Fear of falling in older patients
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CHAPTER 4

ASSESSING SEVERITY OF DELIRIUM BY THE DELIRIUM OBSERVATION SCREENING SCALE

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ABSTRACT

Objective Delirium is the most common acute neuropsychiatric disorder in hospitalized elderly. Assessment of the severity of delirium is important for adjusting medication. The minimal dose of medication is preferable to prevent side effects. Only few nurse based severity measures are available. The aim of this study was to validate a scale developed to assess symptoms of delirium during regular nursing care, the Delirium Observation Screening (DOS) Scale, for monitoring severity of delirium.

Method Delirious patients of 65 years and older were included. Delirium was diagnosed according to DSM-IV criteria and the Confusion Assessment Method. The DOS Scale was compared to the Dutch version of the Delirium Rating Scale-Revised-98 (DRS-R-98). Global cognitive functioning was assessed by the Informant Questionnaire Cognitive Decline in the Elderly-Short Form (IQCODE-SF) and the KATZ-ADL Scale was used for functional impairment.

Results 97 Delirious patients were included: 41 hip fracture patients and 56 medical patients. The correlation between total DRS-R-98 scores and DOS Scale scores was 0.67 (p=0.01). For the cognitive impaired group (IQCODE-SF≥3.9) this correlation was 0.61 (p=0.01); for the group with no global cognitive impairment, this correlation was 0.67 (p=0.01). Correlations between DRS-R-98 and DOS Scale for hypoactive, hyperactive and mixed delirium subtype were 0.40 (p=0.32), 0.44 (p=0.01) and 0.69 (p=0.05) respectively.

Conclusions The DOS Scale is able to measure severity of delirium. In routine daily clinical practice, the DOS Scale is a time-efficient, easy to use and reliable method for measuring and monitoring severity of delirium by nurses.
INTRODUCTION

Delirium is an acute neuropsychiatric syndrome with a typical fluctuating course, deranged consciousness and cognitive and attentional disturbances. Delirium is common in hospitalized older patients and is associated with many serious short- and long-term consequences, including increased length of hospital stay, increased morbidity and hospital mortality, and higher hospital costs.1-6

After diagnosing delirium it is important to closely observe the severity of delirium for adaptation of medication as this medication may cause unfavourable side effects. In order to assess severity of delirium, many different instruments have been developed both for clinical and research use. Frequently used scales for assessment of the severity of delirium are the Delirium Detection Score7 for severity of delirium in the ICU, the MDAS8,9 or the Delirium Rating Scale (DRS).10 The most widely used instrument to diagnose delirium and to assess severity is the DRS-R-98.11 The DRS-R-98 has been demonstrated to be an adequate instrument for physicians to assess the severity of delirium.12 The Dutch translation of the DRS-R-98 is a valid and reliable severity measure for delirium as demonstrated by a high inter-rater reliability and internal consistency.13

The DRS-R-98 is only validated for rating by experienced physicians. Due to the fluctuating nature and different presentations of the condition, the severity of delirium might be difficult to assess by once-daily visits by physicians. Compared to physicians, nurses have more frequent round-the-clock contact with patients and are in a strategic position to observe changes in behaviour.14 The Delirium Observation Screening (DOS) Scale was originally designed for nurses to screen for the presence of delirium. It has the advantage that it can be applied by nurses without specific training in geriatric care.15 The DOS Scale rates three times a day nurses’ observations during regular care and has been tested in several studies with good results. Monitoring the severity of delirium with the DOS Scale would be a great advantage. Therefore, the aim of this study was to compare the score of the DOS Scale with the DRS-R-98, in a population of acutely admitted older patients with delirium.
METHODS

SAMPLE
This study was conducted between May 1st 2005 and July 1st 2008 at the Academic Medical Center, Amsterdam, a tertiary university teaching hospital. All consecutive patients admitted with a hip fracture to the Department of Surgery and patients acutely admitted to the Department of Internal Medicine were included if they were 65 years or older and diagnosed with delirium. This study was part of a larger, on-going study on the pathophysiology of delirium and was approved by the hospital’s Medical Ethics Committee. All patients gave informed consent; in case of cognitive impairment, surrogate consent was obtained from a close relative.

PROCEDURE
Two geriatric physicians, a fellow in geriatric medicine, and a team of research nurses trained in geriatric medicine collected demographic and clinical data. The presence or absence of delirium was scored with the Confusion Assessment Method\textsuperscript{16}, a scale based on the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV).\textsuperscript{17} All patients were evaluated within 48 hours after admission. The DRS-R-98 was applied by trained geriatric physicians. Nurses (not research nurses) of both departments applied the DOS Scale three times a day, at the end of each shift. These nurses were trained in the administration of the DOS Scale rating as part of their daily tasks.

