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Delirium rating scale-revised-98 (DRS-R-98): Colombian adaptation of the Spanish version

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Introduction. *Delirium* is associated with high morbidity and mortality. There are no available instruments validated for evaluation and follow-up of this syndrome in Columbia.

Methods. An expert's panel adapted the Spanish DRS-R-98. In 110, randomly selected, medical-surgical hospitalized patients, 17 (15.5 %) of them with *delirium* diagnosed with DSM-IV-TR criteria, the inter-rater reliability, validity and sensitivity to clinical change of the new adaptation of the scale were measured.

Results. Internal consistency (Cronbach's α: 0.956), inter-rater reliability (ICC: 0.95) and validity (94.8 % under the ROC curve area) were very good. For the Cut-off score of 14 for the total scale score, sensitivity was 82.4 % and specificity 97.8 %. The scale was sensitive to clinical change, with a mean difference of 12.9 (t: 4.071; p = 0.007).

Conclusions. The Colombian adaptation of the Spanish DRS-R-98 is sensitive, specific and reliable for assessment of *delirium* in hospitalized adults in medical surgical settings.

Key words:
Delirium. Scales. Validation studies. Measurement. Diagnosis.

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Escala revisada-98 para valoración del *delirium* (DRS-R-98): adaptación colombiana de la versión española

Introducción. El *delirium* es un trastorno con alta morbilidad y mortalidad asociadas. En Colombia no hay instrumentos validados para la evaluación y seguimiento de este síndrome.

Métodos. Un panel de expertos adaptó la DRS-R-98 española. En 110 pacientes medicoquirúrgicos hospitalizados elegidos al azar, 17 (15,5 %) de ellos con *delirium* según los criterios del DSM IV TR, fue estimada la fiabilidad interevaluador, validez y sensibilidad al cambio clínico de la nueva adaptación de la escala.

Resultados. La consistencia interna (α de Cronbach 0,956), la fiabilidad interevaluador (CCI: 0,95) y la validez (área bajo la curva ROC del 94,8 %) fueron muy buenas. Para el punto de corte de 14 en la escala total la sensibilidad fue 82,4 % y la especificidad 97,8 %. La escala fue sensible al cambio clínico; diferencia de medias: 12.9 (t: 4,071; p = 0,007).

Conclusiones. La adaptación colombiana de la DRS-R-98 española es sensible, específica y fiable para la evaluación del *delirium* en adultos hospitalizados por causas medicoquirúrgicas.

Palabras clave:
Delirium. Escalas. Estudios de validación. Medición. Diagnóstico.

INTRODUCTION

Delirium is overlooked by non-psychiatric doctors in 67 % of the cases and is associated with prolonged hospital stays, long term cognitive disorders and high mortality[1-4].

It is one of the most common mental health problems in hospitalized persons, with a frequency that goes up to 56 %, according to the group studied[5-7]. An 8.3 % frequency of *delirium* has been reported in Colombia in patients hospitalized for any medical or surgical disease[8].

It is characterized by its acute onset and fluctuating course with hypoprosexia, disorientation, psychomotor and memory disorder and sensoperceptive and thought disorders[9,10]. The most common classification is that proposed by Lipowski, who described three subtypes from the psychomotor point of view: hyperactive, hypoactive and mixed[11].

The *Delirium* Rating Scale (DRS)[12] and its improved version, the *Delirium* Rating Scale-Revised-98 (DRS-R-98)[13], are among the instruments that serve for diagnosis, quantification of severity and follow-up of the patients with this disorder. The latter makes it possible to widely and flexibly evaluate the characteristic symptoms of delirium, which facilitates its use in clinical practice and research[13]. The Spanish version of the DRS-R-98 was validated by Fonseca, Bulbena, Navarrete et al.

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They found high interrater reliability (ICC: 0.96), high internal consistency (Cronbach's α 0.78) and very good concurrent validity with the Berrios orientation scale (r: 0.74)[14].

The DRS-R-98 consists of 16 items, in two subscales. The first one contains 13 severity items, the second three diagnostic items. The sum of the scoring of the two sections provides the final score whose maximum value is 32. The subscale that evaluates severity may be used repeatedly during short time intervals. The total scale can be used for the differential diagnosis since it groups characteristics of the disorder, such as the acute onset and fluctuation of the clinical picture[13,14].

This study aims to determine the validity and reliability of the Colombian adaptation of the Spanish DRS-R-98 in three phases: Colombian adaptation in clinical language, measurement of reliability and validity in patients in Colombia and evaluation of its utility for follow-up of patients with delirium.

