Original Article

Assessing Delirium in Cancer Patients. The Italian Versions of the Delirium Rating Scale and the Memorial Delirium Assessment Scale

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Abstract

To validate the Italian versions of the Delirium Rating Scale (DRS) and the Memorial Delirium Assessment Scale (MDAS), 105 cancer patients consecutively referred for neurological or psychiatric consultation for mental status change were evaluated using the Confusion Assessment Method (CAM), the DRS, the MDAS, and the Mini-Mental State Examination (MMSE). According to the CAM criteria and clinical examination, 66 patients were delirious, and 39 received diagnoses other than delirium. The DRS and the MDAS scores significantly distinguished delirious from non-delirious patients. The MDAS and the DRS were mutually correlated. When using the proposed cut-off scores for the two scales, the MDAS had higher specificity (94%) but lower sensitivity (68%) than the DRS (sensitivity = 95%, specificity = 61% for DRS cut-off 10; sensitivity = 80%, specificity = 76%, DRS cut-off 12). The MMSE showed high sensitivity (96%) and very low specificity (38%). Exploratory factor analysis of the DRS and the MDAS suggested a three-factor and two-factor structure, respectively. Both instruments in their Italian version proved to be useful for the assessment of delirium among cancer patients. Further research is needed to examine the use of the DRS and the MDAS in other clinical contexts. J Pain Symptom Manage 2001;21:59–68. © *U.S. Cancer Pain Relief Committee, 2001.*

Key Words

Delirium, Delirium Rating Scale (DRS), Memorial Delirium Assessment Scale (MDAS), cancer

Introduction

Delirium is a common psychiatric disorder in hospitalized patients, with the highest prevalence among the elderly,[1–3] post-surgical patients,[4–5] and AIDS[6] and cancer patients in advanced stages of illness.[7,8] Because delirium is associated with prolonged hospital stay, poor

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Accepted for publication: February 22, 2000.

Published by Elsevier, New York, New York

0885-3924/01/$–see front matter
PII S0885-3924(00)00241-4

hospital outcome and high mortality,[9–11] the need for identification and treatment of the disorder has been repeatedly pointed out.[12,13] Nevertheless, because of the protean and fluctuating nature of delirium,[14] and insufficient use of validated assessment instruments in clinical practice,[15,16] a high percentage of delirious patients go unrecognized[17] or misdiagnosed.[18]

The development of instruments that use more definite operational criteria, such as DSM-III-R[19] or DSM-IV,[20] should allow more precise assessment of delirium among hospitalized physically ill patients. Among these instruments, the Delirium Rating Scale (DRS)[21] has been extensively used to evaluate delirium and to rate its severity.[22–25] More recently, the Memorial Delirium Assessment Scale (MDAS)[26] was developed in order to measure delirium severity and symptom changes over time.

Given the lack of data about this field in Italy, the aim of this study was to validate the Italian versions of the DRS and MDAS in assessing delirium among patients with advanced cancer.

Methods

The study was carried out in six centers in Italy, including four medical oncology wards and two palliative care units. Consecutive inpatients presenting with a mental status change who were referred to the consultation-liaison psychiatric service or palliative care unit were evaluated. Neurological or psychiatric consultation was performed using the DSM-III-R criteria for delirium. A research psychologist trained in neuropsychological assessment then submitted the patients to a battery of tests. All the researchers participated in a pre-research meeting where the aims of the study and the use of the instruments were discussed and reliability tests were carried out by using a video-taped example case (mean reliability criteria $\kappa \geq .80$). Disease-related and sociodemographic data were collected from the patients' charts.

