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Review article

The clinical use of quality-of-life scales in neurological disorders

Corallo F, De Luca R, Leonardi R, De Salvo S, Bramanti P, Marino S. The clinical use of quality-of-life scales in neurological disorders.

Objective: Quality of life (QoL) is a growing issue in medicine, particularly in the evaluation of rehabilitative care. The concept of QoL is included in and expands the definition of health given by the WHO (World Health Organization) and comprises complete physical, mental, and social well-being. It expresses the degree of satisfaction in various areas as a result of the opportunities that arise during one's lifetime despite the restrictions and impediments that life itself puts forth. The last decade has exponentially increased the number of studies on QoL, although they are still limited.
Methods: We performed a literature review on the QoL scales used in patients with neurological disorders.
Results: Recent studies have shown the importance of QoL assessment because standard treatments do not assess the treatment impact felt by the patient. In fact, by understanding the impact of treatment on survival and QoL, one can make a clearer interpretation of the health of the patient.
Conclusion: This review has adopted an innovative holistic methodological approach, which allowed a global evaluation of the comfort reported by the patients. The scales applied in this study allowed to choose the most suitable therapeutic strategies and programme individual therapeutic treatment.

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Summations

- Evaluation of the quality of life (QoL) has acquired increasing importance in patients with degenerative diseases.
- The lack of treatment modalities for neurological disorders and disease progression emphasise the need for palliative therapies that have to be evaluated according to international guidelines.
- The development of the methodology for QoL evaluation continues towards more precise assessment using computer adaptive testing, implementation of electronic methods for data collection, integration of health measurement and patient preference weighting, rigorous statistical analysis and meaningful interpretation of QoL data.

Considerations

- Although several studies have shown the importance of QoL in the last few years, QoL scales are not used in clinical practice.
- This review describes the main QoL scales in neurological disorders, but many others have not been shown.

Introduction

Measurement of the QoL is becoming increasingly important in clinical patient management. The World Health Organization (WHO) has expanded and codified the definition of health to include mental and social well-being, making it multidimensional. This has permitted us, in the last few decades, to develop QoL concepts and adopt different instruments for multidimensional evaluation of health (1). The main reason for the rapid development of QoL measures in healthcare is the growing recognition of the importance of understanding the impact of healthcare interventions on the patient's QoL rather than merely treating their bodies (2). Further, physicians have always intended to find out and understand how their patients feel. This is particularly important for patients affected by neurodegenerative disorders, either disabling or life threatening (3). Evidence that measuring QoL provides a better evaluation of these latter conditions is presented in the recent literature. The aim of this review was to assess the role and importance of principal QoL scales in neurodegenerative and demyelinating disorders such as Alzheimer's disease (AD), Parkinson's disease (PD), multiple sclerosis (MS), and amyotrophic lateral sclerosis (ALS), which account for a significant and increasing proportion of morbidity and mortality in the developed world. Largely as a result of increased life expectancy and changing population demographics, neurodegenerative disorders are becoming increasingly common (4). Evaluation of QoL has acquired increasing importance in neurodegenerative diseases. Treatment of neurodegenerative diseases places a substantial medical, social, and psychological burden on patients and their families and profoundly affects the QoL of all persons involved. QoL refers to people's emotional, social, and physical well-being and their ability to function in daily life (5). QoL measures attempt to directly evaluate the impact of neurodegenerative diseases or interventions on people's ability to function in life. Besides this global conceptualisation of QoL, there is a growing field of research on QoL measures focussed on the measurement of health-related QoL (HRQoL). Instruments aimed at measuring the patient's health status outlook enable us to quantify the loss of QoL caused by disease and the improvement that can be achieved by interventions (6). Disease-specific measurements are devised to assess the impact of a specific disease across a spectrum of important domains of life. They evaluate the relevant domains for a specific disease. Currently, most of the tools consider the physical conditions, the psychological comfort, and the level of activity, whereas a few consider, for example, the social sphere (7). For some tools an external evaluator is needed, for example, the physician, whereas in the majority of cases the questionnaires are answered by the patient himself. In patients suffering from neurodegenerative diseases (such as AD, PD, MS, and ALS), the evaluation of QoL could involve significant difficulties because of the relative unreliability of subjective assessment in the early stages of disease, as well as because of language barriers that make it impossible to obtain information about the patient's experience during later stages. During the course of the disease, every patient could reach a stage of cognitive decline in which any type of introspective evaluation of memory might be possible (8). Perez et al. argue that specific instruments tend to be more responsive to changes and more sensitive to discriminating the range of impairment because of their focus on the most relevant aspects of the QoL for the problems assessed. For all these reasons, it is necessary to study other fields on the basis of carefully selected specific measures of QoL chosen as being of particular importance to patients and to the hypotheses being tested. However, a critical analysis of the properties of the growing range of generic and disease-specific measures is necessary to guide and direct researchers and clinicians towards the most appropriate measures in terms of reliability, validity, and sensitivity to change instruments used in measuring the QoL (does it really measure what it is supposed to measure?); reliable (does it give the same measurement after repeated administrations in stable patients?); sensitive (does it reflect clinically meaningful differences in the QoL across the broad spectrum of clinical conditions?); and responsive (does it detect changes when the patient's condition changes?). In Italy at present some translated and validated tools are being increasingly used in the neurological field (9). The aim of this work review was to assess the role of the principal QoL scales as a state-of-the-art measuring tool for assessing the QoL of patients suffering from neurodegenerative diseases.

