific instruments like the Incapacity Status Scale (ISS) and the Environmental Status Scale (ESS), can be categorized in this approach.[14,15] Scales measuring both disability and handicap, as reported by the patients, are an additional useful measure of disablement in MS.[11] The Incapacity Status Scale (ISS) was developed to describe disability and assess functional status from the patient's perspective.[14,15] This scale quantifies the individual's physical and mental dysfunction, closely reflecting the activities of daily living, and has been found to be relevant for evaluating the clinical impact of MS.[11,16,17]

Previous research shows that clinicians' and patients' perceptions of health status and disability did not lead to consensus.[18–20] Clinicians most frequently focus on physical impairment as a relevant indicator of a patient's self-rated health or well-being. In clinical practice, strategies aimed at improving patients suffering from MS are most frequently focused on patients with more severe disability.[20] In many cases health professionals perceive physical impairment as a relevant indicator of patients' poorer HRQoL, but in doing so, these professionals might overlook aspects of patients' own perception of their health status. That is, MS patients themselves may perceive physical functioning differently.[19] Midgard et al compared the EDSS and ISS among 124 MS patients with mean disease duration of 7.8 years.[21] Their results showed a consistently strong relationship between the EDSS score (i.e. the clinician's measure of disability) and the single items of the ISS (i.e. a self-report measure). However, the items from the cognitive and psychosocial dimensions of the ISS, namely Speech and hearing, Mood and thought, Mentation, and Medical problems, did not correlate significantly or showed a weak correlation with the physical impairment as expressed in the EDSS. A similar observation was made in a recent pilot study on the Functional Limitations Profile as a measure of disability in MS, indicating that the psychosocial factors reported in MS are not associated with physical functioning.[22]

Health-related quality of life (HRQoL) is an important consideration in the treatment of patients with MS and seems to be more sensitive to changes during a disease than conventional disability measurements such as EDSS.[12–17] Thus, HRQoL has started to be widely applied as an outcome measure.[9,22–30] HRQoL is a concept that most people intuitively understand, but one that is difficult to define precisely. Most definitions of HRQoL are centered on the notion of health put forth by the WHO. Accordingly, HRQoL is often defined as optimum levels of physical, emotional, mental, role (e.g. work, parent, career) and social functioning, including relationships, and perception of health, fitness life satisfaction and well-being.[6] Several previous studies[18,20,31–33] investigated the relationships between disability and HRQoL in MS patients. Studies examining HRQoL in patients with MS showed that patients suffering from MS have lower HRQoL compared with the healthy population and especially have worse self-rated physical and mental health status.[18–20,26,34–39] In addition, the results of studies comparing MS patients with patients affected by other chronic diseases show that MS patients have the least favorable ratings of general health, vitality, physical functions and limitations in social roles.[40] This is because the effect of physical disability on activities of daily living is supposed to be greater in MS than in other chronic diseases.[33,34,41–43]

Previous studies in this field have concentrated mainly on the differences between a patient's and a physician's evaluation of functional status and have shown that they indeed differ. These studies have focussed less on their associations with HRQoL, however. Therefore, the aim of this study was to compare the physical disability and functional status as assessed by a neurologist and by a patient and to explore their relationships with patient's health-related quality of life (HRQoL).

Methods

Study design

This was an observational cross-sectional study.

Participants and procedure

The study sample consisted of MS patients from hospitals, outpatient clinic and MS clubs and in the eastern part of Slovakia. Exclusion criteria were cognitive impairment (determined by a Mini-Mental State Examination (MMSE) score of <24), a history of psychiatric or medical conditions affecting the outcomes of the study, pregnancy, under 18 years of age or not speaking Slovak. Patients were enrolled in the study between 2003 and 2006.