The Confusion Assessment Method (CAM)[27] was used as a specific tool for diagnosing delirium. The CAM provides an algorithm for the identification of delirium according to five operational diagnostic criteria following the DSM-III-R. To have a diagnosis of delirium, the CAM requires the presence of acute onset and fluctuating course of symptoms, inattention, and either disorganized thinking or altered level of consciousness. When validated against psychiatric diagnosis and used by trained health professionals, the CAM showed high levels of specificity (94–100%) and sensitivity (90–95%) in different studies.[27,28]

The Delirium Rating Scale (DRS)[21] is a 10-item clinician-rated symptom rating scale developed to identify delirium in the medically ill and to measure its severity. Items are derived from DSM-III criteria, are scored from 0 to 3 or 0 to 4, and evaluate temporal onset of symptoms, perceptual disturbances, hallucinations, delusions, psychomotor behavior, cognitive status, presence of an organic underlying pathology, sleep-wake disturbances, and fluctuations of symptoms. The DRS rating is based on a 24-hour period of observation. All available information from the patient interview, mental status examination, nursing observation and family reports contributed to the DRS rating. The total DRS score is obtained by summing up the scores on the 10 items (range, 0–32). Cut-off scores of 10 and 12 have been suggested to distinguish patients with delirium from patients with other neuropsychiatric diseases.[21,22]

The Memorial Delirium Assessment Scale (MDAS)[26] is specifically designed to quantify the severity of delirium symptoms. It is composed of 10 four-point observer-rated items that, as indicated by the authors, were developed to be consistent with the proposed DSM-IV diagnostic criteria for delirium. It integrates objective cognitive testing and evaluation of behavioral symptoms. Repeated daily evaluation are possible to capture short term fluctuations of symptoms and to document response to treatment. The MDAS yields a global score ranging from 0 to 30, with a suggested cut-off score of 13 for delirium.[26] It includes items on level of consciousness, disorientation, short-term memory, digit span, attention, disorganized thinking, perceptual disturbances, delusions, psychomotor activity, and sleep-wake cycle disturbances.

*The Italian versions of the DRS and the MDAS can be obtained from Augusto Caraceni, MD, National Cancer Institute, Via Venezian 1, 20133 Milan, Italy.

Both the DRS and the MDAS were translated into Italian by two of the authors (A.C. and L.G.) and back-translated into English by two bilingual physicians. These versions were considered valid by the original authors (P. Trzepacz, personal communication; W. Breitbart, personal communication).*

The Mini-Mental State Examination (MMSE)[29] is a well-known instrument to assess mental status. It measures the subject's cognitive status through 11 questions concerning orientation, short-term memory, visuospatial abilities, and use of language. The score ranges from 0 to 30, with a cut-off score of 24 for cognitive impairment.

The patients' performance status was evaluated by using the Karnofsky Performance Status Score (KPS).[30] This is a well-known instrument that rates, on a 0–100 scale, the patient's activity and independence in daily living (performance status) (e.g., score = 0 corresponds to death, scores between 30 and 40 indicate disability needing special care and assistance, and scores between 90 and 100 indicate an ability to carry on normal activity with minimal to no assistance).

Statistical analysis was performed by using the Statistical Package for Social Science (SPSS 6.1).[31] Inter-item reliability was established by calculating Cronbach's α-coefficient for the scales. Spearman tests were used to evaluate linear correlations between the items, and correlations between the scores of the different instruments. Student's *t*-test for independent samples and ANOVA were employed to examine differences between delirious and non-delirious patients. Exploratory factor analysis (with Varimax rotation) was applied to assess the DRS and MDAS potential factor structure.

Results

Characteristics of the Sample

The study population consisted of 105 patients (55 males, 52.4% and 50 females, 47.6%) with a mean age of 67.7 (±13.18) years. Sites of cancer were respiratory system (n = 21, 20%), breast (n = 20, 19%), gastrointestinal tract (n = 17, 16%), genitourinary system (n = 17, 16%), head and neck (n = 4, 3.8%), blood (n = 4, 3.8%) and other sites (n = 22, 21%). Most patients had metastatic cancer (73.3%) and a minority had a locoregional or local cancer (26.7%).

