

REVIEW

Neurostatus and EDSS Calculation with Cases

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ABSTRACT

Expanded Disability Status Scale (EDSS) is the most commonly used disability scale for multiple sclerosis (MS) patients. It provides effective and reliable evaluation at every stage of the disease. It is mainly based

on the evaluation of functional systems. Neurostatus provides an up-to-date and improved basis for EDSS assessment.

Keywords: Multiple sclerosis, neurostatus, disability

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INTRODUCTION

Expanded Disability Status Scale (EDSS) is the most commonly used scale in multiple sclerosis (MS) patients. EDSS is a very effective method of reflecting disability (1). EDSS, with a scoring system between 0 and 10, reveals the patient's morbidity. Zero points is normal neurological examination. 10 points shows the MS-related death cases. Patients with EDSS score up to 5 are fully ambulatory patients. Up to this point, the main determinant of EDSS are functional systems (FS), the ambulation status is the main determinant in the degree of disability after 5.

NEUROSTATUS

Disability Status Scale was first described by John Kurtzke in 1955. It was a 10-digit general disability scale in that period (2, 3). A comprehensive scale of 20 digits was created with the addition of half-steps in 1983 (4, 5).

Disability Status Scale

0. Grade 0 in all FS
1. Grade 1 in any/all FS
2. Grade 2 in 1 or 2 FS; others O/1
3. Grade 3 in 2 FS; grade 3 in 1 FS/s ½ FS grade 2; grade 2 in 3-5 FS
4. Ambulation 300 m +without aid; FS exceed DSS 3
5. Limited ambulation without aid; FS usually exceed DSS 4
6. Ambulatory with aid; FS combinations with 3+ grade 3+
7. Wheelchair; FS combinations with 2+ grade 4+
8. Bed patient; FS combinations with several grade 4+
9. Helpless bed patient; FS combinations with most FS grade 4+
10. Death due to MS

Neurostatus has made EDSS a standard, institutional, updated, and controllable structure (5). Standard scoring and EDSS account is provided with FS. Neurostatus has provided more than 9000 certifications since 2004 (6). This infrastructure, which includes training and application materials, works in tandem with international clinical research. The

certification process required for clinical studies is carried out by online exams. Almost all MS clinical research requires the highest level of exam success. It is very important that the EDSS assessment is effective and of high quality for more effective results in the safety of clinical trials and neurology practice (3, 7).

Functional Systems

FS scores form the basis of the EEDSS assessment. There are eight FSs in total, together with ambulation (5).

- Visual (Optic) Functions
- Brainstem Functions
- Pyramidal Functions
- Cerebellar Functions
- Sensory Functions
- Bowel and Bladder Functions
- Cerebral Functions
- Ambulation

Some FS scores are converted before they are reflected in EDSS. Visual and bowel/bladder system scores are converted before EDSS (Table 1).

Table 1. Converted of visual and bowel/bladder system scores

Visual functions system score	1	2	3	4	5	6
After conversion	1	2	2	3	3	4
Bowel and bladder functions score	1	2	3	4	5	6
After conversion	1	2	3	3	4	5

Visual (Optic) Functions

The patient should be examined after correcting the refractive error. Snellen Chart is used. At a distance of 20 feet (5 meters), the level at which there are no more than one error is evaluated. Visual acuity, visual field, and optical disc status are checked. When calculating EDSS, functional system converts score. If the patient has an obstacle before the visual system; this situation is recorded but does not contribute to the patient's EDSS score (5, 6)

Functional System Score

0. Normal
1. Disc pallor and/or small scotoma and/or visual acuity of worse eye less than 20/20 (1.0) but better than 20/30 (0.67)
2. Worse eye with maximal visual acuity of 20/30 to 20/59 (0.67–0.34)
3. Worse eye with large scotoma and/or moderate decrease in fields and/or maximal visual acuity of 20/60 to 20/99 (0.33–0.21)
4. Worse eye with marked decrease of fields and/or maximal visual acuity of 20/100 to 20/200 (0.2–0.1); Grade 3 plus maximal acuity of better eye of 20/60 (0.33) or less
5. Worse eye with maximal visual acuity less than 20/200 (0.1); Grade 4 plus maximal acuity of better eye of 20/60 (0.33) or less
6. Grade 5 plus maximal visual acuity of better eye of 20/60 (0.33) or less

Brainstem Functions

Extraocular movements impairment (EOM), nystagmus, trigeminal nerve status, facial nerve area, hearing status, talk, swallowing and other cranial nerve functions are evaluated. According to the evaluation results, there is a FS score between 0 and 5 (5, 6).