Data collection consisted of a medical examination carried out by a neurologist and an interview conducted with

each participant by a psychologist or a trained research assistant to obtain information about sociodemographic characteristics. The data collection procedure started by sending out the questionnaires, an invitation letter and a written informed consent form to participants' homes by postal mail two weeks before the planned interview. Next, a trained interviewer called each patient to arrange a face-to-face interview and a neurological examination in the neurology outpatient clinic. During the interview patients'; responses on sociodemographic (e.g. employment, level of education) or clinical (e.g. drugs used) variables were clarified when ambiguous, and missing answers on the questionnaires were completed. A neurological examination was performed immediately after the interview, and always by the same neurologist. The neurologist assessed the level of neurological impairment and disability.

The Ethics Committee of the Safarik University in Kosice approved the study before it started. All patients signed an informed consent prior to the study. Participation in the study was fully voluntary and anonymous, with no incentives provided for participation.

Measures

Expanded Disability Status Scale (EDSS)

The EDSS was performed to assess the level of neurological impairment and disability.[10] This scale is the most frequently used measure of functional disability among MS patients. The EDSS is a combination of grades which are based on neurological testing within 8 functional systems, namely Pyramidal, Cerebellar, Brainstem, Sensory, Bowel and Bladder, Visual, Cerebral, and other or miscellaneous functions. The overall EDSS score ranges from 0 (normal) to 10 (death due to MS). Patients with EDSS scores of 0–4.5 are fully ambulatory, and those above 7.0 are wheelchair bound or bedridden.

Incapacity Status Scale (ISS)

Disability was assessed using the Incapacity Status Scale of the Minimal Record of Disability for MS.[11,15–17,44] The ISS is an inventory of functional disabilities and represents a patient's evaluation regarding his functioning. The questionnaire consists of 16 items and can be sub-divided into those items dealing with mobility (stairs, ambulation and transfers), personal ADLs (bathing, dressing, grooming and feeding), sphincter function (bowel, bladder, and sexual function), cognitive function (mood and thought, mentation, and fatigue) and the senses (vision, speech and hearing). One item, medical problems, examines the effects of MS more globally. The scores range from 0 to 4: 0 – no observable problem; 1 – disturbance is present at times but able to perform without aid; 2 – disturbance does interfere with day-to-day functioning, but able to perform with mechanical assistance except for occasional visits to maintain medication; 3 – disturbance interferes with day-to-day functioning and consistently requires professional intervention beyond that required to maintain medication; and 4 – loss of function without effective substitution. The total score is taken as the sum of the unweighted scores for each item. The rating reflects current disability even if the patient was maintained on medication. The ISS sum score ranges from 0 to 64, with a higher score indicating more severe disability.

For the purposes of this study 3 ISS sub-scales were used. These were identified by means of Principal Component Analysis (PCA) with varimax rotation. PCA revealed a clear 3-factor solution explaining 55.8% of total variance. The first factor, ISS_1, entitled "physical component", contained 7 items (1 – stair climbing, 2 – ambulation, 3 – toilet/chair/bed transfer, 6 – bathing, 7 – dressing, 8 – grooming, 9 – feeding). Factor ISS_2, the "autonomic and fatigue component", contained 4 items (4 – bowel function, 5 – bladder function, 15 – fatigability, 16 – sexual function). Factor ISS_3, the "sensory and cognitive component", contained 5 items (10 – vision, 11 – speech and hearing, 12 – medical problems, 13 – mood and thought disturbances, 14 – mentation). The factor loadings (item–component correlations) of all items were over .50 with the exception of item 12-medical problems, which was .42. The range of factor loadings for the 3 ISS subscales was .58–.84 for the physical component of ISS, .56–.66 for the autonomic component and fatigue, and .42–.72 for the sensory and cognitive component. The reliability of the ISS scale has been substantiated by their use in several countries.[44,45] In our sample the Cronbach's alpha for the total ISS was .87 (mean inter-item correlation .30), for the physical component .92 (mean i–ic .62), for the autonomic component and fatigue .64 (mean i–ic .30) and for the sensory and cognitive component .69 (mean i–ic .31).

