

SHORT VERSIONS OF THE GERIATRIC DEPRESSION SCALE: A STUDY OF THEIR VALIDITY FOR THE DIAGNOSIS OF A MAJOR DEPRESSIVE EPISODE ACCORDING TO ICD-10 AND DSM-IV

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ABSTRACT

Objective. To determine the validity of short Geriatric Depression Scale (GDS) versions for the detection of a major depressive episode according to ICD-10 criteria for research and DSM-IV.

Design. Cross-sectional evaluation of depressive symptoms in a sample of elderly subjects with short GDS versions. Different GDS cutoff points were used to estimate the sensitivity, specificity, positive predictive value and negative predictive value for the diagnosis of major depressive episode. Internal consistency of the scales was estimated with the Cronbach's alpha coefficient.

Setting. Mental Health Unit for the Elderly of 'Santa Casa' Medical School in São Paulo, Brazil.

Participants. Sixty-four consecutive outpatients aged 60 or over who met criteria for depressive disorder (current or in remission). Subjects with severe sensory impairment, aphasia or Mini-Mental State score lower than 10 were excluded from the study.

Measurements. ICD-10 Checklist of Symptoms, GDS with 15, 10, 4 and 1 items, Montgomery-Åsberg Depression Rating Scale (MADRS), ICD-10 diagnostic criteria for research and DSM-IV diagnostic criteria.

Results. The use of the cutoff point 4/5 for the GDS-15 produced sensitivity and specificity rates of 92.7% and 65.2% respectively, and positive and negative predictive values of 82.6% and 83.3% respectively when ICD-10 diagnostic criteria for major depressive episode were used as the 'gold standard'. Similarly, rates of 97.0%, 54.8%, 69.6% and 94.4% were found when DSM-IV was the comparing diagnostic criteria. Sensitivity, specificity and positive and negative predictive values for the cutoff point 6/7 were 80.5%, 78.3%, 86.8% and 69.2% according to ICD-10, and 84.8%, 67.7%, 73.7% and 80.8% respectively according to DSM-IV. Intermediate values were found for the cutoff point 5/6. The best fit for GDS-10 was the cutoff point 4/5, which produced a sensitivity rate of 80.5%, specificity of 78.3%, positive predictive value of 86.8% and negative predictive value of 60.2% according to ICD-10 diagnosis of a major depressive episode. Similarly, rates of 84.8%, 67.7%, 73.7% and 80.8% were found when DSM-IV criteria for major depression were used. GDS-4 cutoff point of 2/3 was associated with a sensitivity rate of 80.5%, specificity of 78.3%, positive predictive value of 86.8% and negative predictive value of 69.2% when compared to ICD-10. Again, rates of 84.8%, 67.7%, 73.7% and 80.8% respectively were found when the criteria used were based on DSM-IV. GDS-1 had low sensitivity (61.0% and 63.6% for ICD-10 and DSM-IV respectively) and negative predictive value (56.7% and 67.6% for ICD-10 and DSM-IV respectively), suggesting that this question is of limited clinical utility in screening for depression. GDS-15 ($\rho = 0.82$), GDS-10 ($\rho = 0.82$) and GDS-4 ($\rho = 0.81$) scores were highly correlated with subjects' scores on the MADRS. Reliability coefficients were 0.81 for GDS-15, 0.75 for GDS-10 and 0.41 for GDS-4.

Conclusion. GDS-15, GDS-10 and GDS-4 are good screening instruments for major depression as defined by both the ICD-10 and DSM-IV. The shorter four- and one-item versions are of limited clinical value due to low reliability and failure to monitor the severity of the depressive episode. General practitioners may benefit from the systematic use of short GDS versions to increase detection rates of depression among the elderly. Copyright © 1999 John Wiley & Sons, Ltd.

