

Primerjava uporabe razširjene lestvice stopnje zmanjšane zmožnosti (EDSS) in lestvice funkcionalne neodvisnosti (FIM) pri bolnikih z multiplo sklerozo

Comparison of the expanded disability status scale and the functional independence measure in patients with multiple sclerosis

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Izvleček

Teoretična izhodišča: Za objektivno oceno bolnikov z multiplo sklerozo, spremljanje njihovega stanja in poteka rehabilitacije potrebujemo ocenjevalne lestvice. Najpogosteje uporabljena lestvica pri bolnikih z multiplo sklerozo je EDSS, s katero pridobimo informacije o neuroloških okvarah. Glavna pomanjkljivost lestvice je, da je preveč osredotočena na zmožnost hoje in da ni dovolj občutljiva za spremljanje sprememb bolnika v času. FIM je najširše uporabljana lestvica v rehabilitaciji. Ocenjuje motorične in kognitivne sposobnosti bolnika pri opravljanju vsakodnevnih opravil. V raziskavi smo se osredotočili na primerjavo EDSS in FIM. Želeli smo ugotoviti uporabnost FIM pri bolnikih z multiplo sklerozo.

Metode: Izvedli smo presečno raziskavo bolnikov z multiplo sklerozo, v kateri

Abstract

Objective: This study aimed to evaluate scales that are used to follow up on the condition and course of rehabilitation for an objective assessment of patients with multiple sclerosis. The most commonly used scale is the Expanded Disability Status Scale (EDSS) for obtaining information on neurological impairments. The main disadvantage of this scale is that it focuses a lot on the ability to walk and is not adequately sensitive for detecting the changes in the patient in time. The Functional Independence Measure (FIM) is the most commonly used scale in rehabilitation. It evaluates the ability of patients to perform daily activities, for example, feeding and dressing. In the study, we focused on the comparison of EDSS and FIM to ascertain the applicability of FIM in patients with multiple sclerosis.

je sodelovalo 38 bolnikov. Delo je potekalo na način pogovora z bolnikom in s pregledom medicinske dokumentacije, kjer smo pridobili oceno EDSS. Bolnika smo nato ocenili z lestvico FIM. Pridobljene podatke smo statistično obdelali s programom IBM SPSS 25 ter jih grafično in tabelarno prikazali s pomočjo programa Microsoft Excel.

Rezultati: Statistična analiza je pokazala močno negativno korelacijo med EDSS in FIM ($r = -0,731$). Motorični del lestvice FIM je v visoki negativni korelaciji z EDSS ($r = -0,732$), kognitivni del pa v nizki negativni korelaciji ($r = -0,262$). Spol in trajanje bolezni na oceno FIM nista pomembno vplivala; starost je pokazala srednje močno negativno korelacijo ($r = -0,396$).

Zaključek: Ugotovili smo, da je FIM uporabna lestvica za rutinsko ocenjevanje bolnikov z multiplo sklerozo in jo posledično predlagamo v kliničnem okolju.

Methods: We performed a cross-sectional study of 38 patients with multiple sclerosis by talking to the patients and reviewing the medical documentation where the EDSS evaluation was conducted. Then, we evaluated the patient using the FIM scale. The data were processed using the IBM SPSS Statistics 25 software and displayed graphically using the Microsoft Excel program.

Results: The statistical analysis showed a strong negative correlation between EDSS and FIM ($r = -0.731$). The motor part of the FIM scale had a strong negative correlation with EDSS ($r = -0.732$). The cognitive part had a weak negative correlation ($r = -0.262$). The sex and the duration of the disease did not impact the FIM evaluation significantly. The age had a moderately strong negative correlation ($r = -0.396$).

Conclusion: We proposed that FIM was a useful scale for the routine evaluation of patients in the clinical environment.

INTRODUCTION

Multiple sclerosis (MS) is an autoimmune demyelinating disease characterized by neurological deficits in time and space resulting from demyelinating lesions, inflammation, and axonal damage in various areas of the central nervous system (1). It has different forms depending on the course of the disease. The most common is the relapsing-remitting form, which occurs in relapses followed by periods of improvement. The recovery from relapses can be partial or complete. The disease can also have a primarily progressive course, implying no improvement in the meantime: the disease gradually escalates and leads to severe disability. The secondary progressive form is characterized by the deterioration of neurological functions during onset (2). After several years, a whole range of signs and disorders can appear at the same time: motor and sensory, coordination and balance, sphincter and cognitive, and vision and mood (3).

Various experts within the interdisciplinary team are involved in the treatment due to numerous disorders of physical structures and functions, as well as the reduced ability to perform different activities in rehabilitation.