Functional System Score

0. Normal
1. Signs only
2. Moderate nystagmus and/or moderate EOM impairment and/or other mild disability
3. Severe nystagmus and/or marked EOM weakness and/or moderate disability of other cranial nerves
4. Marked dysarthria and/or marked disability
5. Inability to swallow or speak

Pyramidal Functions

Reflexes, muscle strength and spasticity are evaluated. Examines the extremity and gait spasticity. Deep tendon reflexes and superficial reflexes should be examined. Patient is executed on heel and finger. Muscle strength assessment is based on the British Medical Research Council (BMRC) scale (Table 2)(8).

Table 2. British Medical Research Council Scale

BMRC*	Muscle strength
0	No contraction
1	Flicker or trace contraction
2	Active movement, with gravity eliminated
3	Active movement against gravity
4	Active movement against gravity and resistance
5	Normal power

* British Medical Research Council

Functional System Score

- 0 Normal
1. Abnormal signs without disability
2. Minimal disability
3. Mild to moderate paraparesis or hemiparesis
4. Marked paraparesis or hemiparesis
5. Paraplegia or hemiplegia;
6. Tetraplegia

Cerebellar Functions

In the patient, tremor, ataxia and walking status are examined. Truncal, limb and gait ataxia are examined. Cerebellar test cannot be evaluated if there is pyramidal weakness (BMRC Grade 3 or worse in limb strength). This is indicated by X. To evaluate the condition of the extremities, tremor, dysmetria and alternating movements tests should be performed. (5, 6)

Functional System Score

0. Normal
1. Abnormal findings but no disability
2. Mild ataxia and/or moderate station ataxia
3. Moderate truncal ataxia and/or moderate limb ataxia and/or moderate or severe gait/truncal ataxia
4. Severe gait/truncal ataxia and severe ataxia in three or four limbs
5. Unable to perform coordinated movements related to ataxia

Sensory Functions

In this examination, superficial senses, vibration sensation and position sense are evaluated. Paresthesia and Ihermitte findings does not participate in FS score (5, 6).

Functional System Score

0. Normal
1. Vibration or figure-writing decrease only in one or two limbs.
2. Mild decrease in touch or pain or position sense, and/or moderate decrease in vibration in one or two limbs; or vibratory (c/s figure writing) decrease alone in three or four limbs
3. Moderate decrease in touch or pain or position sense, and/or essentially lost vibration in one or two limbs; or mild decrease in touch or pain and/or moderate decrease in all proprioceptive tests in three or four limbs
4. Marked decrease in touch or pain or loss of proprioception, alone or combined, in one or two limbs; or moderate decrease in touch or pain and/or severe proprioceptive decrease in more than two limbs
5. Loss (essentially) of sensation in one or two limbs; or moderate decrease in touch or pain and/or loss of proprioception for most of the body below the head
6. Sensation essentially lost below the head.

Bowel and Bladder Functions

Urinary retention, urgency and incontinence are examined. Bowel dysfunction is controlled. Sexual dysfunction can be documented but in general does not impact on FS score. When determining the EDSS step, the Bowel and Bladder FS score is converted to (5, 6).

Functional System Score

0. Normal
1. Mild urinary hesitance, urgency, or retention
2. Moderate hesitance, urgency, retention of bowel or bladder, or rare urinary incontinence
3. Frequent urinary incontinence
4. In need of almost constant catheterization
5. Loss of bladder function
6. Loss of bowel and bladder function

Cerebral Functions

Depression, euphoria, mentation status and fatigue can be documented. In neurology practice, mental examination has a special place. However, during the neurostatus assessment, the mental examination cannot be evaluated sufficiently. Because fatigue is difficult to evaluate objectively, it does not contribute to the cerebral FS score or EDSS step. The presence of depression and/or euphoria alone results in a cerebral FS score of 1, but does not affect the EDSS step. However, a cerebral FS score of 1 due to mild fatigue and/or signs only decrease in mentation contributes to the determination of the EDSS step (5, 6).

Functional System Score

- 0. Normal
- 1. Mood alteration only (does not affect EDSS score)
- 2. Mild decrease in mentation
- 3. Moderate decrease in mentation
- 4. Marked decrease in mentation
- 5. Dementia

Ambulation

Fully ambulatory means at least 500 meters of ambulation. if the walking distance is at least 500 meters. Unrestricted means the patient is able to walk a distance that is regarded as normal, compared with healthy individuals of similar age. Observe the patient walking unassisted for a minimum distance of 500 meters and measure the time. The best performing walking assistant is selected. The patient should not touch the wall or a person because, these is not a walking assistant (5, 6).