KEY WORDS—depression; GDS; short versions; assessment; screening; diagnosis; ICD-10; DSM-IV; validity; reliability

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Depression is a common and disabling disorder in later life. Epidemiological surveys indicate that 1–16% of the elderly are clinically depressed (Copeland *et al.*, 1987; Kay *et al.*, 1985; Livingston *et al.*, 1990; Roberts *et al.*, 1997). In addition, these subjects are significant users of medical services (Koenig and Kuchibhatla, 1998) and are at increased risk of suicide (Cattel and Jolley, 1996; Conwell *et al.*, 1996; Draper, 1996). These factors make depression one of the most relevant medical problems among the elderly. However, depressive symptoms often go unrecognized by both patients and medical professionals (Koenig *et al.*, 1988; Rabins, 1996; Williams-Russo, 1996), causing unnecessary suffering to those who are untreated, burden to the families and increased financial costs to society (Gurland *et al.*, 1997; Lebowitz *et al.*, 1997).

Many factors contribute to make the detection of depression in older adults particularly difficult. These include the presence of concurrent medical illness, social isolation, insidious onset of symptoms and the occasional absence of obvious depressed mood (Lebowitz *et al.*, 1997; Berger *et al.*, 1998; Gallo *et al.*, 1997). In fact, the presence of clinically significant symptoms that do not fulfil criteria for a depressive disorder is very common in this age group (Koenig and Blazer, 1996) and the identification of such cases very often depends on the use of systematic assessments.

The Geriatric Depression Scale (GDS) (Yesavage *et al.*, 1983) is one of the most widely used instruments for the screening of depression in later life (see Stiles and McGarrahan, 1998 for review). Short forms of the GDS with 1, 4, 10, 15 and 20 questions (as opposed to the 30 questions of the original version) are also available (van Marwijk *et al.*, 1995). Their use in clinical practice is even more attractive, as they can substantially reduce administration time. Test–retest reliability indexes for the short versions are usually acceptable (van Marwijk *et al.*, 1995; Lyness *et al.*, 1997; Shah *et al.*, 1996), but their validity for diagnosis of depression according to current diagnostic criteria has not yet been established.

The present study was designed to evaluate the validity of the GDS-15, 10, 4 and 1 for the diagnosis of a major depressive episode according to the ICD-10 diagnostic criteria for research (WHO, 1993) and the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV) (APA, 1994).

METHODS

Subjects were selected from the outpatient clinic for the elderly (UNID) of the Department of Mental Health of 'Santa Casa' Medical School of São Paulo, Brazil. The characteristics of this service have been published elsewhere (Almeida *et al.*, 1998). Briefly, UNID provides medical diagnosis and treatment to a socially deprived segment of the elderly population of the central area of the city of São Paulo. The registration of patients in the unit includes both self and medical referral. For the present study, we recruited 64 consecutive referrals of subjects aged 60 or over who fulfilled ICD-10 criteria for the diagnosis of depressive disorder (current or in remission). Subjects with severe hearing or visual impairment, aphasia or a Mini-Mental State Examination (MMSE) (Folstein *et al.*, 1975) score lower than 10 were not included. All subjects were informed about the aims of the study and, after giving their consent, were asked to answer a number of questions assessing socio-demographic features such as age, sex, marital status, place of birth, years of schooling, employment status and family income per capita.

Subjects were then asked to answer the questions of the GDS-15, Brazilian version. Questions were read aloud to all subjects, so that illiterate patients could also be evaluated. The scores for the GDS-10, GDS-4 and GDS-1 were estimated according to van Marwijk *et al.* (1995). The details about the construction of the Brazilian version of the GDS have been described elsewhere (Almeida and Almeida, 1999). In summary, all scale items were converted to Portuguese and back to English by independent translators. The English version was then compared to the original and minor adjustments were made to ensure that the Brazilian scale was an accurate translation of the original. The test–retest reliability of the scale was assessed in a sample of 51 subjects. Weighted kappa for the 15- and 10-item GDS was 0.64 and 0.60 respectively, but only 0.37 and 0.06 for the GDS-4 and GDS-1.

The ICD-10 Symptom Checklist for Mental Disorders (Janca *et al.*, 1994) was used to investigate the presence or absence of specific symptoms necessary to fulfil criteria for a depressive disorder. Symptoms were rated according to the information obtained from both the patient and a qualified informant (spouse or children for most cases). This checklist of symptoms was then used to reach the diagnosis of major depressive episode or dysthymia according to ICD-10 diagnostic

criteria for research and DSM-IV. Finally, the Montgomery-Åsberg Rating Scale (MADRS) (Montgomery and Åsberg, 1979; Dratcu *et al.*, 1987) was used as a supplementary measure of validity.