The functioning of a patient with MS needs to be carefully assessed and the types and degrees of reduced abilities need to be determined for properly planning the rehabilitation treatment.

The most widely used scale and the gold standard for assessing people with MS is the Extended Disability Status Scale (EDSS). It enables the assessment of functional systems and activities.

It is used to assess vision, brainstem, pyramidal system, cerebellum, sensory system, urination and defecation, nervous functions, and walking (4). Despite its widespread use, the EDSS scale has its drawbacks and limitations. One of the disadvantages is the sensitivity of the scale because it is too small to monitor changes over time. Also, EDSS is not sensitive to assess cognitive changes and upper limb abilities, and gives a lot of importance to walking in certain assessments.

The Functional Independence Scale (FIM) is the most commonly used measurement tool for assessing the outcome of rehabilitation. In Slovenia, it is used, among other things, at the tertiary level in the University Rehabilitation Institute Soča, where the characteristics of FIM are also checked (5). Given the

disadvantages of EDSS, some studies investigated the use of FIM in assessing reduced ability in patients with MS (6). FIM showed greater variability while assessing and comparing the psychometric properties of EDSS and FIM. The FIM might also be a better indicator for assessing changes over time (7). The FIM scale is used to assess an individual activity or ability with ratings from “0” (fully capable) to “7” (completely incapable). The mid-term assessments are highly accurate and clear from the point of view of assessment and planning of medical device (MD) and patient care; they show the need for patient supervision, MD care, or physical assistance from other people (8).

FIM is a widely accepted measuring technique to assess patient functioning. It is an ordinal scale with 18 items used in various diagnoses. The ratings range from 1, which means that the patient needs full help, to 7, which means that the patient is completely independent. For grades below 6, the patient needs supervision or assistance in performing tasks (8). In Slovenia, the FIM scale is used for patient assessment and systematic data collection at the Institute of the Republic of Slovenia for Rehabilitation (5).

This study was conducted to compare the use of the FIM scale with EDSS in patients with MS based on recent studies. The literature review revealed that few authors had conducted a similar study. The main purpose of this study was to determine whether FIM could be used for assessing patients with MS, and to explore further the possibility of using FIM in rehabilitating such patients. We investigated the influence of sex, age, duration, and disease form on the assessment of FIM and EDSS, and determined the correlation between the motor and cognitive part of FIM and EDSS.

MATERIALS AND METHODS

The study was performed at the Terme Topolšica after obtaining approval of head nurse and director of the spa. It comprised 38 patients with MS who came to the spa for restorative balneotherapy. The patients were of both sexes and different ages. The exclusion criterion was the presence of injuries or other diseases that would affect the FIM assessment. All participants signed an informed consent form to participate in this study.

The data were collected based on patient interviews, medical record reviews, and assessment of their motor and cognitive abilities according to FIM. We recorded the results in a questionnaire that we had previously prepared, including age, disease duration, disease form, EDSS score, and FIM score.

The collected data were analyzed and processed using SPSS Statistics 25 (IBM software) and tabulated and presented graphically using Microsoft Excel.

RESULTS

The study had 38 participants [24 (63.2%) women and 14 (36.8%) men].

The age of the participants ranged from 31 to 87 years. The duration of the disease was between 8 and 49 years. Furthermore, 13 (34.2%) patients had a primary progressive MS, 15 (39.5%) had a relapsing-remitting MS, and 10 (26.3%) had a secondary progressive MS.

The mean score of study participants using the EDSS was 6.4 ± 2.0 . On the FIM scale, a score of 1 represented the worst situation and a score of 7 the best. The total score on the FIM scale was a maximum of 126, with participants averaging 93.9 ± 28.7 .

The EDSS and FIM scores of the same participants are depicted via a graph based on the position of total FIM and EDSS grades (Fig. 1).

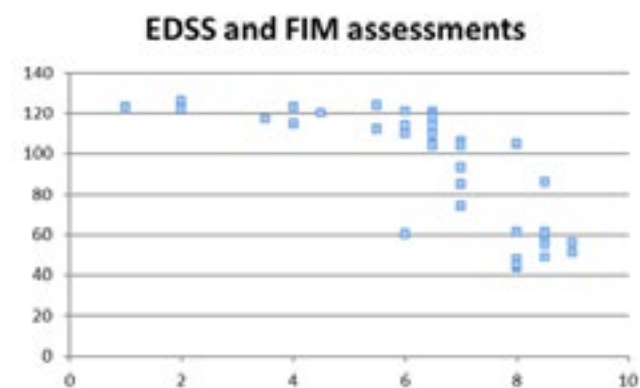


Figure 1. Position of total EDSS and FIM grades of each participant.

