Early Detection of Post Stroke Depression: psychometric properties of the Signs of Depression Scale

Rehabilitation centre

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Summary (max. 300 words, ex title and key words)

Title: Early detection of Post Stroke Depression: psychometric properties of the Signs of Depression Scale

Background

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Titel: Vroeg signalering van depressie na een beroerte: psychometrische eigenschappen van de Symptomen van Depressie Schaal

Inleiding

Doel en onderzoeksvraag(vragen)

Methode

Resultaten

Conclusie

Aanbevelingen

Trefwoorden (max. 5 woorden)

Background

Post-stroke depression (PSD) is a common and distressing complication following stroke[1]. It is characterized by depressive symptoms, such as loss of interest and disheartened mood during the largest part of the day, lasting for at least two weeks and affects daily functioning of the patient[2]. There is a considerable variation in the frequency of PSD. In a pooled estimate, depressive symptoms are present in 33% of the patients at any time during follow up[3]. Various reviews showed that PSD is related to increased morbidity and mortality [1, 4-9], severe physical impairment [1, 5, 10], poor cognitive functioning [1, 4, 5, 10], functional dependence [1, 7, 8], poor recovery and participation in rehabilitation [1, 3-8, 10-12], longer stay in hospital and reduced social activity [1, 3, 4, 6-8, 10-12]. Despite the high prevalence and the impact of PSD on various factors, PSD is under-recognized and under-treated [1, 6, 7, 13-15]. Early recognition of PSD may advance patient's recovery and participation in rehabilitation[1, 3-8, 10-12].

Approximately 8% of the patients are transferred to a rehabilitation centre for an average time of three months[16]. Within this time, nurses have intensive and continuous contact with stroke patients[5, 17], they build a trustworthy relationship with the patient [18] and are in the position to identify subtle symptoms of PSD [5, 17]. Nurses see PSD as an important problem that needs more attention in the daily nursing care [18] and are willing to identify depressive symptoms [17]. Generally used methods in screening patients for PSD are based on adequate communication skills [1, 12, 17, 19-23]. As PSD is strongly associated with communicative and cognitive impairments following stroke [1, 24], these methods are therefore not sufficient. Observational screening tools for nurses on the other hand, could be useful [17] to improve the recognition of depressive symptoms [13, 25].

A few observational instruments have been developed to screen for depressive symptoms, which include the Stroke Aphasic Depression Questionnaire (SADQ-H) [26], the Aphasic Depression Rating Scale (ADRS) [27] and the Signs of Depression Scale (SODS) [28]. The SODS [28] is probably the most promising instrument in daily nursing care, because it was developed by and to be used by nurses in daily care of stroke patients [28], administration does not require training, it is easy and quick to administer [17, 28, 29] and the patient is not directly involved in administration [17]. The SODS is based on the criteria of depressive symptoms concerning the past two weeks[2] and consists of six items with a dichotomous response format. A cut-off of ≥3 in patients without communicative and cognitive impairments showed high sensitivity (83%) and specificity (93%) and a good validity (r=0.79) compared to the Hamilton Depression Rating Scale (HADS) [28]. Despite the yes/no response format to avoid ambiguity inherent in multiple-response scales [28] and produce the least response bias [30], these limited response categories lack precision and detail [31, 32]. Also, the ease of

administration with this response format is presumed smaller [30]. Therefore, the SODS is adjusted to a Dutch four-point rated scale (SODS-R). Research on the psychometric properties and feasibility of the SODS-R is required.

