

# Validity of the Portuguese version of Clinical Dementia Rating

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## Keywords

Dementia; dementia, amnesic cognitive disorders. Aged. Clinical Dementia Rating. Psychological tests.

## Abstract

### Objective

To evaluate the validity of the Portuguese version of the Clinical Dementia Rating for classifying the cognitive function among the elderly.

### Methods

The Mini Mental State Examination was utilized as a screening method for cognitive deficit among a cohort of 424 elderly. All those who scored <26 points (108 elderly) and 48 elderly with scores =26 were included in the study. The 156 subjects selected were submitted to clinical evaluation and neuropsychological tests for the diagnosis of dementia. Afterwards, both cases and non-cases were classified, according to the Portuguese version of the Clinical Dementia Rating, in the categories normal, questionable, mild, moderate and severe dementia.

### Results

Among the 156 subjects selected, 122 were non-cases, 62 (51%) were classified as normal (CDR=0) and 60 (49%) as questionable (CDR=0.5). Among the 34 cases of dementia, 17 (50%) were classified as mild dementia (CDR=1), eight (23%) as moderate (CDR=2) and six (18%) as severe dementia (CDR=3). Only three (9%) of the cases were considered questionable cases by the Clinical Dementia Rating. Its sensibility was 91.2% and the specificity was 100%. The positive predictive value was 100% and the negative predictive value was 97.6%. The Mini Mental State Examination scores declined significantly according to the degree of dementia.

### Conclusions

The Portuguese version of the Clinical Dementia Rating is a valid instrument for classifying the dementia status of the elderly. Almost half the cases considered normal by the diagnostic criteria of the Mini Mental State Examination were questionable cases according to the Clinical Dementia Rating and might correspond to cases of mild cognitive impairment, with an increased risk of conversion to dementia cases.

## INTRODUCTION

The term dementia does not describe a disease, but rather a chronic syndrome whose principal characteristics are: a decline in acquired memory, decline in intellectual or other cognitive functions, changes in behaviour and personality, as well as impairment in psychosocial performance. The degree of increased incapacity increases as cognitive deficit advances.<sup>1,8</sup>

Dementias are an emerging public health issue among the elderly, not only due to its high prevalence in this age group, but also because they are important causes of impairment and mortality.<sup>11,12</sup> As the population ages, as can currently be observed in Brazil, the incidence of dementia assumes epidemic proportions.<sup>6</sup>

Considering the few therapeutic alternatives available and the greater effectiveness of treatments diag-

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nosed precociously, identifying cases that are at a high risk of evolving into dementia assumes greater relevance. Developed by Hughes et al<sup>7</sup> and adapted by Morris,<sup>9</sup> the Clinical Dementia Rating (CDR) is the ideal instrument for this end. It makes it possible to classify the prevalence of the diverse degrees of dementia, as well as identifying questionable cases, those that are not considered normal. These cases may correspond to the so called aging-associated cognitive decline or to the mild cognitive impairment, that in other epidemiological studies belongs to the group with the largest rate of conversion into dementia.<sup>3,10</sup>

The objective of this study is to validate the use of the Portuguese version of the Clinical Dementia Rating when classifying cognitive functions among the elderly.<sup>2,7</sup>

## METHODS

This study is part of a longitudinal investigation<sup>11</sup> that was initiated in the beginning of 1991 with a cohort of elderly people aged 65 years and older residing in the city of São Paulo. The survivors of this cohort (n=424) were recruited again in 1998, when a methodology similar to the first inquiry, utilizing the Mini-

Mental State Examination (MMSE)<sup>4</sup> was applied. Seeking to generate high sensibility for the detection of cognitive impairments compatible with dementia, all the elderly who scored less than 26 points on the MMSE (n=108) were included in this study. In an attempt to attain high specificity for normal cases, those individuals with scores greater or equal to 26 (316), 15% (n=48) were assigned to a sub sample. The 156 (108+48) subjects selected were evaluated for a diagnosis of dementia and classified according to the CDR.