According to the CAM and neurological/psychiatric consultation, 66 patients (62.8%: 32 males, 30.47% and 34 females, 32.38%) received a diagnosis of delirium, while 39 (37.2%: 22 males 20.85%, and 17 females, 16.2%) did not meet the criteria for delirium. Among the non-delirious patients, 7 subjects did not receive any psychiatric diagnosis, 13 patients presented symptoms of acute change in cognition (e.g., transitory hallucination, disordered sleep-wake cycle, new-onset memory dis-

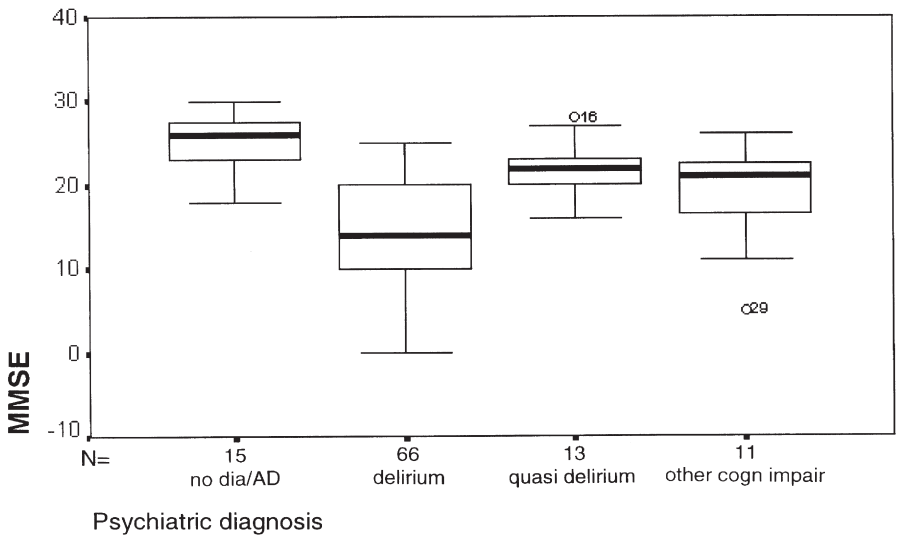

Figure 1. Distribution of scores on the MMSE (Boxplot) for 4 subgroups of patients.

Table 1
Difference Between Delirious and Non-Delirious Patients on the DRS, MDAS, MMSE, and Performance Status (KPS) Scores

		Non-delirious patients (n = 39)			
	Delirious patients (n = 66)	Without cognitive impairment (n = 15)	With cognitive impairment (n = 24)	F	P
Age	66.76 ± 12.58	62 ± 13.47	68.12 ± 20.45	0.79	*ns*
DRS	16.81 ± 5.51	4 ± 3.22	10.7 ± 3.74	47.84	.001
MDAS	15.90 ± 5.75	3.6 ± 2.72	8.66 ± 3.89	44.70	.001
MMSE	13.57 ± 6.81	25.33 ± 3.28	20.45 ± 5.17	27.63	.001
KPS	41.21 ± 13.53	55.33 ± 15.52	48.75 ± 18.72	6.01	.01

turbances) probably due to medical factors, without fulfilling the criteria for delirium, 7 patients met the criteria for a diagnosis of dementia, 8 patients had a diagnosis of adjustment disorder, and 4 had longstanding cognitive symptoms (2 patients with mild cognitive disorder and 2 patients with alcohol use associated with amnesic syndrome). Because of the heterogeneity of this sample, non-delirious patients were divided in three subgroups, including definite non-delirium (no-diagnosis + adjustment disorder, n = 15), "quasi-delirium" (incomplete syndromes, n = 13), and other cognitive impairment (dementia + other chronic cognitive symptoms, n = 11).

Figure 1 shows the distribution of scores (boxplots) on the DRS, MDAS, and MMSE in the different groups of patients. The differences on the neuropsychological and performance status measures for the delirious and non-delirious patients, distinguishing in this last group patients without any cognitive impairment (patients without psychiatric diagnosis or with adjustment disorders, n = 15) from patients with cognitive impairment ("quasi delirium" + dementia + chronic cognitive symptoms, n = 24), are shown in Table 1. Patients with delirium obtained lower scores on the DRS, the MDAS, and the MMSE than non-delirious patients ($P < 0.001$). They also showed lower scores on the KPS ($P < 0.01$). There were no age differences between the groups.