Data analysis

The data were analysed using the statistical package 'Stata', version 5. Likelihood ratio analysis of contingency tables was used in the investigation of categorical data, the statistical result being distributed as chi-squared (χ^2). Sensitivity and specificity rates, as well as positive and negative predictive values, were estimated from 2×2 tables. One-way analysis of variance was used to estimate score differences among patients with mild, moderate and severe depression. This analysis was followed by *post-hoc* multiple comparisons using the Scheffé method. Kappa statistic was determined as a measure of agreement between ICD-10 and DSM-IV for the diagnosis of major depressive episode. Kappa values indicate if the agreement between measures is poor (<0.20), fair (0.21–0.40), moderate (0.41–0.60), good (0.61–0.80) or very good (0.81–1.00). Spearman correlation coefficients were calculated as a measure of association between GDS total scores for the questionnaires with 4, 10 and 15 items, as well as between MADRS and GDS scores. The internal consistency (reliability) of the various short versions of the GDS was measured using Cronbach's alpha coefficient. Ninety-five per cent confidence intervals (CI) were calculated for groups' means, kappa (CI_κ), Spearman correlation coefficients (CI_{Sp}) and for alpha values (CI_{α}).

RESULTS

Sixty-four subjects were recruited between March and May 1998. Fifty-four were women (84.4%). Subjects' mean age was 67.45 (CI = 65.98–68.92) and their average monthly income was approximately US\$ 256.20 (CI = 163.80–348.50). Twenty-five (39.1%) were currently married and eight (12.5%) were unable to read or write. Subjects' mean MMSE score was 25.30 (CI = 24.33–26.26).

Forty-one (64.1%) and thirty-three (51.6%) subjects fulfilled criteria for major depressive episode according to ICD-10 and DSM-IV respectively. Agreement between the two diagnostic

systems was 87.5%, with a kappa value of 0.75 ($CI_\kappa = 0.59$ –0.91). Subjects were then further classified for severity of symptoms according to ICD-10 guidelines. Thirteen (20.3%) met criteria for mild, 16 (25.0%) for moderate and 12 (18.7%) for severe depressive episode. Another two patients fulfilled ICD-10 criteria for dysthymia. Seven subjects (10.9%) fulfilled criteria for dysthymia according to DSM-IV.

The mean GDS-15 score for the whole sample was 7.27 (CI = 6.32–8.21), with values ranging from 0 to 15. Scores varied significantly according to the degree of severity of the depressive episode ($F = 27.71$, $df = 3$, $p < 0.001$). Fig. 1 shows mean GDS-15 scores and the respective 95% confidence intervals for subjects with severe ($N = 12$), moderate ($N = 16$), mild ($N = 13$) and no depression ($N = 23$) according to ICD-10. Scheffé analyses for multiple comparisons showed that patients with severe depression scored on average 3.69 (CI = 0.93–6.45, $p = 0.004$), 4.69 (CI = 1.80–7.59, $p < 0.001$) and 7.96 (CI = 5.38–10.53, $p < 0.001$) more points than subjects with moderate, mild and no depression respectively. Table 1 displays mean score differences for patients with no, mild, moderate and severe depression for both the GDS and MADRS.

Table 1. Mean score differences between levels of depression severity according to ICD-10 using the GDS-15, GDS-10, GDS-4 and MADRS

	No depression	Mild	Moderate
GDS-15			
Mild	3.26(0.005)		
Moderate	4.27(<0.001)	1.00(0.766)	
Severe	7.96(<0.001)	4.69 (<0.001)	3.69(0.004)
GDS-10			
Mild	2.31(0.003)		
Moderate	2.87(<0.001)	0.57(0.841)	
Severe	5.17(<0.001)	2.86(<0.001)	2.29(0.008)
GDS-4			
Mild	1.01(0.010)		
Moderate	1.34(<0.001)	0.33(0.770)	
Severe	2.00(<0.001)	0.99(0.036)	0.67(0.224)
MADRS			
Mild	8.40(<0.001)		
Moderate	12.10(<0.001)	3.70(0.245)	
Severe	21.12(<0.001)	12.72(<0.001)	9.02(<0.001)

Note: Numbers in brackets represent p values for alpha = 0.05 (two-tailed values).