Short-form-36 Health Survey (SF-36)

Patients' HRQoL is frequently measured by the generic SF-36, which was originally designed as an indicator of health status for use in population surveys. This instrument can be used for measuring general health and is not specific for any age, disease or treatment group.[46] The SF-36 is a 36-item questionnaire and includes eight multi-item scales to measure these eight dimensions: (1) physical functioning (10 items), (2) role limitation due to physical health (4 items), (3) bodily pain (2 items), (4) social functioning (2 items), (5) general mental health (5 items), (6) covering psychological distress and well-being (5 items), (7) role limitations due to emotional problems (3 items), and (8) vitality, energy or fatigue (4 items). In addition, one question covers change in health status over the past year (1 item). The SF-36 consists of 8 sub-scales which can be combined as the Physical Component Summary (PCS) and the Mental Component Summary (MCS). All item scores were coded, summed and transformed linearly between 0 and 100, with higher scores indicating better health

status. In our study Cronbach's alpha yielded .90 for the SF-36 PCS and .89 for the MCS.

Sociodemographic data

Sociodemographic data, such as age, gender and data concerning education, were obtained via a self-report questionnaire. Age was treated as a continual variable; we trichotomised education into elementary (primary school), secondary (secondary grammar school) and university education.

Statistical analyses

Descriptive statistics (means and standard deviations) were used for the sample description. Principal Component Analysis (PCA) with varimax rotation was employed for creating the ISS sub-scales. Spearman's correlation coefficients were used to examine the associations between the main study variables. Finally, multiple linear regression analyses were used to analyze the associations between disability (EDSS, ISS) and HRQoL (PCS/MCS), controlled for age, gender, education, disease duration (after checks for multicollinearity). In all analyses in which data were missing, a listwise deletion method was used. The analyses were performed with IBM SPSS 20.0 for Windows (IBM company, Chicago, Illinois, USA).

Results

Out of 425 patients, 189 patients did not respond, 11 were excluded due to exclusion criteria, and 2 patients provided incomplete data (response rate 54.1%). There were no statistically significant differences between the non-responders and the participants regarding gender, but the non-responders (45.1 ± 10.5 years) were significantly older than the participants (38.4 ± 10.6 years) ($p < .05$).

The study group consisted of 223 MS patients (67.3 % women; mean age 38.9 ± 10.8 years; mean disease duration 5.8 ± 4.2 years). A majority of patients had the relapsing-remitting type of MS (65.9%). The secondary progressive type (23.8%) and the primary progressive type (10.3%) were less common. A basic description of the sample is given in Table 1.

Over 76% of the patients reported problems in stair climbing or ambulation. More than half of the patients reported bladder impairment, and nearly half sexual dysfunction. Nearly all patients reported present fatigability as the most significant problem. Patients very often reported mood and thought disturbances (68.7%), and more than half of them had medical problems (Table 2).

Table 3 shows the correlations between the study variables. PCS correlated significantly with EDSS, ISS total scale and all three ISS sub-scales. MCS correlated significantly with subscale 2 'autonomic and fatigue component', subscale 3 'sensory and cognitive component' and the ISS total score. EDSS correlated significantly with the ISS total scale as well as all ISS sub-scales.

The regression model for PCS found age ($\beta = -.29$, $p \leqslant .001$) and EDSS ($\beta = -.49$, $p \leqslant .001$) entered in Step

Table 1
Demographic and clinical characteristics of the patient sample ($N = 223$)

Variable	*N* (%)	Mean ± SD	Range
Gender			
Male	73 (32.7)		
Female	150 (67.3)		
Age		38.9 ± 10.8	18–65
Education			
Elementary	60 (26.9)		
Secondary	118 (52.9)		
University	38 (17.0)		
Clinical course			
Relapsing–remitting	147 (65.9)		
Secondary progressive	53 (23.8)		
Primary progressive	23 (10.3)		
Disease duration (yrs)		5.8 ± 4.2	.5–37
EDSS		3.1 ± 1.5	1.0–8.5
ISS total scale		10.2 ± 7.3	0–33
ISS_1 – physical component		4.2 ± 4.6	0–26
ISS_2 – autonomic and fatigue		3.8 ± 2.6	0–14
ISS_3 – sensory and cognitive		2.4 ± 2.0	0–10
PCS SF-36		36.1 ± 10.8	13.3–67.4
MCS SF-36		45.8 ± 9.5	19.5–64.0