Methods/tools

Alzheimer's Disease Questionnaire

The dementia QoL Instrument (DQoL) was specifically designed for self-assessment of QoL in AD patients with dementia using the Mini Mental State Examination (MMSE) $\geqslant$ 12, without the intervention of the caregiver. The original work included a structured interview consisting of 96 items that investigated the characteristics of patients

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Table 1. Definition of the domains assessed in DQoL

Domain	Definition
Aesthetics	Appreciation and enjoyment of the beauty of nature
Positive affect	Laughing, having fun, feeling happy, happy, joyful, full of hope
Negative affect	Worry, frustration, depression, anxiety, sadness, loneliness, fear, irritability, nervousness, embarrassment, anger
Self-esteem	Ability to take own decisions, satisfaction, feel confident, trust
Feelings of belonging	Feeling loved, accepted, popular, useful

DQoL, dementia quality of life.
Adapted from Brod et al. (10).

and their experiences of living with dementia. The interview included questions on the following: functional status, basic and advanced activities of daily living, mobility, physical well-being, social interaction skills, aesthetic awareness, and perception of the QoL. The instrument takes ~10 min to administer. The validation work has led to the current version, which consists of 56 items divided into five domains (aesthetics, positive affection, negative affection, self-esteem, feeling of belonging) (10) (see Table 1). Item-stems were made as simple as possible and a five-point visual scale was used to present multiple choice responses to patients. All points on the response scale are associated with verbal descriptors. Screening questions ensure that patients understand the instructions on the questionnaire and the response format for the scale. In a sample of 99 patients diagnosed with mild to moderate dementia (range from 12 to 21 MMSE), only 4% could not correctly answer the screening questions and thus were not administered the entire scale. For patients who completed the DQoL, internal consistency reliabilities for subscales were moderate to high. There were no significant differences between patient groups with mild and moderate dementia severity in terms of scale reliability (10).

QoL-Alzheimer's disease (QoL-AD) has been specifically constructed for self-assessment of QoL in patients suffering from dementia with MMSE > 12 without the intervention of the caregiver. The original instrument foresaw a structured interview composed of 96 items that investigated the characteristics of the patients and their experience of living with dementia; this interview included the evaluation of: the functional condition, basic and complex activities of daily life, mobility, physical comfort, and wellness in social life, ability to interact, aesthetic sense and perception of the quality of life. Validation has reduced the original version to 56 items divided into five domains (aesthetics, positive affections, negative affections, self-esteem, feeling of belonging) and took about 15–20 min to answer (11). The authors propose the scale as a useful tool for the evaluation of the long-term effects of treatment (see Table 2). Although it is keenly recognised that there is no 'gold standard' or superior instrument for assessing QoL, this study has shown that both the QoL-AD and DQoL are useful instruments for capturing QoL from the perspective of the patient with dementia. However, given that the QoL-AD had better rates of completion and internal reliability in this study, the QoL-AD may be the most favourable instrument, particularly for those with more severe cognitive impairment and, to a less extent, functional impairment. Researchers, however, should consider the type of data that they require and for what purpose before making an informed decision on which instrument to employ. It may also be advisable to examine QoL using at least two measurements and to also consider collection of qualitative data as a complementary source of information to ensure the best assessment of QoL and capture of the true perspective of the person with dementia. Items for the QoL-AD were selected to reflect domains of QoL in older adults based on a literature review of QoL in geriatric populations. Face validity and comprehensiveness were ensured by having AD patients, caregivers, older adults without dementia and dementia experts review potential items (see Table 2). The final scale is composed of 13 items that measure the domains of physical condition, mood, memory, functional abilities, interpersonal relationships, ability to participate in meaningful activities and financial situation. Response options are four-point multiple choice options (1 = poor, 4 = excellent). Scale scores range from 13 to 52, with higher scores indicating greater QoL. Patients and caregivers