Ambulation Score

- 0. Unrestricted
- 1. Fully ambulatory
- 2. >300 meters, but <500 meters, without help or assistance (EDSS 4.5 or 5.0)
- 3. >200 meters, but <300 meters, without help or assistance (EDSS 5.0)
- 4. >100 meters, but <200 meters, without help or assistance (EDSS 5.5)
- 5. Walking range <100 meters without assistance (EDSS 6.0)
- 6. Unilateral assistance, >50 meters (EDSS 6.0)
- 7. Bilateral assistance, >120 meters (EDSS 6.0)
- 8. Unilateral assistance, <50 meters (EDSS 6.5)
- 9. Bilateral assistance, >5 meters, but <120 meters (EDSS 6.5)

- 10. Uses wheelchair without help; unable to walk 5 meters even with aid, essentially restricted to wheelchair; wheels self and transfers alone; up and about in wheelchair some 12 hours a day (EDSS 7.0)
- 11. Uses wheelchair with help; unable to take more than a few steps; restricted to wheelchair; may need some help in transferring and in wheeling self (EDSS 7.5)
- 12. Essentially restricted to bed or chair or perambulated in wheelchair, but out of bed most of day; retains many self-care functions; generally, has effective use of arms (EDSS 8.0)
- 13. Restricted to bed much of the seat
- 14. Bed patient, can communicate and eat
- 15. Helpless bed patient, unable to communicate, eat or swallow

EDSS CALCULATION WITH SAMPLES

First, the patient detailed examination must be performed. Then the FS score is determined. Necessary changes are made to the systems that need conversion. The EDSS score is calculated based on a FS and ambulation.

Functional System Score Calculation

- Neurological examination: Visual acuity; left eye; 0.1 (20/200), right eye; 1.0 (20/20)
Visual FS score: 4 (after conversion: 3)
- Neurological examination: Visual acuity; left eye; 0.1 (20/200), right eye; 0.8 (20/25) left eye defects from childhood.
Visual FS score: 1 (after conversion: 1)
- Neurological examination: Visual acuity; left eye; 0.05 (20/400), right eye; 0.8 (20/25)
Visual FS score: 5 (after conversion: 3)
- Neurological examination: Persistent nystagmus (primary) in the primary position, internuclear ophthalmoparasis (middle) in the left eye, clinically detectable dysarthria (mild)
Brainstem FS score: 3
- The patient has a clone in the right lower extremity, live deep tendon reflexes in the lower extremities, muscle strength is complete in all muscle groups.
Pyramidal FS score: 1
- The patient's right lower extremity 2/5 muscle strength, right upper extremity 3/5 muscle strength, live reflexes in lower extremities, plantar response extensor on the right.
Pyramidal FS score: 4

Table 3. Expanded Disability Status Scale Calculation

Visual	Brainstem	Pyramidal	Cerebellar	Sensory	Bowel and bladder	Cerebral	Ambulation	EDSS
0	3	0	0	0	0	0	0	3
1 (1)	3	0	0	0	0	0	0	3
1 (1)	3	1	1	0	0	1	0	3
2 (2)	3	0	0	0	0	0	0	3.5
2 (2)	3	1	1	1	0	0	0	3.5
1 (1)	3	1	1	3	0	1	0	3.5
1 (1)	3	1	3	3	1 (1)	0	0	4
0	1	4	2	1	0	0	0	4.5
0	1	4	3	3	1 (1)	0	0	4.5
0	1	4	3	4	1 (1)	1	0	5

- The patient cannot walk more than a few steps due to lower extremity ataxia. Have only trunkal ataxia when sitting. There is a mild tremor in the upper extremities
Cerebellar FS score: 4
- The patient has no complaints. Slightly reduced vibration sensation in the lower extremities. Other sensory examination findings are within normal limits
Sensory FS score: 1
- The patient has Lhermitte's complaint and mild depression
Sensory FS score: 0, Cerebral System score: 1
- Patient needs bladder catheterization several times a week, constipation problem is present, occasional manual intervention is required.
Bowel and bladder FS score: 3 (after conversion: 3)

Examples of EDSS calculation are given in Table 3. EDSS is the basic assessment scale of MS. It is used at every stage of the disease. It is important that EDSS is done correctly, in terms of diagnosis, treatment and follow-up.

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