METHODOLOGY

Adaptation

The Spanish DRS-R-98 was given to some experts (four psychiatrists and one neurologist) who individually modified it. Based on these changes, a draft was elaborated that was given to the experts for a second evaluation that gave rise to the version that was used in the pilot test. The suggestions resulting from the pilot test in which the three psychiatrists applied the scale to 15 hospitalized persons were taken into account. They did so to evaluate difficulties regarding understanding of the items, frequency of the responses, restriction of the response range, time used in the application of the test and ease of scoring[15,16]. The final adaptation was evaluated by the original author (Dr. Trzepacz) and by a member of the author's group of the Spanish version (Dr. Bulbena), before the following study phases. (The Colombian adaptation of the Spanish DRS-R-98 can be requested to Dr. Franco).

Participants

This study was approved by the Ethics and Bioethics Institute of the University Pontificia Bolivariana. Those included were adults hospitalized in the Clínica Universitaria Bolivariana (CUB) due to medical or surgical diseases during the study period. Patients in coma or admitted in obstetrics or intensive therapy were excluded.

The initial sample size was calculated with the Walter, Eliaszw and Donner formula for the Intraclass Correlation Coefficient (ICC): $3/2 + ([2(Z_{1-\alpha}+Z_{1-\beta})^2 xn] / [\ln(C_0)]^2 \times [n-1])$, where $C_0 = (1-\rho 1)\times(1-\rho_0 + n\rho_0)/(1-\rho_0)\times(1-\rho_1 + n\rho_1)$. The following statistical parameters were taken into account: number of evaluations or n = 2, type I error (significance level) or $\alpha = 0.05$, type II error (power) or $\beta = 0.2$, Kappa null-hypothesis or $\rho_0 = 0.5$, Kappa alternative hypothesis or $\rho_1 = 0.3$. This sample size was 100 patients.

The initial 110 participants were enrolled by chance by means of cards with the clinical history numbers corresponding to the persons hospitalized during the previous 24 hours that were introduced into a dark box every day. One member of the research group drew two cards, that corresponded to the patients to be evaluated.

The sociodemographical and clinical data were recorded in a survey designed for the study. The variables included were chosen by consensus of the investigators.

Reliability, validity and utility for patient follow-up

To know the interrater reliability two investigators blinded to each other applied the DRS-R-98 to each one of the 110 patients. They had 24 hours and could use information sources such as companions, nursing staff or clinical history according to the instructions.

In order to estimate validity, a different psychiatrist from the two other raters and who did not know the results of the test interviewed the 110 patients to assess if they fulfilled the DSM IV TR diagnostic criteria for delirium[10] (gold standard) and thus obtained the sub-sample of persons with this disorder. This rater performed a semi-structured clinical interview where he had to record in writing if the persons fulfilled each one of the diagnostic criteria for this entity and could use any other available information source outside of the interview with the patient.

The usefulness for the follow-up of patients was verified with a fourth rater who applied the severity subscale one to two weeks after the initiation of the usual treatment to some of the persons with *delirium* according to the gold standard. This rater did not belong to the research group and did not know the result of the previous measurements.

Statistical analysis

The data analysis was performed with the SPSS 10 software. Measure of central tendency (means), dispersion (standard deviation) and proportions (percentages) were used for sociodemographical and clinical variables.

Consistency of the scores for the total scale, severity subscale and diagnostic subscale was evaluated with Cronbach's α. The α on excluding each one of the items was also calculated. Interrater reliability was evaluated with ICC for the scale as a whole and for the two subscales.

Validity and cut-offs, with sensitivity and specificity, were measured with the receptor-operator curve analysis (ROC).

The usefulness of the scale for patient follow-up was evaluated with the t test for related samples.

RESULTS

Description of the sample and scale

All the patients selected agreed to participate in the study. Minimum age was 23 years and maximum 98. The other sociodemographical data of the sample appear in table 1.

The most frequent medical-surgical diagnosis was cancer and its complications: 10 (9.1 %) cases; followed by urinary tract infection: 8 (7.3 %); community acquired pneumonia: 6 (5.5 %). Five (4.5 %) persons were found with sepsis, 5 (4.5 %) with congestive heart failure and 5 (4.5 %) with arterial hypertension complications. Acute coronary syndrome, bile tract diseases, fractures and complications related with diabetes mellitus each occurred in 4 (3.6 %) patients. Cirrhosis and cerebrovascular disease were diagnosed in 3 (2.7 %) persons each one.

Diagnosis of delirium, based on DSM IV TR criteria (gold standard), was made in 17 (15.5 %) of the 110 patients evaluated. Average score of the scale in the negative group for *delirium* was 2.35 (SD: 4.95) and for the positive one 23.88 (SD: 12.11). The difference in these averages was 21.53 (95 % CI: 15.23; 27.82), with statistical significance (F: 41.351; $p < 0.000$; t: 7.218; $p < 0.000$).