Table 2. Item QoL-AD

	Score	
Evaluate	Patient	Caregiver
1. Physical health	1 2 4 3	1 2 3 4
2. Energy	1 2 4 3	1 2 4 3
3. Mood	1 2 4 3	1 2 4 3
4. Living situation	1 2 4 3	1 2 4 3
5. Memory	1 2 4 3	1 2 4 3
6. Family	1 2 4 3	1 2 4 3
7. Marriage	1 2 4 3	1 2 4 3
8. Friends	1 2 4 3	1 2 4 3
9. Self as a whole	1 2 4 3	1 2 4 3
10. Ability to do chores around the house	1 2 4 3	1 2 4 3
11. Ability to do things for fun	1 2 4 3	1 2 4 3
12. Money	1 2 4 3	1 2 4 3

QoL-AD, quality of life-Alzheimer's disease.
Adapted from Logsdon et al. (11).

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typically complete the QoL-AD separately. Patients are interviewed and caregivers respond to the QoL-AD items on a questionnaire. Composite scores that combine reports from patients and caregivers are weighted to improve the patient's self-report. The scale takes an average of 10 min to administer to patients, and caregivers take <10 min to complete the questionnaire (11). Psychometric properties of the QoL-AD were initially evaluated in a group of 77 AD outpatients and their caregivers (11). A follow-up study with a larger sample of 177 AD patients was recently published (12), in which 155 of the 177 patients interviewed were able to complete the QoL-AD. Mean MMSE for patients who did not complete the questionnaire was 4.1 compared with 18.1 for those who did (range 4–29); all patients with MMSE scores above 11 were able to complete the QoL-AD. In addition to greater cognitive impairment, patients who did not complete the questionnaire also showed significantly more impairment in basic and instrumental ADLs. Validity was indicated by low to moderate correlations between QoL scores and the MMSE and reports of instrumental activities of daily living, depression, and engagement in pleasant activities (12). Validity of patient scores in the second study was indicated by correlations between QoL-AD scores and several measures of domains hypothesised to be associated with QoL: behavioural competence, psychological status, physical function and interpersonal environment. There were stronger associations between caregiver-reported QoL and measures of these other domains (11).

The Apparent Affect Rating Scale (AARS) in projects of search is used to assess the QoL in patients institutionalised and affected by moderate to severe dementia. It includes five domains (three belonging to negative symptoms such as anger, anxiety, fear, depression and sadness and two to positive symptoms such as pleasure and interest). This scale requires the assistance of an evaluator trained to interpret the signs and facial expressions of the patient that imply emotions. The period of observation was 5 min. The evaluator should be empathetic and sensitive to nonverbal expressions and should have a good knowledge of the patients, their experiences and the environment in which the evaluation is being carried out (12) (see Table 3). The authors of AARS have used different methods to implement the model. Some investigators have interpreted these five domains as defining features of QoL, whereas others have viewed some factors as predictors of QoL and others as indicators of QoL. In fact, some instruments incorporate items on functional and cognitive impairment in the scale, whereas others consider these factors as potential predictors of QoL but not as defining features. Some authors noted that items on cognition and physical functioning in QoL measures were included; there are many problems because these domains inevitably decline with advancing dementia (12).

Table 3. Item dell'AARS

	0	1	2	3	4	5
Period of observation: 5 min	Not applicable	Never	<16 s	16–59 s	12 min	>2 min
Like signs: laugh, smile, look for the contact with each other, call each other so warmly, kissing, singing, responding the sound of a melody. Expressions of pleasure						
Anger signs: physical aggression, yelling, swearing, scold, shake their fists, gnashing of teeth, frown, squint, gesturing at a distance. Expressions of anger						
Anxiety/fear signs: scream, yell for help, restlessness, wince, grimace, repetitive movements, tremor, shortness of breath, eyes wide open, tension of facial muscles, bustle. Expressions of anxiety/fear						
Depression/sadness signs: crying, tears, angry, groans, sighs, Amim, facing towards down. Expressions of sadness						
Interest signs: participation in tasks, maintaining eye contact, follow objects or people with their eyes, look around, respond by saying something, turn towards a person or object						

AARS, Apparent Affect Rating Scale.
Adapted from Lawton (13).