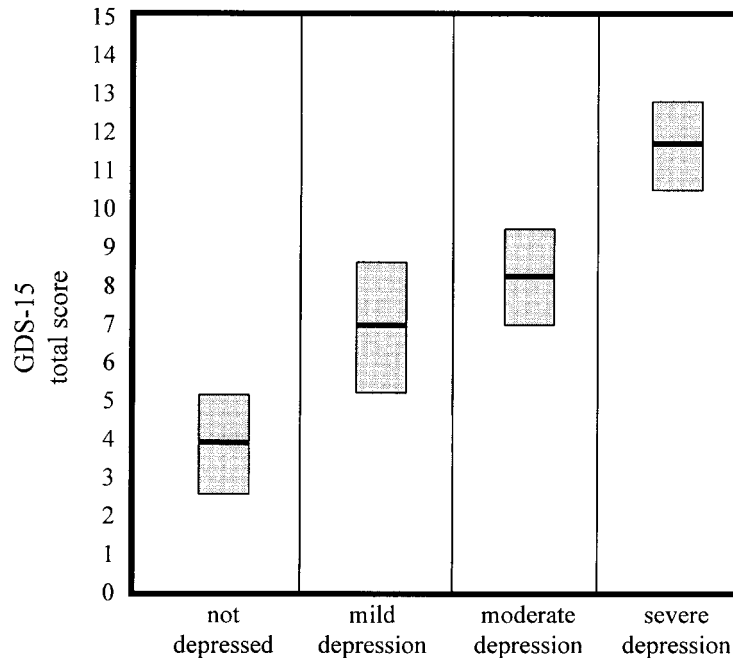


Fig. 1. GDS-15 total scores for subjects with severe, moderate, mild and no depression according to ICD-10 diagnostic criteria for research. Dark lines indicate mean scores. Boxes represent 95% confidence intervals of the mean

Table 2 shows the percentage of patients with depression who answered the 15 GDS questions according to the depressive pattern. Question 2 was the most sensitive GDS-15 item for the detection of depression according to ICD-10 (82.9%) and DSM-IV (84.8%). Table 3 shows sensitivity and

specificity rates, as well as positive and negative predictive values, for different GDS cutoff points for the diagnosis of a major depressive episode according to ICD-10 and DSM-IV. The use of just one question ('Are you basically satisfied with your life?') to ascertain the presence of depression was

Table 2. Questions included in the GDS-15 and the percentage of patients fulfilling criteria for a major depressive episode according to ICD-10 and DSM-IV who scored within the depression range

	ICD-10 (%)	DSM-IV (%)
Are you basically satisfied with your life? ^{10,4,1}	61.0	63.6
Have you dropped many of your activities and interests? ^{10,4}	82.9	84.8
Do you feel that your life is empty?	73.2	75.8
Do you often get bored?	75.6	75.8
Are you in good spirits most of the time? ¹⁰	63.4	60.6
Are you afraid that something bad is going to happen to you?	51.2	60.6
Do you feel happy most of the time? ^{10,4}	68.3	72.7
Do you feel helpless? ¹⁰	65.8	72.7
Do you prefer to stay at home, rather than going out and doing new things? ^{10,4}	70.7	72.7
Do you feel you have more problems with your memory than most?	58.5	60.6
Do you think it is wonderful to be alive?	24.4	24.2
Do you feel pretty worthless the way you are now? ¹⁰	48.8	54.5
Do you feel full of energy? ¹⁰	56.1	60.6
Do you feel that your situation is hopeless?	43.9	51.5
Do you think that most people are better off than you are? ¹⁰	63.4	63.6

Note: The numbers 10, 4 and 1 at the side of the questions indicate the items included in the GDS-10, GDS-4 and GDS-1 respectively.