According to the clinical presentations as described by Lipowski\textsuperscript{18} and based on the classification system developed by Liptzin and Levkoff (1992), delirium was classified by geriatric physicians into three subtypes delirium: hypoactive, hyperactive and mixed delirium.

MEASURES

CAM
The CAM is a sensitive, specific, reliable and easy to use instrument for identification of delirium.\textsuperscript{19} It is based on four cardinal features of delirium: (1)
acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness. A diagnosis delirium according to the CAM requires the presence of features 1, 2, and either 3 or 4.20

**DRS-R-98**

The DRS-R-98 (Appendix I) consists of two sections: three diagnostic items for initial rating (temporal onset of symptoms), fluctuation of symptoms and physical aetiology) and a thirteen-item severity scale for repeated measures. The severity items cover language, thought processes, two items of symptom intensity and each response may be rated 0 to 3 points. Ratings covered a 24-hour period using all available information from family, nurses, doctors and medical records, including the DOS score. Whenever an item of the DRS-R-98 could not be rated it was so noted and later scored midway, that is 1.5 point, as suggested by Trzepacz.21

The inter-rater reliability of the Dutch version of the DRS-R-98 severity scale between both raters was 0.97 (95% confidence interval (CI): 0.96-0.98), while the Cronbach’s alpha coefficient was 0.94. The translation procedure was described elsewhere.22

**DOS Scale**

The DOS Scale is developed as a twenty-five observational items scale related to the symptoms of delirium as described in het DSM-IV. Based on clinical study the twenty-five items were reduced to thirteen items that can be rated as present or absent in less than five minutes.23 A score of 0 is defined as ‘normal behaviour’, meaning absence of behavioural alterations. Three items (3, 8 and 9) are reverse-scored, i.e. normal behaviour’ is rated as ‘always’. The highest score of the complete DOS during one shift is 13; the cut-off point is 3. Three points or more indicate delirium.15 The 24-hour total score of the DOS Scale was rated as the sum of the scores of the DOS Scales applied in three work shifts. No suggestions for missing values were described in the original DOS Scale, so DOS Scale scores with missing values were enrolled in the analysis.
THE IQCODE-SF AND THE KATZ-ADL

The Dutch version of the Informant Questionnaire Cognitive Decline in the Elderly Short Form (IQCODE-SF) was administered to caregivers to obtain information about the presence of pre-morbid global cognitive impairment prior to admission. The score is an average of the 16-item score; each rated from 1 (much improved) to 5 (much worse). Patients with a mean score of 3.9 or more were considered to have serious cognitive impairment.

The modified Katz-ADL index score is a 15-item scale for measuring functional status in a geriatric population. The modified Katz-ADL index score consists of a scale for patients and one for their caregiver. The final Katz-ADL index score was based on the Katz-score of the caregiver.

DELIRIUM SYMPTOM INTERVIEW

Using the Delirium Symptom Interview (DSI) Liptzin and Levkoff (1992) defined specific symptoms of the DSI as ‘hyperactive’ or ‘hypoactive’. Delirious patients who had three or more different symptoms of ‘hyperactivity’ were rated as ‘hyperactive. Those who had four or more different symptoms of ‘hypo activity’ were rated as ‘hypoactive’. Patients rated positive on both scores were considered ‘mixed’.

STATISTICAL ANALYSIS

Data were analysed using the Statistical Package for the Social Sciences software version 16.0 (SPSS Inc. Chicago, Illinois). Variables that were not normally distributed were expressed as median scores and ranges, otherwise mean and standard deviation was noted. Distributions of scores were assessed by reviewing the distribution of scores graphically depicted in a histogram. For the baseline characteristics standard descriptive statistics were used. Differences in scores of continuous variables were tested with a Student t-test or Mann-Whitney U test. The Chi-square test was used to compare the distribution of categorical data.

Since the goal of this study was to compare the DRS-R-98 with the DOS Scale, patients with either only a DRS-R-98 or DOS Scale during a period of 24 hours were...
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excluded. DOS Scale scores based on only one score in 24 hours were excluded. DRS-R-98 score measurements with more than 25% missing items were excluded as well. Finally, from each patient no more than one set of measurements was enrolled in the analysis. The most completed set of measurement was enrolled. When two sets of measurements were equally complete, the first one was enrolled.