Diagnosis of dementia among the individuals selected was obtained according to criteria of the “Diagnostic and Statistical Manual, IV edition (DSM-IV)” and the “National Institute of Neurological, Communicative Disorders and Stroke-Alzheimer Disease and Related Disorders Association (NINCDS-ADRDA).<sup>1,8</sup>

In order to corroborate the clinical diagnosis, other neuropsychological tests were applied: memory of a list of words and their evocation,<sup>14</sup> test of verbal fluency categories<sup>13</sup> and test of the clock (spontaneous and copy).<sup>15</sup>

The CDR evaluates cognition and behavior, as well

**Table 1** - Classification of the categories evaluated by the Clinical Dementia Rating.

Impairment level	None (0)	Questionable (0.5)	Mild (1)	Moderate (2)	Severe (3)
Memory	No memory loss or slight inconsistent forgetfulness	Consistent forgetfulness, partial recollection of events.	Moderate memory loss; more marked for recent events; defect interferes with daily activities.	Severe memory loss; only highly learned material retained.	Severe memory loss; only fragments remain.
Orientation	Fully oriented.	Fully oriented except with slight difficulties with time relationships.	Moderate difficulty with time relationships, oriented in familiar areas.	Severe difficulty with time relationships, almost always disoriented to place.	Oriented to person only.
Judgement & Problem Solving	Solves everyday problems, such as financial affairs; judgement preserved.	Slight difficulty in solving problems, similarities and differences.	Moderate difficulty on handling problems, similarities and differences, social judgement maintained.	Severely impaired in handling problems, similarities and differences; social judgement impaired.	Unable to make judgements or solve problems.
Community Affairs	Independent function in job, shopping, social groups.	Slight impairment in these activities.	Is not independent in these activities, appears normal to casual inspection.	Is not independent outside home, appears well enough to be taken to events outside the home.	Is not independent outside the home, appears to be too ill to be taken to events outside the home.
Home and Hobbies	Daily life at home, hobbies and intellectual interests well maintained.	Daily life at home, hobbies and intellectual interests slightly impaired.	Slight impairment of tasks at home, more difficult chores, hobbies and interests are abandoned.	Only simple chores are maintained, restricted interests, poorly maintained.	No significant function at home.
Personal Care	Fully capable of self-care.	Fully capable of self-care.	Needs assistance.	Requires assistance in dressing and hygiene.	Requires much help with personal care; frequent incontinence.

Fonte: Bertolucci et al<sup>2</sup>

**Table 2** - General rules for classification according to the Clinical Dementia Rating

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1- M=2 or more Sec; CDR=M.  
Except:  
2- M=0; 2 Sec=M and 3 Sec≠0; CDR=0.5.  
Other situations:  
3- M=0.5; all other Sec=0; CDR=0.5.  
4- M≥1; all other Sec<1; CDR=0.5.  
5- M=1 Sec; 2 Sec<M; 2 Sec>M; CDR=M.  
6- M>2 Sec and <3 Sec; CDR=M.  
7- M<2 Sec and >3 Sec; CDR=M.  
8- M< or >4 Sec;  
CDR= the majority of Secs,  
except when the categories are 0 and M=0.5 (rule 3).

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M: Memory; Sec: Secondary categories: Orientation, Judgement, and Problem Solving, Community Affairs, Home and Hobbies, Personal Care; CDR: Final classification, 0=Normal; 0,5=Questionable; 1=Mild; 2=Moderate and 3=Severe

as the influence of cognitive losses in the subject's ability to perform adequately daily activities. In order to attain the classification, it is not necessary to establish cutoff scores based on populational studies, for individuals performances are compared to their own past scores. This instrument is divided into six cognitive behavioral categories: memory, orientation, judgment or problem solving, community affairs, home and hobbies and personal care (Table 1). Each of these six categories should be classified in: 0 (no impairment); 0,5 (questionable); 1 (mild dementia); 2 (moderate dementia); and 3 (severe dementia), except for the category personal care, for which the 0,5 level – questionable impairment – does not exist. Memory is considered the primary category and all others are secondary.<sup>2,7</sup> The global CDR or its final classification is derived from the scores obtained in each of these six categories, according to a set of rules elaborated and validated by Morris<sup>9</sup> (Table 2).

The CDR was applied by means of an unstructured interview conducted by an examiner that was unfamiliar with the clinical diagnosis. A family member, preferentially the spouse or a son or daughter with whom the subject was living or interacting on a daily basis or an individual who was close to him/her. On rare occasions, when the elderly person was living alone, the closest relative or a neighborhood "friend" was contacted. Data was evaluated for coherence and only on few occasions was it necessary to repeat the interview with another informant.