Reliability Data

Tables 2 and 3 show reliability analyses for the DRS and the MDAS in the whole sample. With regard to the DRS, analysis of internal consistency indicated a coefficient (Cronbach's α) of 0.70. The item-total correlation for the ten items ranged from 0.09 (item 10) to 0.56 (item 7), with items 9 and item 3 showing the lowest correlation coefficients (0.09 and 0.29) and items 6, 4, and 8 the highest (0.56, 0.54 and 0.54, respectively) (Table 2). MDAS Cronbach's α coefficient was 0.89. The item-total correlation for the ten items ranged from 0.43 (item 7) to 0.82 (item 1), with items 3, 7 and item 10 having the lowest correlation coefficients (0.27, 0.32, 0.35) and items 1 and 5 the highest (0.82 and 0.80) (Table 3).

Table 2
Delirium Rating Scale (DRS) Reliability Data

DRS item	Mean (SD)	Item total r	Alpha if removed
1. Temporal onset	2.12 (1.03)	0.47	0.66
2. Perceptual disturbance	0.87 (1.03)	0.53	0.65
3. Hallucination type	0.84 (0.98)	0.29	0.69
4. Delusions	0.66 (1.17)	0.54	0.64
5. Psychomotor behavior	1.25 (0.96)	0.40	0.67
6. Cognitive status	2.26 (1.28)	0.56	0.64
7. Physical disorder	1.37 (0.66)	0.31	0.69
8. Sleep-wake disturbance	1.43 (0.95)	0.54	0.65
9. Mood lability	0.69 (2.22)	0.09	0.77
10. Variability of symptoms	2.07 (1.78)	0.35	0.68

Table 3
Memorial Delirium Assessment Scale (MDAS) Reliability Data

MDAS item	Mean (SD)	Item total r	Alpha if removed
1. Awareness	0.84 (0.97)	0.82	0.86
2. Disorientation	1.43 (1.19)	0.70	0.87
3. Memory (words)	2.01 (0.85)	0.46	0.89
4. Digit span	1.96 (0.98)	0.58	0.88
5. Attention	1.43 (0.98)	0.80	0.86
6. Thinking	1.07 (1.01)	0.76	0.87
7. Perceptual disturbances	0.71 (0.89)	0.43	0.89
8. Delusions	0.56 (0.92)	0.58	0.88
9. Psychomotor activity	1.28 (0.91)	0.58	0.88
10. Sleep-wake disturbance	1.1 (0.83)	0.53	0.88

Table 4
Individual MDAS and DRS Correlations with the MMSE Total Score (Spearman's Correlation Coefficient)

MDAS	MMSE Total Score	DRS	MMSE Total Score
Total score	−0.88	Total score	−0.67
1. Awareness	−0.80	1. Temporal onset	−0.30
2. Disorientation	−0.85	2. Perceptual disturbance	−0.38
3. Memory (words)	−0.57	3. Hallucination type	−0.18
4. Digit span	−0.61	4. Delusions	−0.50
5. Attention	−0.77	5. Psychomotor behavior	−0.59
6. Thinking	−0.76	6. Cognitive status	−0.82
7. Perceptual disturbance	−0.35	7. Physical disorder	−0.32
8. Delusions	−0.53	8. Sleep-wake disturbance	−0.45
9. Psychomotor activity	−0.53	9. Mood lability	−0.03
10. Sleep-wake disturbance	−0.48	10. Variability of symptoms	−0.21

Concurrent Validity, Sensitivity and Specificity

Spearman correlation test indicated a significant association between the DRS and the MDAS total score ($r = 0.76$, $P = 0.001$). The MMSE score was significantly associated with the MDAS ($r = -0.88$, $P = 0.001$) and the DRS ($r = -0.67$, $P = 0.001$) total scores. Individual MDAS items were highly correlated with the MMSE total score (r ranges from −0.48 to −0.85), with the exception of item 7 (perceptual disturbance, $r = -0.35$) (Table 4). Lower correlation was found between individual DRS items and the MMSE total score (range from −0.03 to −0.82) (Table 4).