Internal consistency

Cronbach's α was 0.956. It was 0.945 for the severity subscale and 0.894 for the diagnostic one. Table 2 shows the α when each one of the items is eliminated.

Interrater reliability

The ICC was 0.95 (95 % CI: 0.927; 0.965) for the total DRS-R-98; 0.957 (95 % IC: 0.938; 0.971) for the severity

Table 1 **Sociodemographic characteristics of 110 patients hospitalized in the Clínica Universitaria Bolivariana. Medellín, 2005**

Age		
Average	59,15	
SD	18.6	
	n	**%**
Gender		
Man	46	41.8
Woman	64	58.2
Schooling		
Without studies	5	4.5
Primary*	48	43.6
Secondary*	36	32.7
Upper education*	21	19.1
Civil status		
Single	17	15.5
Living together	3	2.7
Married	64	58.2
Separated	7	6.4
Widow (er)	19	17.3
Occupation		
Employed	34	30.9
Independent	14	12.7
Housewife/househusband	43	39.1
Unemployed	4	3.6
Retired	10	9.1
Pensioner	5	4.5

*Complete or incomplete

Table 2 **Cronbach's α coefficient for total DRS-R-98 and its severity and diagnosis subscales, on eliminating each one of the items**

Item	α on the eliminating the item	Severity subscale	Diagnostic subscale
Sleep-awakeness cycle	0.952	0.941	N/A
Perception disorders	0.955	0.946	N/A
Delusions	0.959	0.951	N/A
Affective lability	0.950	0.937	N/A
Language	0.954	0.942	N/A
Thought course	0.954	0.943	N/A
Motor agitation	0.956	0.947	N/A
Psychomotor delay	0.956	0.945	N/A
Orientation	0.949	0.935	N/A
Attention	0.949	0.935	N/A
Short term memory	0.952	0.939	N/A
Long term memory	0.951	0.937	N/A
Visual-spatial capacity	0.949	0.935	N/A
Form of symptom onset	0.953	N/A	0.848
Fluctuation of severity	0.953	N/A	0.876
Medical disease	0.952	N/A	0.815

N/A: not applicable.

subscale and 0.855 (95 % IC: 0.789; 0.901) for the diagnostic one.

Validity

Area under the ROC curve for total score of the scale was 94.8 % (fig. 1) and 95.1 % for the severity subscale.

Table 3 shows sensitivity and specificity for the total scale and for the severity subscale of DRS-R-98.

Usefulness for patient follow-up

Average age of the seven patients assessed to evaluate sensitivity to change of the severity subscale was 63.57 years (SD: 26.336). Mean score in the first evaluation was 21.9 and in the second 9. Difference between both 12.9 (95 % CI: 5.129; 20.858) was statistically significance (t: 4.071; gl: 6; p = 0.007).

DISCUSSION

The sociodemographical characteristics and medical-surgical diagnoses of the group used to test this scale were sufficiently extensive to include patients in a wide range, similar to that which can be found in the usual practice with hospitalized patients, in whom the test could be used[17]. The average score in the DRS-R-98 was significantly greater in patients with *delirium* than in the rest of the patients. The scale was also shown to be sensitive to change in the clinical condition of the patients who had been diagnosed with *delirium* and in whom treatment for it was established.

Table 3 Sensitivity and specificity of total DRS-R-98 and severity subscale, according to ROC curves

Total DRS-R-98			Severity subscale		
Score	Sensitivity	Specificity	Score	Sensitivity	Specificity
0.5	100	44.1	0.5	100	44.1
1.5	94.1	67.7	1.5	94.1	73.1
2.5	94.1	76.3	2.5	94.1	82.8
3.5	88.2	81.7	3.5	88.2	87.1
4.5	88.2	87.1	4.5	88.2	89.2
6	88.2	88.2	5.5	82.4	91.4
7.5	88.2	91.4	6.5	82.4	92.5
8.5	82.4	93.5	8	82.4	93.5
10	82.4	94.6	9.5	82.4	95.7
12	82.4	95.7	10.5	82.4	96.8
14	82.4	97.8	11.5	76.5	97.8
15.5	70.6	97.8	13	70.6	97.8
19	64.7	97.8	18	64.7	97.8
22.5	58.8	97.8	22.5	47.1	97.8
24.5	58.8	98.9	24	47.1	98.9
27	52.9	98.9	26	35.3	98.9
30	41.2	98.9	27.5	29.4	98.9
32.5	35.3	98.9	29	29.4	100
34	23.5	98.9	30.5	59	100
35.5	17.6	100	32	0	100
36.5	11.8	100	N/A	N/A	N/A
37.5	5.9	100	N/A	N/A	N/A
39	0	100	N/A	N/A	N/A