In order to classify each category in the most appropriate manner, the informant was asked to tell the examiner some of the patient's daily activities and to compare them with his/her life history or past performance. Examples:

1. Ms. Y, aged 80 years old, had been a bilingual secretary in a large firm. According to her friend and neighbor in the building where she has been living for many years (this informant was chosen

because the patient is single and lives alone), presents difficulty in remembering her appointments, even the most important ones such as medical consultations. She calls the doctor's office several times to ask at what time is her appointment without realizing that she has already called before. This information was utilized to classify her in the memory category as 1 ( mild dementia).

2. Mr. X, aged 77, was an accountant. According to his daughter, after his retirement he lost his former interest in many more complex activities and prefers to stay at home reading the newspaper. He no longer emits his opinion concerning family decisions, however, when solicited, he gives coherent suggestions. He takes care of his pension and pays his bills, although he sometimes asks his daughter for help. He still drives his car, without any problems, but seems to be apprehensive. This information was utilized to classify the category judgment and problem solving as 0.5 (questionable).
3. Ms. W, aged 90, according to her niece, worked until recently as an elderly physician's secretary. She dedicated herself to her job. It was her routine for many years. However, her memory loss, that steadily became more severe, led to her "compulsory" retirement. This information was utilized to classify the category community affairs in 1 (mild dementia).

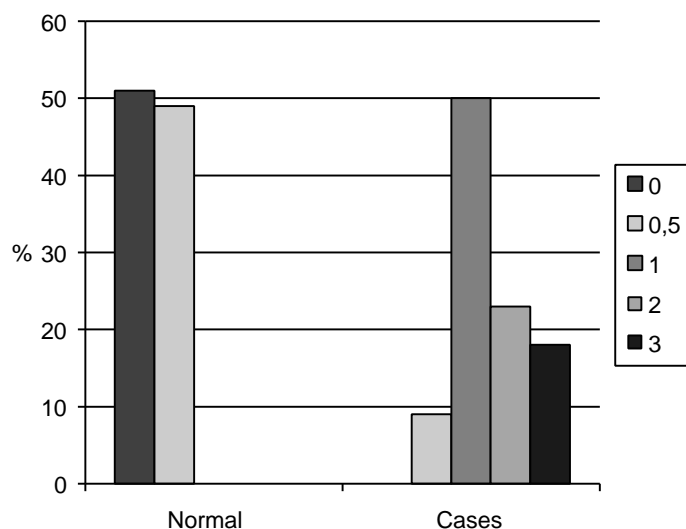
Translation and back translation was not undertaken when utilizing this instrument for, as previously mentioned, it was not a structured interview, that is, it did not consist of a series of questions applied in the same manner.

Stata and SPSS programs were utilized to analyze the data, and the level of significance greater than 95%. In order to verify agreement between CDR classification and the DSM-IV and NINCDS-ADRDA diagnostic criteria, the Kappa (k) coefficient was employed. Variance analysis (ANOVA) was utilized to relate scores on the MMSE test to the CDR classification. Bonferroni's test was employed in the com-

**Table 3** - Diagnosis of dementia by the Clinical Dementia Rating.

CDR	Cases	Diagnosis* Normal	Total
Cases (1,2,3)	31	0	31
Normal (0 e 0.5)	3	122	125
<b>Total</b>	<b>34</b>	<b>122</b>	<b>156</b>

CDR: Clinical Dementia Rating  
\*According to the criteria "Diagnostic and Statistical Manual, IV edition (DSM-IV)" and "National Institute of Neurologic, Communicative Disorders and Stroke-Alzheimer Disease and Related Disorders Association (NINCDS-ADRDA)".



**Figure 1** - Results of the Clinical Dementia Rating classification for individuals with a normal diagnosis and for cases classified as dementia according to clinical criteria.

parison between the mean MMSE scores and the CDR classification.

## RESULTS

According to the DSM-IV and NINCDS-ADRDA criteria, 34 (22%) subjects presented dementia (Table 3). Among the cases of dementia, 17 (50%) were classified as mild dementia (CDR=1), eight (23%) as moderate (CDR=2) and six (18%) as severe (CDR=3). Only three cases (9%) were considered questionable by the CDR (Figure 1). Among the remaining 122 subjects (78%), considered non-cases within the sample, 62 (51%) were classified as normal (CDR=0) and 60 (49%) as questionable (CDR=0.5). Therefore, there was a high level of agreement between clinical diagnosis and dementia ( $k=0.93$ ). Therefore, according to the criteria employed in this study, the CDR's sensibility was 91.2%, and it presented a 100% specificity, 100% positive predictive value, 97.6% negative predictive value and 98.1% accuracy.

