The Brief International Cognitive Assessment for Multiple Sclerosis (BICAMS) for the evaluation of the EDSS Cerebral Functional Score

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INTRODUCTION

While neurological examination is sufficient to assess most functional scores (FS) of the Expanded Disability Status Scale (EDSS), no objective tool is available to determine the cerebral FS (CFS), despite several neuropsychological tests have been validated for the assessment of patients with Multiple Sclerosis (MS). Landgod et al. developed the Brief International Cognitive Assessment for MS (BICAMS) that takes about 15 minutes. Aim of our study was to integrate the BICAMS in the CFS calculation, and to evaluate its impact on a large cohort of MS patients.

METHODS

BICAMS and orientation tests (OTs) were used to match the different Neurostatus-CFS definitions (Table 1). To appreciate the implementation of neuropsychological tests we calculated both the EDSS before (Native-EDSS) and after the use of the BICAMS/OTs (NPS-EDSS) and compared them with a paired t-test. We performed a multivariate logistic regression analysis to test the effect of age, age at onset, disease duration, gender, education, and native-EDSS on the probability of having one impaired test at the BICAMS, and on having a NPS-EDSS different from the native-EDSS.

Table 1. Definition of CFS Scores

CFS	Kurtzke - EDSS	NEUROSTATUS	BICAMS
0	Normal	None	All three BICAMS tests are normal. No disorientation.
1	Mood alteration only (does not affect EDSS score)	Signs only: not apparent to patient and / or significant other	One impaired BICAMS test. No disorientation.
2	Mild decrease in mentation	Mild: patient and/or significant other report mild changes in mentation.	Two impaired BICAMS tests. No disorientation.
3	Moderate decrease in mentation	Moderate: abnormalities on brief mental status testing, but still oriented to person, place and time	Three impaired BICAMS test. No disorientation.
4	Marked decrease in mentation (chronic brain syndrome)	Marked: not oriented in one or two spheres (person, place or time), marked effect on lifestyle	Disorientation in one or two spheres, independent of BICAMS.
5	Dementia, or chronic brain syndrome, severe or incompetent	Dementia confusion and/or complete disorientation	Disorientation in three spheres, independent of BICAMS.

CFS = Cerebral Functional Score; **EDSS** = Expanded Disability Status Scale; **BICAMS** = Brief International Cognitive Assessment for Multiple Sclerosis.

Table 2. Demographics of enrolled patients

Parameter	Value
Age at enrolment, years ± SD (range)	42.5 ± 11.3 (15–73)
Female, n (%)	399 (66.1)
Disease duration, years ± SD (range)	12.9 ± 8.9 (0.1–45.4)
EDSS, score ± SD (range)	3.52 ± 1.9 (0–7.5)
Education, years ± SD (range)	12.7 ± 3.7 (3-24)
Disease form RR, n (%)	509 (84.4)

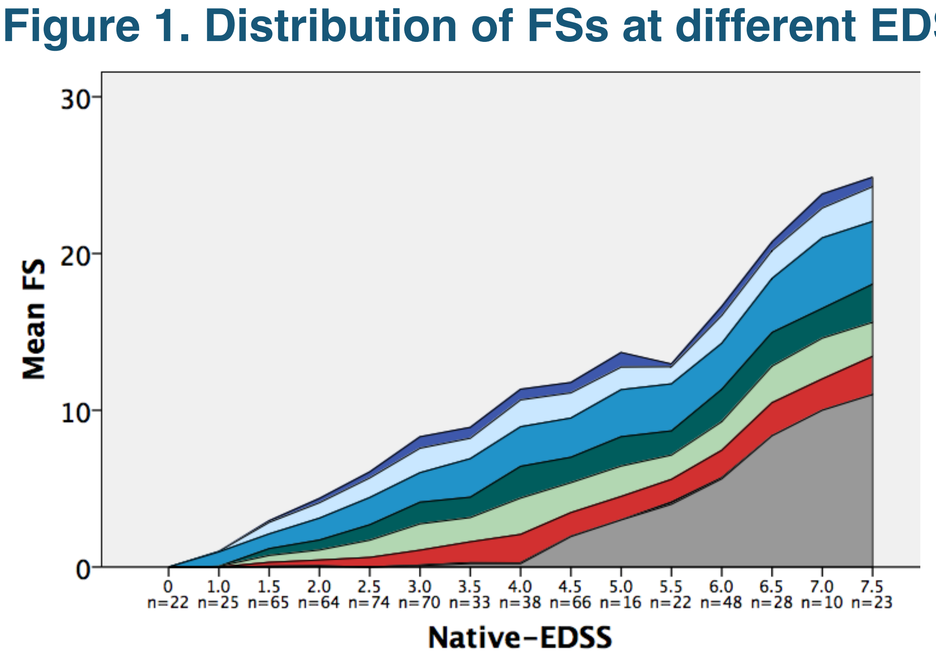
SD = Standard Deviation; **EDSS** = Expanded Disability Status Scale; **RR** = Relapsing-Remitting.