Feasibility of an assessment tool regards clinical appropriateness, ease of administration and outcome relevance [33]. Psychometric evaluation of health status instruments include criterion validity, construct validity and reliability encompassing internal consistency and inter-rater and test-retest reliability [34-37]. Another common outcome is the diagnostic accuracy of an instrument [35] computed through data collected for criterion validity. Criterion validity and diagnostic accuracy are preferably evaluated with the generally used structured clinical interview of the DSM-IV, but is not a sufficient method in stroke patients [1, 12, 17, 19-23]. An alternative reference test could be a psychiatric interview based on the DSM-criteria[2] where patients and their relatives are seen by psychologists. Important limitations of this method are that (1) physicians must request a psychiatric interview due to expenses and (2) the risk for information bias, as relatives rate patient's outcome worse than patients themselves [23, 38-40]. In construct validity, an external validator must correlate with the underlying construct [36]. Physical disability is an useful external validator, because stroke with higher functional impairment appear to have more depressive symptoms [1, 6, 8, 12, 14, 15, 41-44].

Problem statement

Early recognition and treatment of PSD could contribute to quality of care and patients' rehabilitation outcomes. An observational tool for nurses could be useful of which the SODS seems the most promising instrument. This study is a validation of the Dutch four-point rated SODS (SODS-R).

Aim and research questions

In order to contribute to early recognition of depressive symptoms by nurses in stroke patients, the psychometric properties of the SODS-R needs evaluation. The aim of this study is to determine the reliability, validity and feasibility in clinical practice of a four point rated SODS (SODS-R) when used by nurses in the daily care of stroke patient who are admitted to a rehabilitation centre. The following research questions were formulated:

- What is the internal consistency, the inter-rater reliability and the test-retest reliability of the SODS-R when rated by nurses?

- What is the criterion validity of the SODS-R when completed by nurses in identifying depression in patients following a stroke compared with the 9-item Patients Health Questionnaire [45] in the patient and/or a relative?
- What is the construct validity of the SODS-R compared with the Barthel Index[41], an instrument that represents a construct correlated with PSD?
- What is the diagnostic accuracy of the SODS-R in identifying depression in patients following a stroke compared with the 9-item Patients Health Questionnaire [45] in the patient and/or a relative?
- What is the feasibility of the SODS-R when applied by nurses in identifying depression in patients following a stroke?

Method

Design

A quantitative, observational, cross-sectional study was conducted in an inpatient ward of a rehabilitation centre in the Netherlands. This design is appropriate for descriptive psychometric evaluation of health measuring instruments [34, 35, 37].

Participants

The target population consisted of stroke patients admitted to a rehabilitation centre, their relatives and nurses responsible for the care of participating patients. Potential patients were recruited at an inpatient ward of a Dutch rehabilitation centre between May-July 2013. All consecutive patients were approached for participation according a census approach [37], in order to obtain a representative variety in patients. Patients were included if they were aged ≥18 years, had a clinical diagnosis of stroke and a relative available as a proxy. Patients were excluded if they were too ill to participate according to the clinical judgment of nursing staff or researcher. A sample size of at least 50 patients was desired to achieve a good methodological quality [34]. Relatives were included as proxies if they were aged ≥18 years, related to the patient (spouse, child, friend, sibling) and in contact with the patient at least once a week during patients' admission. They were excluded if they were unable to speak or comprehend Dutch. All nurses aged ≥18 years on the ward were included. Nurses temporarily working on the ward were excluded. In case of student nurses, they were included when they were active on the ward for a minimum period of one month and at least in the second year of education.

Ethical considerations

The study was conducted according to the principles of the 59th version of the Declaration of Helsinki[46]. The Medical Ethical Committee of the University Medical Centre Utrecht judged this study not obligatory to the Medical Research Involving Human Subjects Act (11-550/C) and ethical approval was obtained from the rehabilitation centre's Board of Directors.

Measures

The index test on depressive symptoms is the SODS-R, a six item nurses observer-rated screening scale with a four-points Likert response format (0: not at all – 3: nearly every day). Score ranges 0-18 and the Dutch version was available through backward translation [37, 47]. The psychometric properties and feasibility of the SODS-R were evaluated within this study.