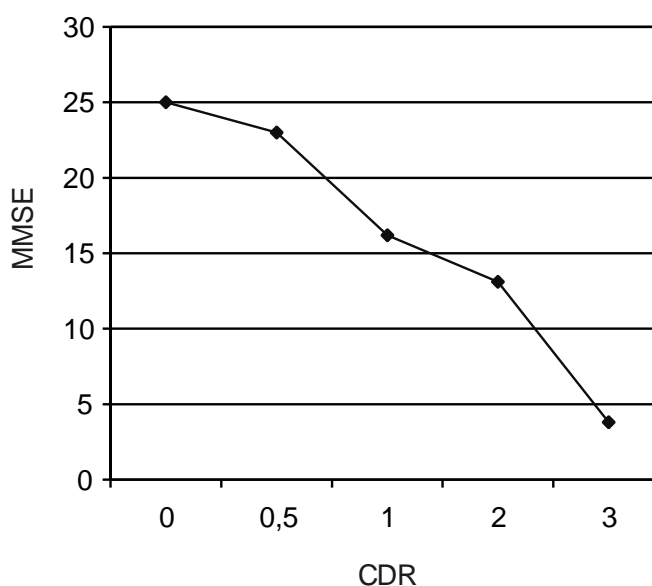
The mean score of non-cases was 27.9 points (the minimum was 26 and a maximum of 30 points), whereas the mean score for the cases was 20.3 points (the minimum was 0 and the maximum was 25 points). No cases of dementia were found among the non-cases (the specificity of the MMSE corresponded to 100% at this cutoff point). The mean scores of the MMSE, according to the various levels of the CDR, declined significantly according to the increase in the degree of de-

mentia, thus, for normal subjects (0) the mean score was 25 with a 3.1 standard deviation (SD), for the questionable subjects (0.5) the mean score was 23 (SD=3.1), for subjects with mild dementia (1) the mean score was 16.2 (SD=5.7), For subjects with mild dementia (2) the mean score was 13.1 (SD=4.5) and for severe dementia (3) the mean score was 3.8 (SD=4.3). The mean scores of the MMSE were significantly different from one another according to the different degrees of dementia, except for those who had mild and moderate levels of impairment according to Bonferroni's test (Figure 2).

## DISCUSSION

When classifying the subjects according to the CDR, disagreements occurred vis-à-vis the clinical diagnosis in only three cases, which were considered questionable by the CDR. Therefore, there was a high level of agreement between clinical criteria (gold standard) and CDR, confirming the validity of the CDR in separating normal subjects from cases of dementia.

The major difficulty encountered in applying the CDR was the choice of informant, due to the requirement that the informant should be in close, daily contact with the elderly subject and be familiar with his present and past routines. The advantages of the instrument seem to be its capacity to integrate cognitive and behavioral aspects and the way in which



CDR: Clinical Dementia Rating  
MMSE: Mini-mental State Examination

**Figure 2** - Mean scores on the MMSE according to the CDR classification.

these interfere in daily activities. By comparing present and past performance of the individual, this instrument avoids the bias that results from the utilization of populational performance. Furthermore, it makes it possible to classify individuals not eligible for classification within the dementia syndrome criteria as normal (0) or questionable (0.5).

Indeed, great diversity in cognitive performance exists among the normal elderly varying from normality, aging-associated cognitive decline to mild cognitive impairment.<sup>10</sup> Whether or not this impairment is, in many cases, the most precocious expression of Alzheimer's disease is yet unknown. In the present study, it was observed that among the normal subjects, almost half were classified as questionable cases (49%). Many of these questionable cases may have greater chances of converting into dementia,

according to other prospective studies.<sup>3,5</sup> This can only be verified by accompanying this cohort, confirming the importance of identifying questionable cases as a risk factor for future dementia.

The sensibility and specificity of the MMSE depends on its cutoff score that in this study was high. Consequently, 69% of the subjects considered impaired by the MMSE, were considered normal (false positives); on the other hand, none of the normal subjects were considered impaired (false negative). Therefore, the cut off score was useful in selecting all the cases, even though it designated many of the normal subjects as probable cases. The fact that the MMSE is an adequate instrument for tracing cases was confirmed by this study. As the severity of dementia increased, the mean scores declined significantly, validating the CDR classification according to the MMSE.

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