Sensitivity, specificity, positive predictive accuracy (PPA), and negative predictive accuracy (NPA) of the scales, together with the results obtained through the MMSE (cut-off ≥ 24) are shown in Table 5. By using the proposed cut-off score of 10,[22] the DRS showed a sensitivity of 95%, a specificity of 61%, a PPA of 80% and an NPA of 89%. By using the more conservative cut-off score of 12, sensitivity was 0.81, specificity 0.76, PPA = 85%, and NPA = 70%. By using the recommended cut-off score of 13,[36] the MDAS showed a sensitivity of 68%, a specificity of 94%, with PPA and NPA of 95% and 63%, respectively. The MMSE showed high sensitivity (96%), low specificity (38%), and PPA and NPA values of 72% and 88%, respectively.

Factor Analysis

Factor analysis of the DRS was consistent with the existence of 3 underlying factors (Table 6). The first factor explained 34.4% of the variance and consisted of 3 items: item 5 (psychomotor behavior), item 8 (sleep-wake cycle), and item 6 (cognitive status after formal testing). The second factor explained an additional 14.2% of the variance and consisted of item 2 (perceptual disturbances), item 3 (hallucinations), and item 4 (delusions). The third factor accounted for a further 12.2% of the variance and consisted of item 1 (temporal onset of symptoms), item 7 (presence of potentially causal physical disorder), item 9 (lability of mood), and item 10 (symptoms fluctuations).

Factor analysis of the MDAS suggested the existence of 2 factors (Table 7). One factor explained 51.1% of the variance and consisted of the series of items investigating the level of consciousness (item 1), orientation (item 2), short-term memory (item 3), digit span (item

Table 5
Sensitivity, Specificity and Predictive Accuracy (PA) of the Scales, According to Their Cut-off Scores

	DRS (cut-off ≥10)	DRS (cut-off ≥12)	MDAS (cut-off ≥13)	MMSE (cut-off <24)
Sensitivity	95%	80%	68%	96%
Specificity	61%	76%	94%	38%
Negative PA	89%	69%	63%	88%
Positive PA	80%	85%	95%	72%

Table 6
DRS Single Item Score Loadings on the Three Main Factors Identified by Exploratory Factor Analysis

Item	Factor 1	Factor 2	Factor 3
Item 5—Psychomotor behavior	**0.80**	−0.06	0.18
Item 8—Sleep-wake cycle disturbance	**0.68**	0.16	0.30
Item 6—Cognitive status	**0.63**	0.27	0.37
Item 2—Perceptual disturbance	0.17	**0.84**	0.12
Item 3—Hallucination type	−0.16	**0.80**	0.19
Item 4—Delusions	0.39	**0.70**	0.04
Item 1—Temporal onset	0.24	0.24	**0.68**
Item 7—Physical disorder	0.25	0.03	**0.61**
Item 10—Variability of symptoms	0.17	0.20	**0.58**
Item 9—Lability of mood	0.51	0.20	**−0.56**

4), attention (item 5), psychomotor activity (item 9), and sleep-wake cycle (item 10). The second factor consisted of the remaining 3 items (item 6, 7, and 8), which explore disorganized thinking, perceptual disturbance, and delusions. This factor explained an additional 11.5% of the total variance.