The 9-item Patients Health Questionnaire (PHQ-9)[45] was used as a reference test for criterion validity and diagnostic accuracy of the SODS-R. The PHQ-9 consists of nine items on symptoms of depression according to the DSM-criteria [2]. In practise, respondents are asked how often they suffered from any of the symptoms during the previous two weeks listed on a four-points Likert scale (0: not at all present – 3: nearly every day). Total score ranges 0-27 with a score 0-4 indicating no depression, 5-9 a mild depression, 10-14 a moderate depression, 15-19 moderately severe depression and ≥20 a severe depression [45]. In a sample of Dutch stroke patients, the PHQ-9 showed good inter-rater reliability (ICC=0.98) and test-retest reliability (r_s= 0.75) and a strong internal consistency (Cronbach's α=0.79). Compared with the 15-item Geriatric Depression Scale (GDS-15), the optimum cut-point of the PHQ-9 for major depression was 10 [48] and was used in this study. In the outcomes of relatives, the burden was taken into account. The relative's burden was measured with the Caregiver Strain Index (CSI) [49], a 13-item scale with dichotomous answer categories, total score ranges 0-13 with a cut-point ≥7 for considerable strain [50]. The internal consistency of the CSI showed a Cronbach's α=0.86 [49]. In Dutch informal caregivers of stroke patients, the CSI is a valid measure for caregivers' strain[51].

The Barthel Index (BI) [41] was applied for measurement of physical disability as an external validator for the construct validity [35, 36] of the SODS-R. The BI[41] is an observational tool often used for the assessment of physical disability in stroke research [52, 53]. It contains 10 items divided into activities of daily living (ADL) and mobility. The patient is rated for each activity on a three- or four-points Likert scale and total score ranges 0-20, in which higher scores indicate the patient is more independent. In a review, the test-retest reliability and inter-rater reliability were high (r= 0.71-0.99) and outcomes of the BI predict the length of rehabilitation and level of independence [52, 53].

Feasibility of the SODS-R was evaluated with a questionnaire constructed on criteria of practicality [33]; outcome is important to the patient, the instrument is short and easy to administer, questions are easy to understand and acceptable to respondent, it is easily scored and scores are readily understandable. The questionnaire was developed by a two-step procedure [54] and criticised on content validity with a five-round Delphi survey. After development, four nursing experts reviewed the questionnaire. The final questionnaire on feasibility of the SODS-R contains ten items with dichotomous answer categories except for the item concerning the time to fill in the SODS-R.

Procedures

All nurses were informed in a briefing about the study procedure, administration of the SODS-R and the questionnaire on feasibility. Nurses were asked to provide data regarding their gender, age, education level and years of experience. In name of the physician, nurses asked patients' permission for the researcher to approach the patient. Patients and their relatives were informed by the researcher about this study without any obligation. The researcher handed over an information letter and asked after a couple of days for informed consent.

After the researcher received written informed consent, the patient and their relative were invited for a meeting. The researcher screened for communicative impairments with the abbreviated Frenchay Aphasia Screening Test (FAST) [55]. In case of adequate communicative skills, cognitive status was tested with the Mini Mental State Examination (MMSE) [56]. The researcher collected baseline data regarding socio-demographics and administered the BI [41]. In case of adequate communication skill the PHQ-9 [45] was administered as a reference test. In case of communicative and/or cognitive impairments, the researcher collected baseline data about the patient from the relative. Also, relative's socio-demographic data and caregiver's burden were collected. The relative was also asked to administer the PHQ-9 [45] for a proxy measurement.

If requested by the physician, the patient experienced a psychiatric interview based on the DSM-criteria [2] by a psychologist as part of their treatment. The psychologist provided outcomes of the psychiatric interview to the researcher. Two nurses responsible for the care were asked the same day to independently administered the SODS-R. After two to three days, one of the two nurses re-administered the SODS-R. This time period was chosen to reduce the risk that depressive symptoms changed over time. Each time the SODS-R was administered, nurses also filled out a questionnaire regarding the feasibility of the SODS-R.