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Parkinson's Disease Questionnaire

Parkinson's Disease Questionnaire (PDQ-39) consists of 39 questions and the PDQ-8 (short form of the PDQ-39), PDQ-which analyse the subject in eight sizes for mobility, activities of daily life, stigma, social support, cognition, communication and physical discomfort. These tools help to collect information, combined with clinical data, and give an overview of the disease extended to the psychosocial consequences on the life of the subject, with implications on the choice of the most appropriate pharmacological interventions, either physical or psychological. The correlation of the PDQ-39 with scales that assess variables such as balance, posture and the fear of falling, as well as with the Unified Parkinson's Disease Rating Scale (UPDRS) or Hoehn and Yahr stage (H&Y), can provide more details about the phenomenon, revealing the incidence of the disorder, as well as describing the benefits and concerns while performing functional tasks and activities. The PDQ-39, a disease-specific 39-item QoL instrument for use in patients with PD, has been shown not only to have good reliability and validity but also to demonstrate consistent responsiveness and reproducibility. In addition to its impressive psychometrics, the PDQ-39 can be easily interpreted and provides the ability to assess the overall impact of the illness. Consequently, the PDQ-39 is the most widely used disease-specific patient-completed rating scale used in PD and has been widely used in many trials to assess the effectiveness of treatment. In addition, the NINDS in its NET-PD project is utilising the PDQ-39 to standardise outcome measures that are more inclusive in terms of QoL and nonmotor aspects of PD, compared with the UPDRS scale (NINDS: 2006 Parkinson's Disease Research Plan: 12–13). On the basis of these interviews and discussions with patients, items were created and a questionnaire was developed. The PDQ-39 has been used as an outcome measure in numerous clinical trials to test the effectiveness and clinical significance of many surgical, pharmacological and psychological treatments (14) (see Table 4). Several authors have shown that PDQ-39, and particularly its summary index (PDQ-39SI), is a widely used patient-reported clinical trial end point. A basic assumption when

Table 4. Item PDQ-39

	Never	Occasionally	Sometimes	Often	Always
Had difficulty doing the leisure activities which you would like to do?					
Had difficulty looking after your home, e.g. DIY, housework, cooking?					
Had difficulty carrying bags of shopping?					
Had problems walking half a mile?					
Had problems walking 100 yards?					
Had problems getting around the house as easily as you would like?					
Had difficulty getting around in public?					
Needed someone else to accompany you when you went out?					
Felt frightened or worried about falling over in public?					
Been confined to the house more than you would like?					
Had difficulty washing yourself?					
Had difficulty dressing yourself?					
Had problems doing up your shoelaces?					
Had problems writing clearly?					
Had difficulty cutting up your food?					
Had difficulty holding a drink without spilling it?					

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Table 4. Continued

	Never	Occasionally	Sometimes	Often	Always
Felt depressed?					
Felt isolated and lonely?					
Felt weepy or tearful?					
Felt angry or bitter?					
Felt anxious?					
Felt worried about your future?					
Felt you had to conceal your Parkinson's from people?					
Avoided situations which involve eating or drinking in public?					
Felt embarrassed in public due to having Parkinson's disease?					
Felt worried by other people's reaction to you?					
Had problems with your close personal relationships?					
Lacked support in the ways you need from your spouse or partner?					
Lacked support in the ways you need from your family or close friends?					
Unexpectedly fallen asleep during the day?					
Had problems with your concentration, e.g. when reading or watching TV?					
Felt your memory was bad?					
Had distressing dreams or hallucinations?					
Had difficulty with your speech?					
Felt unable to communicate with people properly?					

PDQ, Parkinson's Disease Questionnaire.
Adapted from Peto et al. (15).

summing items into a total score is that they represent a common variable. The authors have assessed the unidimensionality of the PDQ-39SI using Rasch and confirmatory factor analysis. Both analyses showed model misfit. Adjustment for differential item functioning and disordered response category thresholds did not improve the model fit, and residual analyses showed deviation from unidimensionality. These data indicate multidimensionality and challenge the interpretation and validity of PDQ-39SI scores.

Amyotrophic Lateral Sclerosis Questionnaire

The Amyotrophic Lateral Sclerosis Assessment Questionnaire (ALSAQ-40 and ALSAQ-5) contains 40 questions that measure five inherent areas pertaining to physical and mental health: 'physical mobility' (10 questions), 'daily activity and independence' (10 questions), 'to eat and to drink' (3 questions), 'communication' (7 questions) and 'emotional operation' (10 questions). The questions refer to the condition perceived by the patient during the last 2 weeks; the answers are quantified on a five-point Likert scale. The ALSAQ-5 contains five questions instead, each belonging to one of the five dimensions of the ALSAQ-40 (12). The lack of treatments for ALS patients and the disease progression indicate the need for palliative therapies that have to be evaluated according to international guidelines. ALSAQ-40 and its shortened form, ALSAQ-5, are widely used ALS patient-focussed disease questionnaires (14). The purpose of the