Discussion

This study investigated the application of the Italian versions of the DRS and the MDAS to assess delirium in cancer inpatients. Of more 100 cancer patients referred to mental health professionals for possible cognitive disorders, two-thirds received a diagnosis of delirium according to the DSM-III-R criteria used in the CAM, as applied by a trained psychologist. In this study, complete correspondence existed between the CAM criteria and the clinical diagnosis made through proper psychiatric/neurological consultation according to the same rating system (DSM-III-R), confirming the high reliability of the CAM when used by trained health professionals.[27,28] Since the agreement of the methods used was not formally tested against the DSM-IV criteria, further validation of the CAM according to the DSM-IV criteria is needed.

As expected, patients with delirium showed lower scores on all the cognitive measures, as well as performance status. Both the DRS and the MDAS significantly differentiated between patients with delirium and non-delirious subjects (Table 1).

The MDAS showed higher levels of internal consistency than the DRS (Cronbach α 0.89 vs. 0.70). While the MDAS result confirms the data of the original validation study (0.91 in the English version), the DRS result is lower than results obtained in investigations of elderly patients (0.90).[32] It is possible that the different factor structure of the two scales, as discussed below, or the specific population examined in this study (cancer patients, as in the MDAS original validation study, rather than the elderly population used to evaluate the DRS) may explain this difference. However further investigation is necessary to understand this discrepancy.

Both scales were significantly interrelated, although higher correlations were found between individual MDAS items and the MMSE total score than individual DRS items and the MMSE score. This may be interpreted by considering that the DRS has only one item for cognition (which was in fact highly correlated with the MMSE, r = −.82) in comparison with the MDAS which has five cognitive items (all of them highly correlated with the MMSE). In line with this observation is the finding that non-cognitive items (e.g., perceptual disturbances, sleep-wake cycle disturbances) of both scales and certain specific DRS items (i.e., labil-

Table 7
MDAS Individual Item Loading on Each of the Two Main Factors Identified by Exploratory Factor Analysis

Item	Factor 1	Factor 2
Item 4—Digit span	**0.77**	0.09
Item 2—Disorientation	**0.72**	0.34
Item 5—Attention	**0.71**	0.48
Item 9—Psychomotor activity	**0.71**	0.16
Item 1—Awareness	**0.69**	0.53
Item 3—Short-term memory	**0.67**	0.01
Item 10—Sleep-wake cycle disturbance	**0.51**	0.34
Item 8—Delusions	0.20	**0.82**
Item 7—Perceptual disturbance	0.03	**0.81**
Item 6—Disorganized thinking	0.52	**0.61**

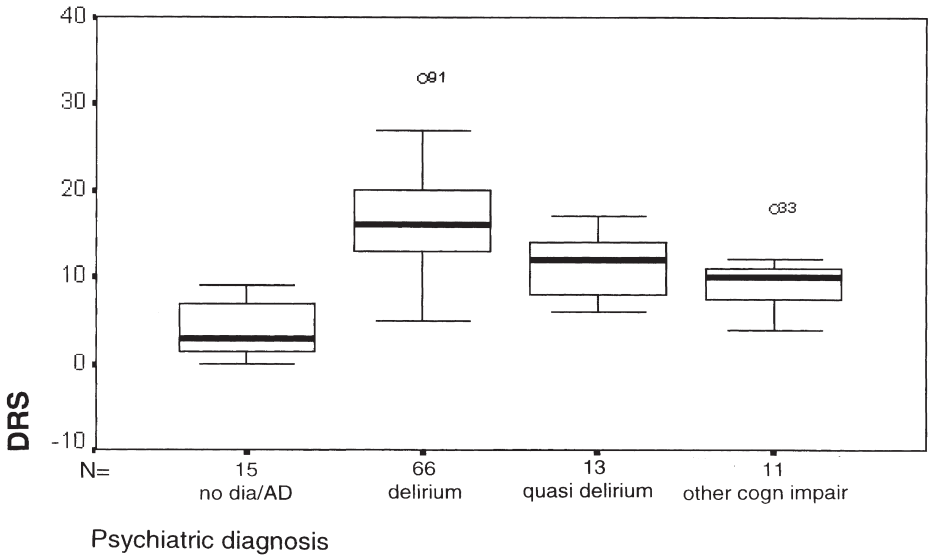

Figure 2. Distribution of scores on the DRS (Boxplot) for 4 subgroups of patients.

ity of mood, physical disorder) showed lower correlations with the MMSE (see Table 4).