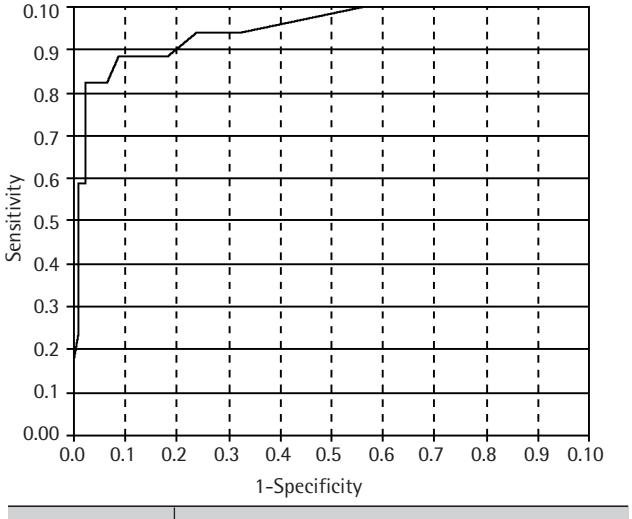

Figure 1 *ROC curve for all the DRS-R-98 items.*

Currently, it is difficult to develop a scale or evaluate its performance without using the Cronbach's a, which is better the closer to 1 it is, with an adequate range between 0.7 and 0.9. This coefficient was high (0.9561) for this instrument, which implies high consistency between the items. It was also high for the subscales evaluated independently. Each item contributed strongly to the scale, which is an indicator of its homogeneity[18].

Interrater reliability according to ICC was very good for the total scale and severity subscale and good for the diagnostic subscale. The ICC serves to differentiate numeric measurements. It is defined as the proportion of the total variability that is due to the subject's variability. It can be interpreted as good when it is between 0.71 and 0.90, and very good when it has a value greater than 0.90[19,20].

Interrater reliability was evaluated for persons with specific training in psychiatry. Given that the DRS-R-98 could be used by other raters, with some training in psychopathology, and that it may be difficult at times, even for an ex-

pert, to discriminate if some clinical manifestations correspond to other disorders (for example: deciding if the depressive symptoms correspond to an affective disorder or to a delirium)[5], reliability of the scale for non-psychiatric clinicians should be evaluated.

The large percentage of the area under the ROC curve obtained shows that both the total DRS-R-98 and the severity subscale have good performance[21]. It is a specific instrument for the diagnosis and follow-up of delirium. Cut-offs suggested are shown in table 4. Regarding the scores of 10 and 14 for the total scale, sensitivity remains stable and specificity increases 3.2 % in the 14 score, which makes it more likely that a truly healthy subject is negative. In the severity subscale, the 10.5 cut off has good specificity and 5.9 % more sensitivity in regards to that of 11.50, which causes a truly ill subject to be positive when using 10.5 as cut-off.

Validation of the original scale in English was done in medical-surgical patients or those with psychiatric diseases[13]. In our study, lower cut-offs were found. This may be explained by the sociodemographical and clinical differences of the populations of both works and indicates that each population should have its own cut-off.

As in the validation of the original scale[13], our adaptation was shown to be useful for the follow-up of the patients. The authors of the original scale followed six patients, finding that it was sensitive to clinical change in them. In our case, we followed seven, also finding this sensitivity to change. This sensitivity to change makes the DRS-R-98 useful to evaluate severity and for the follow-up of patients, whether in research or in the clinical practice.

Regarding the Spanish version that was validated in a population with an average age of 81 years, the present adaptation was validated in a population with a younger average age (59.15 years). In spite of this difference, interrater reliability was practically the same in both groups, indicating an excellent concordance in each one of the two studies[14].

Table 4 Cut-offs suggested for the use of DRS-R-98

	Cut-off	Sensitivity	Specificity
Total scale	10	82.4	94.6
	12	82.4	95.7
	14	82.4	97.8
Severity subscale	10.5	82.4	96.8
	11.5	76.5	97.8

*DRS: *Delirium* rating scale.

On the contrary to the Spanish study that evaluated concurrent validity[14], we did not evaluate it since we have no other validated scales to evaluate *delirium* in Colombia, as far as we known. This manifests the relevance of this study.

It is necessary to know the construct validity of this adaptation of DRS-R-98. Thus, we are gathering the data necessary to carry out its factorial analysis. Studies that evaluate the capacity of the scale are needed to differentiate specifically *delirium* from dementia.

CONCLUSIONS

This is the Colombian adaptation of the Spanish version of the DRS-R-98 obtained through the evaluation of an expert's group. The data presented herein showed that it has very good reliability and validity. The scale was shown to be useful for diagnosis, evaluation of severity and follow-up of *delirium.*

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