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Table 5. Item ALSAQ–40

	Never	Rarely	Sometimes	Often	Always
I have found it difficult to walk short distances, e.g. around the house.					
I have fallen over whilst walking.					
I have stumbled or tripped whilst walking.					
I have lost my balance whilst walking.					
I have had to concentrate whilst walking.					
Walking has tired me out.					
I have had pains in my legs whilst walking.					
I have found it difficult to go up and down the stairs.					
I have found it difficult to stand up.					
I have found it difficult to get myself up out of chairs.					
I have had difficulty using my arms and hands.					
I have found turning and moving in bed difficult.					
I have found picking things up difficult.					
I have found holding books or newspapers, or turning pages, difficult.					
I have had difficulty writing clearly.					
I have found it difficult to do jobs around the house.					
I have found it difficult to feed myself.					
I have had difficulty combing my hair or cleaning my teeth.					
I have had difficulty getting dressed.					
I have had difficulty washing at the hand basin.					
I have had difficulty swallowing.					
I have had difficulty eating solid food.					
I have found it difficult to drink liquids.					
I have found it difficult to participate in conversations.					
I have felt that my speech has not been easy to understand.					
I have slurred or stuttered whilst speaking.					
I have had to talk very slowly.					
I have talked less than I used to do.					
I have been frustrated by my speech.					
I have felt self-conscious about my speech.					

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Table 5. Continued

	Never	Rarely	Sometimes	Often	Always
I have felt lonely.					
I have been bored.					
I have felt embarrassed in social situations.					
I have felt hopeless about the future.					
I have worried that I am a burden to other people.					
I have wondered why I keep going.					
I have felt angry because of the disease.					
I have felt depressed.					
I have worried about how the disease will affect me in the future.					
I have felt as if I have no freedom.					

ALSAQ, Amyotrophic Lateral Sclerosis Assessment Questionnaire
Adapted from Jenkinson et al. (12).

Table 6. Item ALSAQ–5

	Never	Rarely	Sometimes	Often	Always
I have found it difficult to stand up.					
I have had difficulty using my arms and hands.					
I have had difficulty eating solid food.					
I have felt that my speech has not been easy to understand.					
I have felt hopeless about the future.					

ALSAQ, Assessment Questionnaire Lateral Sclerosis Assessment Questionnaire
Adapted from Jenkinson and Fitzpatrick (14).

Jenkinson is to validate the Italian version of ALSAQ-40 and ALSAQ-5 in a large cohort of Italian ALS patients and to further characterise QoL in relation to muscle strength, motor disability and respiratory failure. The authors have recruited 76 ALS patients to complete the Italian version of ALSAQ-40 and ALSAQ-5. To verify the test–retest reliability, 30 patients were re-evaluated after 3 months. The internal reliability of the translated ALSAQ-40 scales and the test–retest reliability were assessed by means of a statistical index such as Cronbach's α. The SF-36 Questionnaire and Revised ALS Functional Rating (ALSFR-R) scale were used to assess the validity of the Italian ALSAQ-40 (16). The Medical Research Council (MRC) and Forced Vital Capacity (FVC) scores for limb muscles were used to measure the degree of patient loss of strength and respiratory failure, respectively. The Italian adaptation of the psychometric properties of ALSAQ-40 and ALSAQ-5 is reliable and similar to those of the original English version. The Italian adaptation showed a very good internal consistency (for all subscales Cronbach's $\alpha > 0.86$) and a good construct validity, as shown by the patterns of correlation between the subscales and SF-36 scores. ALSAQ-5 showed a positive correlation with the corresponding total and subscale scores of the ALSAQ-40 (Spearman's correlation >0.73). The authors have found a strong correlation between Italian ALSAQ-40 and ALSFRS-R scores and between MRC and FVC scores and Physical Mobility and ADL/Independence ALSAQ-40 subscale scores. The emotional functioning subscale on the ALSAQ-40 and either muscle strength or functional ability are not

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Table 7. Item MSQOL-54

	Excellent 1	Very good 2		Good 3	Fair 4	Poor 5
In general, would you say your health is:						
	Much better now than one year ago 1	Somewhat better now than one year ago 2		About the same 3	Somewhat worse now than one year ago 4	Much worse now than one year ago 5
Compared to one year ago, how would you rate your health in general now?						

The following questions are about activities you might do during a typical day. Does your health limit you in these activities? If so, how much?			
	Yes, Limited a Lot	Yes, Limited a Little	No, Not Limited at All
Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
Lifting or carrying groceries	1	2	3
Climbing several flights of stairs	1	2	3
Climbing one flight of stairs	1	2	3
Bending, kneeling, or stooping	1	2	3
Walking more than a mile	1	2	3
Walking several blocks	1	2	3
Walking one block	1	2	3
Bathing and dressing yourself	1	2	3

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?		
	YES	NO
Cut down on the amount of time you could spend on work or other activities	1	2
Accomplished less than you would like	1	2
Were limited in the kind of work or other activities 1 2	1	2
Had difficulty performing the work or other activities (for example, it took extra effort)	1	2

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious).		
	YES	NO
Cut down on the amount of time you could spend on work or other activities	1	2
Accomplished less than you would like	1	2
Didn't do work or other activities as carefully as usual	1	2

	Not at all	Slightly	Moderately	Quite a bit	Extremely
During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?					