The DRS showed higher levels of sensitivity (95%, cut-off ≥10; 81%, cut-off ≥12) than the MDAS (68%). In contrast, the MDAS revealed a higher specificity (94%) and positive predictive accuracy (95%) than the DRS (61% and 80%, respectively, with a DRS cut off ≥10; 76% and 85%, respectively, with a cut-off ≥12). Confirming the data of the original studies,[21,26] the rates of false negative results were 37% by using the MDAS, while the DRS gave a false negative rate of 11% with the cut-off ≥10 and 30% with the cut-off ≥12. The MMSE showed a high false positive rate (28%). Therefore, if used as screening tests, the MDAS would tend to miss a number of patients with mild delirium, whereas the DRS and the MMSE are relatively efficient as screening tests, but, as indicated by other authors,[33,34] do not always distinguish between cognitive failure due to delirium or due to other diseases. These data

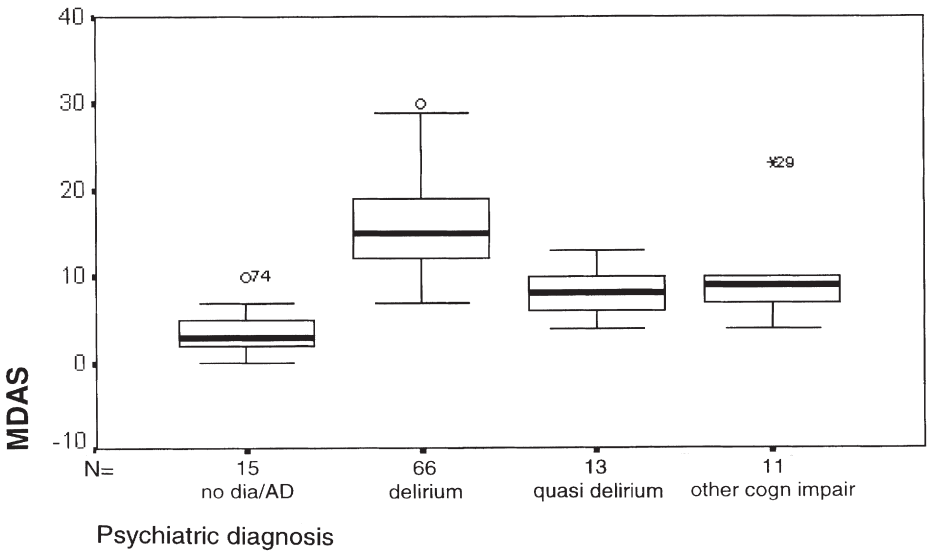

Figure 3. Distribution of scores on the MDAS (Boxplot) for 4 subgroups of patients.

are explained by the degree of overlap existing between the scores of the non-delirious patients with cognitive impairment and the delirious patients scores (Table 1, Figs. 1–3).

Factor analyses showed quite strong similarities between the MDAS and the DRS. The MDAS seemed to identify a pathophysiological model based on the derangement of two main areas of higher brain function, one potentially related to the failure of the attention matrix or of arousal mechanisms[35] and the other associated with the onset of positive phenomena affecting the perception and expression of inner and external stimuli (psychotic dimension). Similarly, the factor structure of the DRS indicated the presence of one factor potentially identifying vigilance and attention disturbances (psychomotor behavior, cognitive status during formal testing, sleep-wake cycle disturbance), and a second factor identifying psychotic symptoms (perceptual disturbance, hallucinations and delusions). A third factor, consisting of diagnostic items that are not present in the MDAS, seemed to underlie time course and cause of the condition (temporal onset, presence of physical disorder) and other non-immediately evident characteristics (lability of mood).