Statistical analyses

IBM SPSS Statistics Version 20 [57] was used to analyse the data. Descriptive statistics were used to summarize demographic data of participants and for evaluation of the feasibility of the SODS-R. Data from the retest of the SODS-R were used for the internal consistency, discriminatory power and construct validity, because this was at least the second time nurses completed the SODS-R and had several days to establish a trustworthy relationship with the patient. Cronbach's α was conducted to determine the internal consistency of the SODS-R, with a Cronbach's α 0.70-0.95 considered as good [34]. The intra-class correlation coefficient (ICC) one-way model was used for inter-rater reliability, because of different pairs of raters. The ICC two-way mixed model was used for test-retest reliability, because different raters administered the SODS-R twice. An ICC of 0.70 is a minimum standard for reliability[34]. A paired-samples T-test was used to determine differences in ratings on the PHQ-9 from patients and relatives. In case of significant differences, there was adjusted for the relatives' burden. If there was no significant difference between patients' and relatives' ratings, patients' missing data was substituted with relatives' data for further analysis. Receiver Operating Characteristics (ROC) curve was used to determine the appropriate cut-points for the SODS-R. An Area Under the Curve (AUC) of >0.90 indicates high accuracy [58]. Criterion validity of the SODS-R with optimum cut-point was compared with outcomes of the PHQ-9 [45] with a crosstab for diagnostic accuracy. Finally, construct validity was established through the product-moment correlation between the SODS-R, PHQ-9 [45]and the BI [41]. Product-moment correlation of 0.70 is considered sufficient [58]. Cases with missing data were excluded from sub analysis. All tests were two-tailed with an α=0.05.

Results

Of the 23 patients admitted to the neurological ward of the rehabilitation centre during the study period, 10 patients did not take part in this study for different reasons. Therefore, a total of 13 patients and their relatives were included (figure 1). The mean age of the patients was 61 years (SD=12.38, range 39-78) and three (23.1%) of these patients were female. The mean time between the stroke event occurred and admission to the rehabilitation centre was 15 days (SD=15.75, range 3-60) of which 11 patients (84.6%) suffered an ischemia. The mean age of the relatives was 56 years (SD=10.57, range 41-71) and nine (69.2%) were female. A total of 22 nurses working on the ward were included of which 18 nurses were asked to administer the SODS-R. The mean age of these nurses was 41 years (SD=13.65, range 20-64), working 28 hours a week (SD=6.03, range 16-36) and 17 (94.4%) were female (table 1). Nurses who administered and not administered the SODS-R differed slightly in hours working weekly.

The SODS-R was completed 38 times, the BI was completed 13 times, the PHQ-9 was completed 12 times through patients of which two (16.7%) were depressed and 12 times through relatives of which two (16.7%) were depressed. All relatives completed the CSI (figure 1). Eight patients (61.5%) received an psychiatric interview, three (37.5%) outcomes were available and all negative for depression.

Reliability

The internal consistency of the SODS-R administered in a total of 12 times was good (Cronbach's α=0.805). Evaluation of the inter-rater reliability showed a moderate correlation (ICC=0.509, 95% CI -0.014-0.815). Test-retest reliability showed a good correlation (ICC=0.836, 95% CI 0.542-0.949). The mean time between these measurements was 2.92 days (SD=0.76).

Validity and diagnostic accuracy

Outcome of patients on the PHQ-9 (mean=5.64, SD=3.613) compared to outcomes of relatives (mean=6.45, SD=4.845) showed no significant differences (p=0.481). The optimum cut-point for the SODS-R in screening for depressive symptoms was ≥2 (AUC=0.683; 95% CI 0.283-1). This cut-point showed a sensitivity of 66.67%, a specificity of 88.89%, a positive predictive value of 66.67% and a negative predictive value of 88.89%. Diagnostic accuracy of the SODS-R with different cut-point are presented in table 2.