Pain

	None	Very mild	Mild	Moderate	Severe	Very severe
How much bodily pain have you had during the past 4 weeks?						

	Not at all	A little bit	Moderately	Quite a bit	Extremely
During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?					

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	All of the Time	Most Of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
Did you feel full of pep?	1	2	3	4	5	6
Have you been a very nervous person?	1	2	3	4	5	6
Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
Have you felt calm and peaceful?	1	2	3	4	5	6
Did you have a lot of energy?	1	2	3	4	5	6
Have you felt downhearted and blue?	1	2	3	4	5	6
Did you feel worn out?	1	2	3	4	5	6

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Have you been a happy person?	1	2	3	4	5	6
Did you feel tired?	1	2	3	4	5	6
Did you feel rested on waking in the morning?	1	2	3	4	5	6
		All of the time	Most of the time	Some of the time	A little of the time	None of the time
During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?						
Health in General						
How TRUE or FALSE is each of the following statements for you.						
		Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
I seem to get sick a little easier than other people		1	2	3	4	5
I am as healthy as anybody I know		1	2	3	4	5
I expect my health to get worse		1	2	3	4	5
My health is excellent		1	2	3	4	5
Health Distress						
How much of the time during the past 4 weeks...						
	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
Were you discouraged by your health problems?	1	2	3	4	5	6
Were you frustrated about your health?	1	2	3	4	5	6
Was your health a worry in your life?	1	2	3	4	5	6
Did you feel weighed down by your health problems?	1	2	3	4	5	6
Cognitive Function						
How much of the time during the past 4 weeks...						
	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
Have you had difficulty concentrating and thinking?	1	2	3	4	5	6
Did you have trouble keeping your attention on an activity for long?	1	2	3	4	5	6
Have you had trouble with your memory?	1	2	3	4	5	6
Have others, such as family members or friends, noticed that you have trouble with your memory or problems with your concentration?	1	2	3	4	5	6
Sexual Function						
The next set of questions are about your sexual function and your satisfaction with your sexual function. Please answer as accurately as possible about your function during the last 4 weeks only. How much of a problem was each of the following for you during the past 4 weeks?						
MEN			Not a problem	A Little of a Problem	Somewhat of a Problem	Very Much a Problem
Lack of sexual interest						
Difficulty getting or keeping an erection						
Difficulty having orgasm						
Ability to satisfy sexual partner						
WOMEN						
Lack of sexual interest						
Difficulty getting or keeping an erection						
Difficulty having orgasm						
Ability to satisfy sexual partner						
		Very satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Very dissatisfied
Overall, how satisfied were you with your sexual function during the past 4 weeks?						

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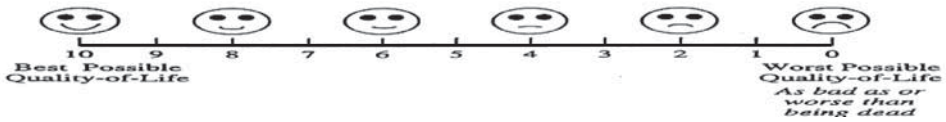
	Not at all	Slightly	Moderately	Quite a bit	Extremely
During the past 4 weeks, to what extent have problems with your bowel or bladder function interfered with your normal social activities with family, friends, neighbors, or groups?					
	Not at all	Slightly	Moderately	Quite a bit	Extremely
During the past 4 weeks, how much did *pain* interfere with your enjoyment of life?					

Overall, how would you rate your own quality-of-life?



Which best describes how you feel about your life as a whole?

Terrible	Unhappy	Mostly dissatisfied	Mixed - about equally satisfied and dissatisfied	Mostly satisfied	Pleased	Delighted

MSQoL, Multiple Sclerosis Quality of Life.
Adapted from Solari (18).

correlated. Emotive connotations that patients assign to their life can remain positive when their health is severely impaired. In conclusion, the authors have found the Italian adaptation of ALSAQ-40 and ALSAQ-5 questionnaires to be valid, reliable and useful as disease-specific QoL instruments for Italian ALS patients. The study by Palmieri and colleagues suggest that the QoL can be maintained as physical function declines (Tables 5 and 6).