A preliminary factor analysis carried out by Trzepacz and Dew[23] on 20 patients partially anticipated these findings, showing that two factors were compatible with the observed variance. In agreement with our analysis, the scores of the psychomotor activity, sleep-wake cycle and cognition items loaded on the first factor, while the variance due to the items concerning temporal onset and fluctuation of symptoms contributed to the second factor. In contrast with our results, these authors[23] found that the items assessing delusions and mood lability loaded on the first factor and those concerning hallucinations and perceptual disturbance loaded on the second factor. Similarly, by studying 61 delirious elderly patients, Trzepacz et al.[24] identified two core factors with only slight differences (cognitive impairment) between delirious-demented patients ($n = 43$) and those with delirium only ($n = 16$). Therefore, according to the results of exploratory factor analysis in our study, both the scales discriminate positive phenomena, such as hallucinations and delusions, from the derangement of cognition and attention. This seems to be in agreement with the clinical observation that only a subset of patients, often classified as having agitated delirium, present or are able to report these experiences.[36,37] The items related to the temporal onset and to the presence of a medical condition explaining the potential etiology of the syndrome were strongly related due to their recognized importance as diagnostic criteria and to the nature of our population, which was affected mostly by advanced cancer. Further assessment will be necessary when, as suggested by Trzepacz,[25] a revised version of the DRS including separate items for each cognitive function and for psychomotor activity (i.e., distinguishing hyperactive and hypoactive states) will be available.

On the basis of our results, the Italian versions of both the DRS and the MDAS showed acceptable levels of internal consistency and validity when used to assess delirium in patients with cancer. From a clinical point of view, in comparison with the DRS, the MDAS has the advantage of not requiring the incorporation of other cognitive measures and it may offer the advantage of repeated administration within a 24-hour period.[26] On the other hand, the DRS has the advantage of being less dependent on patient answers, and the type of cognitive testing is left free to operator decision and clinical needs. The MDAS requires that items which cannot be completed due to lack of patient compliance are prorated on the basis of preceding item rating.

It must be kept in mind that the DRS and the MDAS have not been designed as diagnostic tools and should be combined with other diagnostic criteria (e.g., clinical interview according to the DSM-III-R or the most recent DSM-IV) to be used in clinical practice and research. With respect to this, DRS items 1 and 10 can be considered to assess for criterion C of DSM-IV (acute onset of symptoms and fluctuation during the course of the day); items 2,3, and 6 are consistent with DSM-IV criterion B (change in cognition and perceptual disturbances); and item 7 satisfies DSM-IV criterion D (medical condition sustaining the disorder). DSM-IV criterion A (consciousness and attention failure to be present) is not explicitly included in DRS. Likewise, MDAS items cover DSM-IV criteria A and B, but not criteria C and D. Therefore, the instruments are different and both lack some of the DSM-IV require-

ments which are operationalized by clinical interview or other tools, such as the CAM. The CAM has been devised according to the DSM-III-R, and needs to be refined according to DSM-IV. It also should be noted that the CAM itself performs much better when used by physicians (specificity = 94–100%, sensitivity = 90–95%) than when used by nurses (sensitivity = 68%, specificity = 97%).[38]

In conclusion, the Italian versions of the DRS and MDAS seem to have some of the characteristics of an ideal instrument for the assessment of delirium,[12,17] in that they are simple and designed for specifically for this disorder, they discriminate delirium from other mental disturbances, and are suitable for repetitive administrations (producing a score that can potentially be used to follow up patients in time). These characteristics do not apply to the MMSE which, in our study, has shown very low levels of specificity. Thus, it can be used as a screening tool for general cognitive impairment but not for a more specific evaluation of delirium among advanced cancer patients.[34] Further study should explore the ability of the DRS and the MDAS to allow quantitative evaluations in monitoring the evolution of the syndrome in time and the potential response to therapeutic interventions. Moreover, application of these assessment tools in other clinical conditions, such as dementia, AIDS, cardiac and other major surgery, are necessary to confirm our results and further validate the Italian versions of the scales.

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