Table 3. Performance of the versions of the GDS at different cutoff points for the detection of a major depressive episode according to ICD-10 and DSM-IV

	ICD-10	DSM-IV
GDS-15—cutoff point 4/5		
Sensitivity	92.7	97.0
Specificity	65.2	54.8
Positive predictive value	82.6	69.6
Negative predictive value	83.3	94.4
GDS-15—cutoff point 5/6		
Sensitivity	85.4	90.9
Specificity	73.9	64.5
Positive predictive value	85.3	73.2
Negative predictive value	73.9	86.9
GDS-15—cutoff point 6/7		
Sensitivity	80.5	84.8
Specificity	78.3	67.7
Positive predictive value	86.8	73.7
Negative predictive value	69.2	80.8
GDS-10—cutoff point 3/4		
Sensitivity	92.7	97.0
Specificity	65.2	54.8
Positive predictive value	82.6	69.6
Negative predictive value	83.3	94.4
GDS-10—cutoff point 4/5		
Sensitivity	80.5	84.8
Specificity	78.3	67.7
Positive predictive value	86.8	73.7
Negative predictive value	69.2	80.8
GDS-4—cutoff point 2/3		
Sensitivity	80.5	84.8
Specificity	78.3	67.7
Positive predictive value	86.8	73.7
Negative predictive value	69.2	80.8
GDS-1		
Sensitivity	61.0	63.6
Specificity	91.3	80.6
Positive predictive value	92.6	77.8
Negative predictive value	56.7	67.6

associated with poor sensitivity and negative predictive values, suggesting that this is not a useful strategy to investigate the presence of depression in clinical practice.

Total scores for the 15-, 10- and 4-item GDS were highly correlated. Spearman correlation coefficients were 0.99 ($CI_{Sp} = 0.99-1.00$), 0.95 ($CI_{Sp} = 0.93-0.97$) and 0.96 ($CI_{Sp} = 0.93-0.97$) for the association between GDS-15 and GDS-10, GDS-15 and GDS-4, and GDS-10 and GDS-4 respectively. Similarly, Spearman coefficients were

estimated to explore the association between the total score on the MADRS and GDS-15 ($\rho = 0.82$, $CI_{Sp} = 0.72-0.89$), GDS-10 ($\rho = 0.82$, $CI_{Sp} = 0.72-0.89$) and GDS-4 ($\rho = 0.81$, $CI_{Sp} = 0.70-0.88$). The internal consistency of the short GDS versions was estimated by Cronbach's alpha. Reliability coefficients were 0.81 ($CI_{alpha} = 0.73-0.87$) for GDS-15, 0.75 ($CI_{alpha} = 0.65-0.83$) for GDS-10 and 0.41 ($CI_{alpha} = 0.13-0.61$) for GDS-4.

DISCUSSION

A large number of depression rating scales are currently available for use in clinical and research settings. They all claim to assess the clinical concept of 'depression', although their constructs vary considerably (Snaith, 1993). The choice of a scale should be based on a number of factors, such as its ability to detect cases, assess the severity of symptoms, be sensitive to change over time and indicate when the patient has recovered. Age and cultural factors should not interfere significantly with the performance of the scale. In addition, the scale should be quick to administer and simple to rate.

The Geriatric Depression Rating Scale (GDS) has been widely used in both clinical and research settings (Montorio and Izal, 1996). The scale has been translated to various languages and is available in many Asian (Liu *et al.*, 1998), European (Bach *et al.*, 1996; Clement *et al.*, 1997; Gottfries *et al.*, 1997) and Latin American countries (Baker and Espino, 1997). This suggests that the GDS may produce consistent results across different cultures. Short versions of the scale have been introduced with the aim of saving time with its application (Sheikh and Yesavage, 1986).

The GDS with 15 items has been used in various settings, including the community (Dunn and Sacco, 1989; Ingram, 1996), general practice (van Marwijk *et al.*, 1995; Lyness *et al.*, 1997) and geriatric units (Shah *et al.*, 1996, 1997; Herrmann *et al.*, 1996). The internal consistency of the GDS-15 has been evaluated by a few studies. Most have reported reliability values around 0.80 (van Marwijk *et al.*, 1995; Liu *et al.*, 1998; D'Ath *et al.*, 1994), which is in line with our findings. These results indicate that the questions included in the GDS-15 assess depression in a coherent and useful way. The GDS-10 has also shown good internal consistency in this study ($\alpha = 0.75$) and others (van Marwijk *et al.*, 1995). The use of the shorter

four-item version, however, seems less reliable ($\alpha = 0.41$).