It was graphically shown that the FIM score was high for low and medium EDSS scores, and decreased with an EDSS score of 6 or higher. The statistical analysis showed that the degree of impairment of body structure and function strongly negatively correlated using the EDSS than the FIM scale ($r = -0.731$; $P < 0.001$). The correlation between the ratings of the two scales was strong. The EDSS and FIM score have opposite direction of numerical assessment in the escalation of functional disabilities and therefore the linear correlation coefficient r was negative.

Assessment of the disease development stage using the EDSS and reduced abilities using the FIM scale

The results of the EDSS and FIM scale assessments are presented in Table 1, which include all participants together and based on their sex.

Table 1. Evaluation of participants using EDSS and FIM scales (as all participants together and based on sex)

Scale assessment	EDSS	FIM
All subjects	6.4 ± 2.0	93.9 ± 28.7
Men	6.5 ± 1.8	92.7 ± 29.3
Women	6.4 ± 2.1	94.7 ± 28.9

Comparison between men and women: t-test: EDSS, $P = 0.87$; FIM, $P = 0.84$.

Table 3. Linear correlation between EDSS and FIM scores in participants with different forms of MS

MS form	EDSS	FIM	Pearson correlation coefficient (r)	P value
Primary progressive	7.6 ± 1.9	75.2 ± 26.3	-0.705	0.007
Relapsing–remitting	5.1 ± 1.7	115.2 ± 10.6	-0.570	0.027
Secondary progressive	6.8 ± 2.2	86.6 ± 31.0	-0.646	0.044

The assessment of the incidence rate using the EDSS and the reduced abilities using the FIM scale were compared based on sex. The results of the linear correlations between EDSS and FIM assessments and the age of the participants and the duration of the disease are shown in Table 2.

Table 2. Relationship between EDSS and FIM assessments according to participants' age and disease duration

		EDSS	FIM	AGE	Disease duration
EDSS	r	1	-0.731	0.282	0.252
	P		< 0.001	0.086	0.127
FIM	r		1	-0.396	-0.292
	P			0.014	0.750
Age	r			1	0.728
	P				<0.001
Disease duration	r				1
	P				

P , Probability; r , Pearson's correlation coefficient.

The association between age and EDSS score was weak ($r = 0.282$; $P = 0.086$). Also, a weak correlation was found between assessment using EDSS and the duration of MS ($r = 0.252$; $P = 0.127$).

The correlation between the EDSS and FIM assessment scores was always negative (assessment method) and statistically significant. It was strong in the primary progressive MS and moderate in the relapsing–remitting and secondary progressive MS.

The results of Pearson's linear correlation analysis between EDSS and FIM scores are presented in Table 4.

Table 4. Correlation between EDSS and the motor and cognitive parts of the FIM scale

FIM	Pearson correlation coefficient (r)	P value
Motor FIM	-0.732	<0.001
Cognitive FIM	-0.262	0.113

The linear correlation between the EDSS and motor FIM scores was strong and statistically significant. The correlation of cognitive FIM scores with EDSS scores was weak and statistically insignificant.

DISCUSSION

This study compared the use of the FIM and EDSS in patients with MS and found that the assessment using FIM strongly correlated with the EDSS. Previous studies used FIM mostly in patients after a stroke, while the EDSS was used mainly for assessing patients with MS (9). Some researchers looked for alternative rating scales due to the shortcomings of EDSS. Hobart et al. (7) compared the use of the Barthel index, FIM, and EDSS and investigated their psychometric properties. Rabadi and Vincent (6) investigated the use of the FIM as an alternative to the EDSS in assessing reduced performance due to MS. They conducted a longitudinal study comparing the results of the EDSS and FIM scales and their usefulness for monitoring changes over time. They found that FIM was more sensitive to changes and therefore more suitable for clinical studies.

We demonstrated that FIM was a useful scale for measuring reduced ability in patients with MS. It highly correlated with the EDSS, which was considered to be the most widely used scale in such patients. The EDSS was used to assess neurological deficits, revealing defective functional systems and the state of mobility in patients (2). The FIM provided us with information on functioning, the degree of inability to perform daily activities, the patient's need for care, and the need for

organized physical assistance to the patient. We could plan the rehabilitation of the patient and monitor the progress using the FIM (9). This study showed that FIM could be a useful scale for the routine assessment of patients with MS.