EDSS – Expanded Disability Status Scale, ISS – Incapacity Status Scale, ISS_1 – physical component; ISS_2 – autonomic component and fatigue; ISS_3 – sensory and cognitive component, SF36: PCS – Physical Summary Component, MCS – mental summary component.
Note: The missing cases for each variable are as follows: gender, 0%; age, 0%; education, 3.1%; clinical course, 1.3%; disease duration, 0%; EDSS, 2.2%; ISS, 1.8%; SF-36, 3.1%.

Table 2
Incapacity Status Scale (ISS) scores by symptoms

Function	Number of patients (%)	
	No symptoms (score 0)	With symptoms (score 1, 2, 3, 4)
Subscale ISS_1 – physical		
Stair climbing	52 (24.0)	166 (76.0)
Ambulation	54 (24.8)	164 (75.2)
Transfers	151 (69.3)	67 (30.7)
Bathing	149 (69.0)	69 (31.0)
Dressing	160 (73.4)	58 (26.6)
Grooming	162 (74.7)	56 (25.3)
Feeding	185 (85.3)	33 (14.7)
Subscale ISS_2 – autonomic and fatigue		
Bowel function	158 (72.5)	60 (27.5)
Bladder function	90 (41.7)	128 (58.3)
Fatigability	9 (4.1)	209 (95.9)
Sexual function	110 (51.6)	108 (48.4)
Subscale ISS_3 – sensory and cognitive		
Vision	154 (72.0)	64 (28.0)
Speech and hearing	177 (81.6)	41 (18.4)
Medical problems	99 (46.3)	119 (53.7)
Mood and thought	68 (31.3)	150 (68.7)
Mentation	140 (64.5)	78 (35.5)

Table 3
Correlations between the study variables

	1	2	3	4	5	6	7	8	9	10
1. PCS	–									
2. MCS	.06	–								
3. Age	−.42***	−.01	–							
4. Gender	−.02	−.08	−.08	–						
5. Education	.19**	.15*	.03	−.01	–					
6. Disease duration	−.23***	−.09	.34***	.04	.05	–				
7. EDSS	−.53***	−.02	.33***	−.13	−.17*	.40***	–			
8. ISS_1 – physical component	−.66***	−.08	.32***	−.18**	−.18**	.22***	.71***	–		
9. ISS_2 – autonomic/fatigue	−.56***	−.16*	.35***	−.04	−.07	.24***	.45***	.62***	–	
10. ISS_3 – sensory/cognitive	−.36***	−.35***	.27***	−.02	−.20**	.13	.28***	.41***	.40***	–
11. ISS total score	−.67***	−.21**	.34***	−.15*	−.20**	.26***	.67***	.92***	.82***	.62***

EDSS – Expanded Disability Status Scale, ISS – Incapacity Status Scale, SF36: PCS – Physical Component Summary, MCS – Mental Component Summary.
*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

1 to be significantly associated with the PCS (Table 4). This model explained 37% of the total variance of PCS. When ISS was added into the model in Step 2, the importance of EDSS disappeared ($\beta = -.15$, n.s.), but age remained significant ($\beta = -.23$, $p \leq .001$). In addition, ISS subscale 1 'physical component' ($\beta = -.40$, $p \leq .001$) and subscale 2 'autonomic and fatigue component' ($\beta = -.15$, $p \leq .05$) were shown to be significant as well. The total explained variance for the final model increased to 49%.

The first regression model for MCS (Step 1) found only disease duration ($\beta = .19$, $p \leq .05$) to be significantly associated with the MCS, but not the EDSS. The total explained variance for this model was 3%, and the model was not significant. Adding the ISS sub-scales into the regression model (Step 2) increased the explained variance of MCS to 15%. In the final model, disease duration ($\beta = .22$, $p \leq .01$) and the ISS subscale 3 'sensory and cognitive component' ($\beta = -.36$, $p \leq .01$) were shown to be significant for MCS 1 (Table 4).