In order to compare the DRS-R-98 with the DOS Scale, total DRS-R-98 scores were correlated with total (24 hours) DOS Scale scores, by using Pearson’s Correlation Coefficient ($r_p$). The DOS Scale scores were applied two or three times in 24 hours. In the case of two DOS Scale scores a missing score was calculated as the mean of the other two scores. Correlation between DRS-R-98 scores and total DOS Scale scores was assessed for the group cognitive impaired patients and for the group patients without cognitive impairment. Also, correlations of the total DRS-R-98 scores and total DOS Scale scores for patients with hypoactive, hyperactive and mixed delirium subtype were calculated.

Finally, total DRS-R-98 scores were correlated with total DOS Scale scores, when total DOS Scale scores were calculated as extreme values: with missing items of the DOS Scale scored as 0, and with missing individual DOS Scale items scored as 1. A two-tailed criterion of <.05 was considered statistically significant.

RESULTS

During the study period a total number of 791 consecutive patients were included in the larger, on-going study. In total, 254 patients (32%) were diagnosed with delirium. After exclusion of 124 patients with either only a DRS-R-98 or DOS Score, 21 patients with only one DOS Score, 7 patients with more than 25% DRS-R-98 items missing and 5 patients with an incomplete dataset, a total of 97 patients could be included: 41 patients with a hip fracture and 56 medical patients (Figure 1). The baseline characteristics of this cohort are given in Table 1.

Both surgical and medical patients had a high age (mean 82.1 years, standard deviation (sd) 7.4 and 86.7 years, sd 6.4 years), although hip fracture patients were older than medical patients ($t$-test: 3.3, df=92, $p$=0.02). Also, there was a difference
in functional status, measured with the Katz-ADL index score, between hip fracture and medical patients (p<0.001). There was no difference in IQCODE-SF between the two groups (p=0.75).

In 32% the DOS Scale was applied two times during a period of 24 hours, in 68% of the cases the DOS Scale was applied three times. Missing values (not rated and ‘unable’ ratings) were found in both DRS-R-98 and DOS Scale. For the DOS Scale most missing values were reported in night and evening shift. After night shift 17% was not rated, after day shift 4% and after evening shift this was 11%. In 67% the DRS-R-98 score was obtained completely. In 33% of the cases one to four missing items were missing.

The median DRS-R-98 score was 17.4 (SD 8.4) and 5.06 (SD 2.7) for the DOS Scale score (Table 1). Median scores for DRS-R-98, DOS Scale night, DOS Scale day and median score for DOS Scale evening were not different between hip fracture patients and medical patients. In the group of all patients the correlation between total DRS-R-98 and total DOS Scale was 0.67 (p=0.01). These data are represented in Figure 2 by means of a scatter diagram. For the cognitive impaired group the correlation between DRS-R-98 and total DOS Scale was 0.61 (p=0.01) whereas for the cognitive intact patients, this correlation was 0.67 (p=0.01). According to the criteria of Liptzin and Levkoff 8 patients showed hypoactive delirium, and 36 and 12 patients showed hyperactive and mixed delirium subtype, respectively. Correlations between DRS-R-98 and DOS Scale for these groups were 0.40 (p=0.32), 0.44 (p=0.01) and 0.69 (p=0.05).

When missing DOS Scale scores were scored as 0 or 1, correlations between DRS-R-98 and DOS Scale were 0.60 (p=0.01) and 0.61 (p=0.01) respectively.

**DISCUSSION**

This study was undertaken to investigate whether the DOS Scale, a reliable and valid nurse led instrument, was also able to measure severity of delirium in a population of acutely admitted older hospital patients with delirium. This study provides evidence that the DOS Scale is able to measure severity of delirium in two groups of elderly patients with a high risk of delirium, namely hip fracture and
medical patients. The correlation between DRS-R-98 and the DOS Scale was 0.67; suggesting physician and nurses based measures of delirium severity were related. These results also suggest that repeated nurses’ observations can contribute to monitoring delirium severity in daily clinical practice. Correlations between DRS-R-98 and DOS Scale for hypoactive, hyperactive and mixed delirium subtype were fair to moderate.

The correlation between DRS-R-98 and DOS Scale for the group with no cognitive impaired group was slightly better than in the cognitive impaired group. This could have been the result of the fact that patients psychiatric comorbidity, especially those with dementia, show behaviour, that is sometimes hard to distinguish from delirium. The correlation between the DRS-R-98 and the DOS Scale was best in the mixed subtype of delirium, which is difficult to explain. Since the groups with known subtype are rather small, this needs to be verified in a larger study sample.