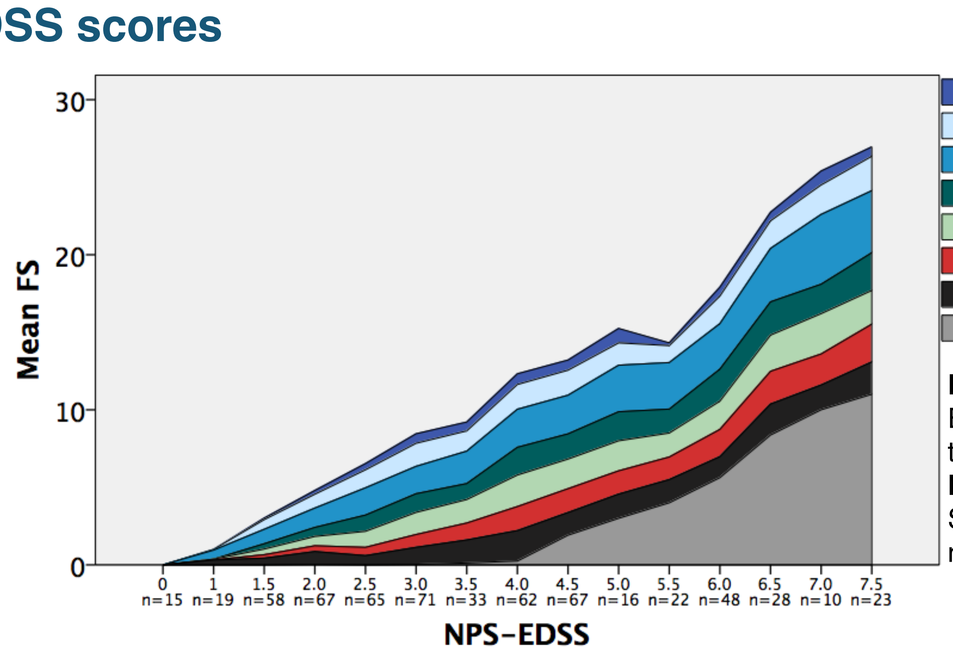
RESULTS

We tested 604 MS patients with BICAMS, OTs, and EDSS. 384 patients (63.6%) had at least one altered test at the BICAMS. Demographics of tested patients are shown in Table 2. NPS-EDSS showed higher scores than the native-EDSS (+0.12; CI 0.09, 0.14; p<0.001). 99 (16.4%) patients had a different EDSS (Native- vs NPS-), and all of these had a Native-EDSS ≤ 4.0. In the subgroup of patients with native-EDSS ≤ 4.0, NPS-EDSS had even higher scores (+0.18; CI 0.14, 0.22; p<0.001), and 25.1% of patients had different EDSS after neuropsychological correction (Native- vs NPS-).

At the multivariate analysis, factors associated with at least one altered test at the BICAMS were age (OR 1.021; CI 1.004, 1.039; p=0.014), male gender (OR 1.507; CI 1.035, 2.195; p=0.033), years of education (OR 0.931; CI 0.887, 0.977; p= 0.004), native-EDSS (OR 1.242; CI 1.117, 1.379; p<0.001). Factors associated with a difference between Native- and NPS-EDSS, in the subgroup of patients with a Native-EDSS ≤ 4.0, were years of education (OR 0.892; CI 0.835, 0.954; p<0.001), male gender (OR 1.657; CI 1.022, 2.686; p=0.040), and Native-EDSS (OR 0.756; CI 0.600, 0.952; p=0.017).

Figure 1. Distribution of FSs at different EDSS scores





FS = Functional Score; Native; **EDSS** = Expanded Disability Status Scale without the use of neuropsychological tests; **NPS-EDSS** = Expanded Disability Status Scale calculated with the use of neuropsychological tests.

CONCLUSIONS

Despite the BICAMS is a brief assessment tool, it shows similar predictive factors of cognitive impairment as more complex neurospcyhological batteries. The use of brief neuropsychological tests leads to a more accurate CFS assessment in two-thirds of MS patients, and a more accurate EDSS calculation in 25% of patients with a score ≤4.0. This may help clinicians to better recognize cognitive impairment in everyday clinical practice, especially in the case of isolated cognitive worsening.