The usefulness of short GDS versions will also depend on their capacity to identify cases of depression in the elderly. For screening purposes one should favour GDS cutoff points that yield high levels of sensitivity and negative predictive values. The use of cutoff points of 4/5 (non-case/case) for the GDS-15, 3/4 for GDS-10 and 2/3 for GDS-4 produced robust results. However, this occurred at the expense of relatively low specificity and positive predictive values, which suggests that the use of higher cutoff points may be more accurate for the diagnosis of a depressive episode. Herrmann *et al.* (1996) suggested that the optimal cutoff score for the GDS-15 was 5/6. This produced sensitivity and specificity rates of 85% and 74% respectively (Herrmann *et al.*, 1996). Their results are very similar to those found in the present study, but are in contrast to the cutoff point of 2/3 proposed by van Marwijk *et al.* (1995). In common with Herrmann *et al.* (1996), we recruited patients from a specialized mental health unit for the elderly, whereas van Marwijk *et al.* (1995) selected their sample from a general medical practice. Psychiatric services are more likely to deal with more severe cases of depression and, as a consequence, select samples of patients that produce higher GDS scores—this may move cutoff points upwards. Another important difference between this and the study by van Marwijk *et al.* (1995) is that they used the Diagnostic Interview Schedule (DIS) as their gold standard for the diagnosis of depression. Recent reports suggest that the DIS may produce a substantial number of false positive cases (Regier *et al.*, 1998), which would explain the lower GDS cutoff points found by van Marwijk *et al.* (1995).

Severity of symptoms in this study was measured in two different ways: ICD-10 definition of mild, moderate and severe depression, and total score on the MADRS. GDS scores increased with illness severity, as defined by both the ICD-10 and MADRS. However, score differences between mild and moderate cases, according to ICD-10 definition, were not statistically significant. There are two possible explanations for these findings: (1) the ICD-10 definition of mild and moderate depression is not clinically meaningful, and (2) short GDS versions are not sensitive enough to detect differences between mild and moderate cases of depression. The ICD-10 definition of illness severity is based solely on the number of symptoms present during the mental state evaluation. This is

KEYPOINTS

- Short GDS scales are quick to apply and simple to rate
- The short forms of the GDS with 10 and 15 items are reliable screening instruments for major depression according to ICD-10 and DSM-IV. Their regular use in medical practice is likely to increase the detection of clinically significant depressive symptoms in older adults
- Different cutoff points are likely to be useful for clinical and research purposes
- The total scores on the GDS with 10 and 15 items are reliable measures of the severity of the depressive episode

clearly an unsatisfactory approach, as it fails to assess the severity of specific symptoms. The same applies to the scores of the GDS. Interestingly, however, GDS scores for all short versions (excluding the GDS-1) were highly correlated with the MADRS, which is a well-accepted measure of severity of symptoms (Maier *et al.*, 1988). Therefore, in practical terms, GDS scores are indicative of illness severity even though the scale does not evaluate symptom severity. GDS-15 scores below 5 seem to indicate the absence of clinically significant depressive symptoms. There is, then, a great deal of overlap between scores indicative of mild and moderate depression according to ICD-10. Tentative scores of 5–7 and 8–9 on the GDS-15 may be used for mild and moderate depression respectively. Scores of 10 or more indicate the presence of a severe depressive episode. In addition, if GDS scores can be used as an indication of the severity of illness, one would expect the scale to monitor change over time reliably. Unfortunately, there are not as yet enough data to support this hypothesis. Finally, shorter GDS versions (GDS-10 or lower) may be less helpful in assessing illness severity, as the limits between mild, moderate and severe depression become increasingly less clear with the reduction of GDS items.

In summary, our results show that the 15- and 10-item GDS can reliably detect the presence of a major depressive episode among older adults. Shorter versions are less reliable and informative. The total score on the GDS-15 indicates illness severity, although the scale does not assess the

severity of specific symptoms. Short GDS scales are quick to apply and simple to rate. Their regular use in general medical practice should be encouraged as a means of increasing professional and public awareness of depression among the elderly, and as an effective way of identifying subjects with significant depressive symptoms.

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