We hypothesized that the FIM and EDSS scores were negatively associated with older age, disease duration, and male sex. We expected these three variables to be associated with low FIM and EDSS scores. The results of this study showed that the association between age, disease duration, and the EDSS was weak. Scalfari et al. (10) also found that the duration of the disease did not affect the physical impairment, but it was affected by the age at which the disease occurred. In the relapsing-remitting MS, the defects and the consequent reduced ability were independent of the duration of the disease. The probability of transition to a progressive MS increased. The higher the age at which a relapsing-remitting MS occurred, the higher the possibility of developing a progressive MS. In the primary progressive MS, we did not find any age-related defects.

The association between the FIM and age was moderately negative, and the association between the FIM and disease duration was insignificantly negative. A longitudinal study was required to determine the impact of disease duration on the FIM, which was performed by Conradsson et al. (11). They observed changes in the patient's abilities for more than 10 years and found that the decline in performance was much more pronounced in moderate and severe MS (EDSS, 4–9.5) than in milder MS (EDSS, 0–3.5). In patients with moderate-to-severe MS, the walking ability and speed decreased and wheelchair dependence increased. Hand dexterity and cognitive processing were also reduced. Patients were also less involved in social activities.

In this study, the FIM and EDSS assessment scores were not statistically significantly different based on sex, which was, surprisingly, contrary to previous studies. This might be due to the selection of patients referred for rehabilitation. The disease occurred twice as often in women than in men (12). The course of the disease was faster in men, with a faster decline and reduced ability (13). Bove et al. (14) found in their longitudinal

study that men showed more severe brain atrophy, a more progressive course of the disease, and higher EDSS scores compared with women in the later period.

We concluded, based on previous findings, that different types of MS correlated differently with the FIM and EDSS scores. The participants with primary progressive MS had, on average, the highest EDSS score and the lowest FIM score. A large proportion of patients needed help in their routine tasks; some were even bedridden. The EDSS assessment results showed that most patients had already used a wheelchair. The correlation between the FIM and EDSS was strongly negative. Patients with a relapsing–remitting MS had the best results, most of whom were still able to walk. In this group, the assessment results were clearly affected because some patients were in remission rather than in the start-up phase. In this study, we included all patients regardless of MS type and phase. Some patients also received nonspecific drug treatment, which relieved their symptoms. Several patients with a relapsing–remitting MS informed that they noted a significant improvement due to medications, especially in terms of walking. The relationship between the FIM and EDSS scores was moderately negative and even in the case of secondary progressive MS it was moderately strongly negative. We did not find such a comparison in previous studies.

We hypothesized that the EDSS would be the most affected by the individual motor assessments using the FIM. One of the frequent criticisms of the EDSS scale is that the scale focuses a lot on walking in certain assessments (15). Hence, we expected that walking long distances would have the greatest impact on the EDSS score, but the results showed that walking up the stairs had the greatest impact on the score. Therefore, walking up the stairs was not taken into account in the EDSS, as only walking certain distances, and whether the patient needs a device or rest, is assessed. Walking the distances most likely did not affect the assessment because patients had fairly high scores in the FIM assessment, even when they were using a wheelchair on their own. The FIM scale is used to assess the extent to which a patient can perform a certain activity independently. It is not the ability to walk that is assessed, but the function of

movement. It is more important that the patients can function as independently as possible whether or not they use various aids. We observed that most patients used a wheelchair or at least walking aids, such as a cane or walker, due to balance problems and rapid fatigue while walking.

A weak correlation was found between the EDSS scores and cognitive items of the FIM scale in participants. The scores of cognitive items in the FIM scale added 35 points to the overall FIM score at best. The result of cognitive assessments was extremely good: on average 32.7 ± 2.5 . Previous studies showed that about half of patients with MS also experienced cognitive impairment. The problems occurred primarily with memory, information processing, and attention (16). We expected some elements of the cognitive area to be impaired, most notably memory and problem solving. We found that few patients had problems with these elements. Hence, cognitive assessment did not significantly affect the overall FIM assessment in most participants. Most of the functional incapacities in the participants were demonstrated during motor scale assessment using the FIM.

CONCLUSIONS

The EDSS score was most commonly used to assess patients with MS, which provided data on the patient's neurological impairments. The patients' abilities and their functioning were important for rehabilitation planning and goal setting in everyday life. As the FIM scale showed the task and extent of help the patients needed, we were interested in exploring whether this scale could be used in patients with different types of MS.

In this study, we found that the FIM scale was highly correlated with EDSS. A highly negative correlation was observed between the EDSS and FIM scores in patients with primary progressive MS, and a moderately strong negative correlation was observed in the relapsing–remitting and secondary progressive MS.

Hence, the FIM scale was useful in assessing patients with MS and showed the level of patient functioning. Therefore, we suggest using this scale in a clinical setting.

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