Not all items of the DRS-R-98 correspond with an item of the DOS Scale with comparable content. The items ‘sleep-wake cycle, ‘short-term memory’ and ‘visuospatial ability’ are, for instance, not represented in the DOS Scale. Furthermore, some items of the DRS-R-98 correspond with more than one item of the DOS Scale. The item ‘attention’ of the DRS-R-98 corresponds with the items ‘dozes during conversation or activities’, ‘is easy distracted by stimuli from the environment’, ‘maintains attention to conversation of action’ and ‘does not finish question or answer’ of the DOS Scale. These constructual facts reduce the possible correlation between the two scales.

Our findings of nurses and physicians based measures were similar to another study, where a new developed nursing screening scale for delirium the Nursing Delirium Screening Scale (NU-DESC), was compared with a physician led MDAS for measuring severity of delirium. The NU-DESC had a sensitivity of 85.7% and a specificity of 86.8% for measuring delirium, which is comparable with the DOS Scale. In this study the correlation between the NU-DESC and the MDAS was 0.67 (p<0.0001) in a group of hospitalized patients. So, this study also shows that a nursing screening instrument for delirium can be used for severity rating. The
results of the study by Gaudreau support the findings in our study, despite the fact that another nursing screening scale is used for measuring severity of delirium.

One limitation of the study is the number of missing data on the DOS Scale scores. The number of missing values is a result of data collection by nurses during regular care. Missing rates were due to several reasons: patient’s behaviour was ‘unable to rate’, high workload, temporary employees or simply forgotten. Interviews with the nurses made clear that they were more willing to rate the DOS Scale if a patient was very restless. This may have made the results less precise since the estimation of the total score is less accurate. If for hyperactive patients a DOS score is rated, more than this is the case for hypoactive patients, DOS Scales for hyperactive patients are more often complete and included. Patients with a hypoactive form of delirium tend to co-operate with their care. Nurses tend to label patients as delirious when their behaviour made them difficult to care for. Palmeteer and McCartney (1985) reported that nurse mistook co-operation with care as an indication of intact cognition. Thus, cooperative patients with hypoactive delirium were consistently not identified. Based on this, we expected the correlation between the DRS-R-98 and the DOS Scale for hyperactive delirium to be better than the correlation for hypoactive delirium. This was not the case. In this study, most patients with hypoactive delirium were excluded, due to many missing items of the DRS-R-98 and DOS Scale.

Another limitation of this study is that due to fluctuations in symptoms of delirium during the hospital stay, symptoms were missed by physicians, since they saw patients mostly just once a day and based their score on different sources. Raters of the DRS-R-98 score were not blinded for the DOS Score, which could have led to overestimation of the correlation between the DOS Scale and the DRS-R-98.

In conclusion, the DOS Scale, a nationwide implemented nurse led scale is able to measure severity of delirium, although it was originally not developed for that purpose. In routine daily clinical practice, a time-efficient (the DOS Scale can be rated in less than 5 minutes), easy to use and reliable method for measuring and monitoring delirium is needed. Especially, in situations that a geriatrician or other physician is not 24 hours present, monitoring delirium by nurses in daily practice
can contribute to a better adjusted treatment of delirium in acutely admitted older patients.

Key points

- Delirium is common in hospitalized older patients and is associated with many serious short- and long-term consequences.
- Nurses have more frequent round-the-clock contact with patients and are in a strategic position to observe changes in behaviour.
- The DOS Scale, a nationwide implemented nurse led scale, designed for nurses to screen for the presence of delirium, is a reliable method for measuring severity of delirium.
FIGURE 1
PATIENTS AGED 65 YEARS AND OLDER ADMITTED WITH A HIP FRACTURE TO THE DEPARTMENT OF SURGERY AND PATIENTS ACUTELY ADMITTED TO THE DEPARTMENT OF INTERNAL MEDICINE BETWEEN MAY 1ST 2005 AND JULY 1ST 2008

Patients included in larger study
n=791

Patients not diagnosed with delirium
n=537

Patients diagnosed with delirium
n=254

Patients excluded because of:
- either only a DRS-R-98 or DOS Score available n=124
- only one DOS Scale score available n=21
- more than 25% missing DRS items n=7
- incomplete data set n=5