Table 4
Multiple linear regression analysis: associations between evaluations of disability (EDSS, ISS) and the physical and mental components of quality of life (SF-36 PCS, MCS), controlled for relevant psychosocial and clinical variables

	PCS			MCS		
	β	adj R^2	smc	β	adj R^2	smc
Model 1						
Age	**−.29*** **	.37	***	−.05	.03	n.s.
Gender	−.09			−.12		
Elementary education[a]	−.09			−.14		
Secondary education[a]	.03			.05		
Disease duration	.06			**.19***		
EDSS	**−.49*** **			−.10		
Model 2						
Age	**−.23*** **	.49	***	.03	.15	***
Gender	−.11			−.09		
Elementary education[a]	−.04			−.07		
Secondary education	.01			.10		
Disease duration	.04			.22**		
EDSS	−.15			−.09		
ISS_1 – physical component	**−.40*** **			.14		
ISS_2 – autonomic and fatigue component	**−.15***			−.12		
ISS_3 – sensory and cognitive component	−.03			**−.36** **		

PCS – SF36 Physical Component Summary, MCS – SF36 Mental Component Summary, EDSS - Expanded Disability Status Scales, ISS - Incapacity Status Scale.
[a] University education was set as the reference; smc – Significance of model change for the added variable(s); Improvement of fit of the model due to the addition of the variable concerned the F change test; Significant values are displayed in bold; *$p \leq .05$,**$p \leq .01$,***$p \leq .001$; n.s. = non-significant result.

Discussion

The aim of this study was to explore differences between clinicians' and patients' evaluations of functional status and disability in MS patients and to examine how they are associated with HRQoL. We found that a neurologist's evaluation (EDSS) was significantly related to the physical component of HRQoL (PCS) but not to the mental component (MCS). Next, our results showed that regarding PCS, after adding a patient's evaluation into the regression model, the relative importance of EDSS decreased substantially. On the other hand, the patient's evaluation of his/her functional status was significantly related to PCS, namely the ISS subscale 'physical component' and the subscale 'autonomic and fatigue component'. With regard to mental HRQoL (MCS) the neurologist's evaluation (EDSS) was not shown to be significant at all; however, the patient's evaluation of functional status did appear to be significant, namely the ISS subscale 'sensory and cognitive component'.

The outcomes of this study are similar to those of an earlier study by Midgard et al and Nortvedt et al comparing the EDSS and ISS scales,[21,29,30] although in their studies the psychosocial dimension of the ISS, or in other words the subscale 'sensory and cognitive component', did not correlate significantly with the physical impairment as

measured by the EDSS. In our study the ISS subscale 'sensory and cognitive component' correlated significantly with physical impairment as measured by EDSS, but the association was weaker when compared with the sub-scales 'autonomic and fatigue component' and 'physical component'.

Next, in our study we explored how functional status as assessed by a neurologist and by a patient are associated with health-related quality of life (HRQoL). The results show that a neurologist's and patient's evaluations also differ regarding their associations with HRQoL. We found that after controlling for relevant sociodemographic and clinical variables the neurologist's evaluation (EDSS) was significantly associated with the physical component of HRQoL (PCS), but when a patient's evaluation of his/her functional status (ISS) was added into the regression model, the relative importance of EDSS became non-significant. Out of three ISS sub-scales the subscale 'physical component' (ISS_1) and the subscale 'autonomic and fatigue component' (ISS_2) were significantly related to PCS. With regard to the mental component of HRQoL (MCS) the neurologist's evaluation (EDSS) was not shown to be significant at all, but the patient's evaluation of functional status and in particular the ISS subscale 'cognitive and psychosocial component' (ISS_3) was shown to be significant. Our results are in line with a study by Rothwell et al and a study by Janse et al who found that neurologists' assessments highly correlated with patients' assessment of their own physical disability using the physical functioning domain of SF-36, but in addition their results showed that quality of life in MS patients was most significantly associated with vitality, general health and mental health in the SF-36, each of which patients rated as more important than clinicians and for each of which patients scored lower than controls.[47,48] The outcomes of other studies suggest that patients with MS, and possibly those with other chronic diseases, are less concerned than their clinicians about physical disability in their illness, especially with regard to its impacts on HRQoL.[19,20,47]