Multiple Sclerosis Questionnaire

The Multiple Sclerosis QoL Health Survey (MSQOL-54) is a multidimensional HRQoL measure that combines both generic and MS-specific items into a single instrument. The developers utilised the SF-36 as the generic component to which 18 items were added to tap MS-specific issues such as fatigue, cognitive function, etc. This 54-item instrument generates 12 subscales along with two summary scores, as well as two additional single-item measures. The subscales are as follows: physical function, limitations in physical role, limitations in emotional role, pain, emotional well-being, energy, health perceptions, social function, cognitive function, health distress, overall QoL and sexual function. The single-item measures are satisfaction with sexual function and change in health. The MSQOL-54 is a structured, self-report questionnaire that the patient can generally complete with little or no assistance. It may also be administered by an interviewer. However, patients with visual or upper extremity impairments may need to have the MSQOL-54 administered as an interview. Interviewers should be trained in basic interviewing skills and in the use of this instrument (17) (see Table 7). Several studies have demonstrated that problems other than physical disability, such as mental health problems and bladder and sexual problems, adversely affect the QoL of MS patients. New studies are also needed to further determine the factors that contribute to the reduced QoL of MS patients. Scientific evaluation of such interventions using QoL questionnaires as a measure of patients' perspectives will allow the most useful strategies to be selected. Finally, published results are lacking from randomised clinical trials on the effect of interferon-β on the QoL. A study conducted by the authors has shown a modest effect; the rest were all small and used incomplete designs. A few significant findings might suggest no real effect on the patient's QoL or might be related to the insensitivity of the instrument used. This underlines the need for further studies on the responsiveness of the instruments used (17).

Conclusion

In the last decade the number of studies on QoL in patients affected by neurological disorders has increased exponentially. Several instruments have been developed, some of which are available in various languages, but the use of QoL as an outcome measure in clinical trials for the disease still has many shortcomings. It lacks *a priori* specification of how data are analysed and often lacks information about the mode of administration of the questionnaires (direct interview, telephone, self-administration, or

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other modes) and completeness of compilation. These problems, however, are only partly attributable to the shortcomings of the researcher or a member still not convinced with the current view of enhancing the patient-centred outcomes (19). Most of the instruments used consist of a set of scales that can in turn be aggregated into a total score and/or a limited number of composite indices. This is particularly important when a tool is used for multidimensional QoL, as the possibility of incurring an error of the first type is increased if we apply the statistical comparisons on individual domains separately, especially if they are re-evaluated over time. The specification of *a priori* and time domains in which a difference is expected overcomes the problem of multiple comparisons. The results reported in the literature show that, although the development and validation of QoL questionnaires for demyelinating and neurodegenerative diseases have reached a satisfactory level, the consensus on which QoL instruments are preferred in clinical trials and interpretation of results should be the subjects of further research and investigation (20). In summary, as a result of the achievements of the past two decades, nowadays we have many reliable and valid tools to evaluate the QoL of patients with neurological disorders. The methodology for assessment of QoL continues to develop towards a more precision evaluation through computer adaptive testing, implementation of electronic methods for data collection, integration of health pro le measurement and patient preference weighting, rigour statistical analysis and meaningful interpretation of QoL data. In parallel, we have observed increasing application of QoL instruments as outcome measures in clinical trials and growing interest in their use to aid patient–clinician interaction and policy decision making. The scientific rigour of QOL research will determine the extent to which the resulting data are accepted by clinicians, policymakers and the public.