Patients available for analysis
n=97
### Table 1 Baseline Patient Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Medical Patients (n=56)</th>
<th>Hip Fracture Patients (n=41)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age in years, mean (sd)</td>
<td>82.1 (7.4)</td>
<td>86.7 (6.4)</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>31 (55.4)</td>
<td>33 (80.5)</td>
</tr>
<tr>
<td>Social status, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>38 (67.9)</td>
<td>32 (78.0)</td>
</tr>
<tr>
<td>Married/ living together</td>
<td>18 (30.1)</td>
<td>8 (19.5)</td>
</tr>
<tr>
<td>Unknown</td>
<td>-</td>
<td>1 (2.5)</td>
</tr>
<tr>
<td>Living arrangement, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home alone</td>
<td>14 (34.1)</td>
<td>39 (69.6)</td>
</tr>
<tr>
<td>Senior residence</td>
<td>7 (17.1)</td>
<td>6 (10.7)</td>
</tr>
<tr>
<td>Old peoples home</td>
<td>17 (41.5)</td>
<td>5 (8.9)</td>
</tr>
<tr>
<td>Nursing home</td>
<td>2 (4.9)</td>
<td>6 (10.7)</td>
</tr>
<tr>
<td>Intermediate care</td>
<td>1 (2.4)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Medical history</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional impairment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Katz-ADL index scores relatives, mean (sd)</td>
<td>5.15 (4.63)</td>
<td>8.21 (3.19)</td>
</tr>
<tr>
<td>Cognitive impairment:**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IQCODE-SF, mean (sd)</td>
<td>4.09 (0.8)</td>
<td>4.17 (0.67)</td>
</tr>
<tr>
<td>Patients with IQCODE-SF ≥3.9, n (%)</td>
<td>35 (62.5)</td>
<td>27 (65.9)</td>
</tr>
<tr>
<td><strong>Situation at discharge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of stay in days in hospital, mean (sd)</td>
<td>14.98 (14.47)</td>
<td>18.24 (12.12)</td>
</tr>
<tr>
<td>Died during hospital stay, n (%)</td>
<td>5 (9.8)</td>
<td>-</td>
</tr>
<tr>
<td><strong>DRS-R-98 and DOS Scale scores</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRS-R-98, mean (sd)</td>
<td>16.3 (7.7)</td>
<td>18.8 (7.5)</td>
</tr>
<tr>
<td>DOS Scale; night, mean (sd)</td>
<td>4.5 (3.7)</td>
<td>5.9 (3.3)</td>
</tr>
<tr>
<td>DOS Scale; day, mean (sd)</td>
<td>5.0 (2.9)</td>
<td>6.1 (3.1)</td>
</tr>
<tr>
<td>DOS Scale; evening, mean (sd)</td>
<td>4.3 (3.4)</td>
<td>5.5 (3.7)</td>
</tr>
</tbody>
</table>

Mean values (sd) are given for continuous variables with a normal distribution. Median values (IQR) are given for variables that are not normally distributed.

Katz-ADL index = Katz index of Independence in Activities of Daily Living; IQCODE-SF=Informant Questionnaire Cognitive Decline in the Elderly- Short Form; DRS-R-98 = Delirium Rating Scale-revised-98; DOS Scale = Delirium Observation Screening Scale.

** Impairment as determined two weeks prior to admission.
CHAPTER 4

FIGURE 2
DRS-R-98 AND DOS SCALE SCORES
CHAPTER 4

FIGURE 3
SCATTER DIAGRAM DRS-R-98 AND DOS SCALE WITH A LINE OF BEST FIT
APPENDIX 1
The DRS-R-98

Items

1. Sleep-wake cycle
2. Perceptions and hallucinations
3. Delusions
4. Liability of affect
5. Language
6. Thought process abnormalities
7. Motor agitation
8. Motor retardation
9. Orientation
10. Attention
11. Short-term memory
12. Long-term memory
13. Visio spatial ability

Scores: 0-39 points

APPENDIX 2
The DOS Scale

The patient

1. Dozes during conversation or activities
2. Is easy distracted by stimuli form the environment
3. Maintains attention to conversation of action
4. Does not finish question or answer
5. Gives answers which do not fit the question
6. Reacts slowly to instructions
7. Thinks to be somewhere else
8. Knows which part of the day it is
9. Remembers recent event
10. Is picking, disorderly, restless
11. Pulls IV tubes, feeding tubes, catheters etc.
12. Is easy or sudden emotional (frightened, angry, irritated)
13. Sees persons/ things as somebody/ something else

Scores:
Never=0 points; sometimes or always=1 point

Items 3, 8 and 9 are rated in reverse
**REFERENCE LIST**