Strengths and limitations

Previous studies in this field concentrated mainly on the differences between patients' and physicians' evaluation of functional status and focussed less on their associations with HRQoL. In addition, these studies mainly used univariates statistics.[19,37] Our study adds to the existing knowledge by introducing the importance of patients' evaluations for HRQoL using multivariate statistics which allow controlling for relevant potential confounding variables.

However, some limitations of this study should be mentioned. MS patients participating in this study were significantly younger than the non-responders; therefore, we may assume that non-responders were a proportion of the oldest group with the longest disease duration, and possibly the most affected group, which might have prevented them from the participating. A potential consequence of this might be that the outcomes are more related to younger patients than to older ones, and the results cannot be generalized to the whole MS population. A second limitation is that the study has a cross-sectional design, which does not provide us information about changes over time and thus does not allow us to explore causal pathways. Finally, a limitation of this study might be the risk of potential overlap between the patients' assessment of functional status (ISS) and the physical dimension of quality of life (PCS), both of which are self-report scales. However, the fact that the neurologists' assessments (EDSS) highly correlated with the patients' assessment of their own functional status (ISS) (.71), whereby the correlations of both scales (ISS, EDSS) with the physical dimension of quality of life were lower (−.66 and −.53, respectively, all $p < .001$), provides on the one hand a support for the validity of the ISS as a measure of functional status and on the other hand it highlights the relatively higher importance of the patients' evaluation of their own functional status for quality of life as compared with the neurologists' assessments.

Implications for practice and future research

One of the main messages of this study, as well as other previous studies[18–20,29,30] is that physical disability as determined by the neurologist may not always be the main determinant of overall HRQoL. This provides support for more profound use of neurorehabilitation and cognitive rehabilitation in patients with MS. Together with the social model of disability, the concept of restorative neurology, as a scientific and therapeutic attempt to minimize those impairments directly responsible for the disability presented by the person, has been recently gaining ground among neuroscientists and clinicians. The evidence available in the field of neurorehabilitation in multiple sclerosis points towards a beneficial effect on activities and participation of multi/interdisciplinary inpatient programs, as well as for outpatient and home neurorehabilitation programs.[49–52] In addition, this shows that patients can accurately assess their own physical disability and the opinions of patients should be taken into account in the selection of outcome measures for clinical trials.

Future studies could focus on how the studied variables might change over time and how the duration of illness and exacerbation of the disease could influence the impact on subjective perception of disease and give more comprehensive consequences of MS for the patients. From a methodological point of view future work should also be directed at clearer distinction between the constructs of patients' functional status (as assessed by the ISS) and the physical dimension of quality of life (measured by the PCS) as their potential overlap may have an impact on meaningful interpretation of the outcomes. Longitudinal data are needed to further unravel the complex interplay between functional status as evaluated by clinicians, disability evaluated by patients and HRQoL in MS patients.

Conclusions

In conclusion, the results of this study demonstrate that the importance of a neurologist's and a patient's measurement of the patient's functional status for HRQoL differ. EDSS is a relevant measure for estimating physical impairments, but the subjective problems of patients, such as sexual problems, fatigability and cognition which are not covered by the EDSS, seem to also influence HRQoL significantly, especially its mental component. Important for clinical practice is the fact that the EDSS has some limitations which could explain the poor contribution of functional status to HRQoL. Our findings show that using ISS in daily practice could help to provide a more complex understanding of the impact of MS on patients' daily functioning and their HRQoL. It could also be used to help promote dialog between the patient and clinician regarding which symptoms are the most bothersome and which should be addressed first and accordingly to help direct treatment and improve clinical care.

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