References

1. Perez L, Huang J, Jansky L et al. Using focus groups to inform the Neuro-QOL measurement tool: exploring patient-centered, health-related quality of life concepts across neurological conditions. J Neurosci Nurs 2007;**39**:342–353.
2. Welsh MD. Measurement of quality of life in neurodegenerative disorders. Curr Neurol Neurosci Rep 2001;**1**:346–349.
3. Gregory D, Johnston R, Pratt G et al. Dictionary of human Oxford. Quality of Life 2009;**4**:62–65. ISBN 978-1-4051-3287-9.
4. Staren ED, Gupta D, Braun DP. The prognostic role of quality of life assessment in breast cancer. Breast J 2011;**8**:152–154.
5. Nakanishi K, Hanihara T, Mutai H, Nakaaki S. Evaluating the quality of life of people with dementia in residential care facilities. Dement Geriatr Cogn Disord 2011;**32**:39–44.
6. Jamroz-Wiśniewska A, Stelmasiak Z, Bartosik-Psujek H. Validation analysis of the polish version of the Multiple Sclerosis International Quality of Life Questionnaire (MusiQoL). Neurol Neurochir Pol 2011;**45**:235–242.
7. Riepe MW, Mittendorf T. Quality of life as an outcome in Alzheimer's disease and other dementias – obstacles and goals. BMC Neurology 2009;**9**:47.
8. WHOQOL Group. Study protocol for the World Health Organization Project to develop the quality of life assessment instrument (WHOQOL). Qual Life Res 1993;**2**:153–159.
9. Small GW, Rabins PV, Barry PP, Buckholtz NS. Diagnosis and treatment of Alzheimer disease and related disorders: consensus statement of the American Association for Geriatric Psychiatry, the Alzheimer's Association, and the American Geriatrics Society. J Am Med Assoc 1997;**267**:1363–1371.
10. Brod M, Stewart AL, Sands L, Walton P. Conceptualization and measurement of quality of life in dementia: the dementia quality of life instrument (DQoL). Gerontologist 1999;**39**:25–35.
11. Logsdon RG, Gibbons LE, McCurry SM, Teri L. Assessing quality of life in older adults with cognitive impairment. Psychosom Med 2002;**64**:510–519.
12. Jenkinson C, Fitzpatrick R, Brennan C, Bromberg M, Swash M. Development and validation of a short measure of health status for individuals with amyotrophic lateral sclerosis/motor neurone disease: the ALSAQ-40. J Neurol 1999;**246**:16–21.
13. Lawton MP. A multidimensional view of quality of life. In: Birren JE, Lubben JE, Rowe JC and Deutchman DE, editors. The concept and measurement of quality of life in the frail elderly, vol. 10. New York: Academic Press, 1991. p. 3–27.
14. Jenkinson C, Fitzpatrick R. Reduced item set for the amyotrophic lateral sclerosis assessment questionnaire: development and validation of the ALSAQ-5. J Neurol Neurosurg Psychiat 2001;**70**:70–73.
15. Peto V et al. The development and validation of a short measure of functioning and well being for individuals with Parkinson's disease. Qual Life Res 1995;**4**:241–248.
16. Ambs A, Warren JL, Bellizzi KM, Topor M, Haffer SC, Clauser SB. Overview of the SEER – Medicare Health Outcomes Survey linked dataset. Health Care Financ Rev 2008;**29**:5–21.
17. Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. J Health Econ 2002;**22**:271–292.
18. Solari A. Validation of Italian multiple sclerosis quality of life 54 questionnaire. J Neurol Neurosurg Psychiatry 1999;**67**(2):158–162.
19. Hanmer J, Hays RD, Fryback DG. Mode of administration is important in US national estimates of health-related quality of life. Med Care 2007;**45**:1171–1179.
20. Pittock SJ, Mayr WT, McClelland RL et al. Quality of life is favourable for most patients with multiple sclerosis: a population-based cohort study. Arch Neurol 2004;**6**:679–686.
21. Martinez-Martin P, Deuschl G. Effect of medical and surgical interventions on health-related quality of life in Parkinson's disease. Mov Disord 2007;**22**:757–765.

22. Hagell P, Nilsson MH. The 39-item Parkinson's Disease Questionnaire (PDQ-39): is it a unidimensional construct? Ther Adv Neurol Disord 2009;**2**:205–214.
23. Edelman P, Fulton BR, Kuhn D, Chang A. Comparison of three methods of measuring dementia-specific quality of life: perspectives of residents, staff, and observers. Gerontologist 2005;**45**:27–36.
24. Palmieri A, Sorarù G, Lombardi L. Misure di qualità di vita (QoL) specifiche per la SLA. Validazione dell'adattamento italiano di ALSAQ-40 e ALSAQ-5. Basic Appl Myol 2009;**19**:217–223.
25. Deuschl G. A randomized trial of deep-brain stimulation for Parkinson's disease. N Engl J Med 2006;**355**:896–908.
26. Moyle W, Gracia N. Assessing quality of life of older people with dementia in long-term care: a comparison of two self-report measures. J Clin Nurs 2010;**8**:125–127.
27. O'Connor D, Phinney A, Smith A et al. Personhood in dementia care: developing a research agenda for broadening the vision. Dementia 2007;**6**:121–142.
28. Jenkinson C, Fitzpatrick R. Crosscultural evaluation of the short form 8-item Parkinson's Disease Questionnaire (PDQ-8): results from America, Canada, Japan, Italy and Spain. Parkinsonism Relat Disord 2007;**13**:22–28.
29. Higgins IJ, Carr AJ. The clinical utility of quality of life measures. In: Higgins IJ, Carr AJ and Robbins PG, editors. Quality of life, vol 15. London: BMJ Books, 2003. p. 63–78.
30. Behari M, Srivastava AK, Pandey RM. Quality of life in patients with Parkinson's Disease. Parkinsonism and Rel Disord 2005;**11**:221–226.
31. Korczyn AD, Davidson M. Quality of life in Alzheimer's disease. Eur J Neurol 1999;**6**:487–489.

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