In construct validity, the mean BI score was 16.23 (SD=4.045, range 8-20). The discriminant validity of the SODS-R against functional impairment was significant moderate (r=-0.622, p=0.031) and convergent validity of the SODS-R against the PHQ-9 was low (r=0.559, p=0.059). The PHQ-9 against functional impairment was significant good (r=-0.823, p=0.001).

Feasibility

The questionnaire on clinical utility of the SODS-R was completed 38 times by 18 nurses (mean=2.11, SD=1.079). In 92.1% responses, nurses considered patients could have an interest in the use of the SODS-R. The SODS-R is considered easy to use in daily nursing practice in all of the completed questionnaires. The mean time for administration of the SODS-R was 5,39 minutes (SD=4.98) and this was an acceptable time investment for all nurses. The questions were clear to 88.9% of the nurses, except for interpretation of the response format in which nurses found it difficult to answer the question (in 42.9%). Scores of the SODS-R are readily understandable (84.6%), total score is easy to obtain (97.2%) and considered relevant for the treatment plan (94.1%). Finally, the SODS-R is considered easy to use in 86.5% by the lay-out and answer categories. After repeated use of the SODS-R the

time to administer the SODS-R decreased (6.33 minutes SD=6.453 to 3 minutes SD=1.732). Nurses found it less difficult to answer the questions, except for interpretation of the response format.

Discussion

This study examined the psychometric properties and feasibility of the SODS-R administered by nurses to stroke patients admitted to a rehabilitation centre. The internal consistency, inter-rater reliability and test-retest reliability of the SODS-R were moderate to good. Despite a non-significant correlation between the SODS-R and the PHQ-9, criterion validity showed a cut-point of ≥2 with a moderate sensitivity and good specificity. In construct validity, patients with a more severe physical disability showed a significant higher score on the SODS-R. The feasibility of the SODS-R from nurses' perspective was very good except for the response format, which was subject to interpretations.

A cut-point of ≥2 for depressive symptoms on a dichotomous SODS was already revealed in comparison to a Structured Clinical Interview by a psychiatrist[17], the Hospital Anxiety Depression Scale [29] and the Montgomery Asberg Depression Rating Scale [59] in previous studies. This cut-point gave sensitivities of 64-86% and specificities of 38-65%. Although the SODS with a cut-point of ≥3 compared to the HADS had higher sensitivity (83%) and specificity (93%), those nurses awareness on depressive symptoms may have been greater due to recently conducted studies on depression[28]. Considering the impact of PSD on various factors [1, 3-12], a higher sensitivity is desirable for better detection of depressive symptoms but was not found in this study. The high specificity could be important for clinical practice, as physicians must request psychiatric care.

With respect to the reference test, the DSM-IV diagnosis is considered the gold standard in mental disorders [1, 12, 17, 19-23]. Unfortunately data was missing on the outcomes of the psychiatric interview requested by physicians and altered with use of the PHQ-9 in patients and/or relatives. To our knowledge, this study is the first in which the psychometric properties of the SODS-R were examined in rehabilitation care for stroke patients. Screening for PSD is considered an important responsibility for nurses [60]. However, no mood assessment tools were available for the use of nurses in the rehabilitation centre. Assessments were before this study probably more intuitive than objective.

The main limitation of this study was the methodological quality by the number of participants. A sample size of at least 50 patients was desired [34], although others recommend at least 30 patients [61]. Therefore, data were examined on normality before

statistical analysis. Due to the recruitment procedure of patients, there was a risk for volunteer bias [37]. All consecutive patients were approached for this study, although there is no information available about differences in patients who did and did not take part in this study. Also, use of the SODS-R is not part of routine care and there was difficulty in interpretation of response format, which could cause response bias [37].

Conclusion

In conclusion, the SODS-R is an easy to use instrument with minimal efforts and time. This study showed slight indications for the use of the SODS-R by nurses in a rehabilitation centre, but limited to stroke patients without communicative or cognitive impairments and little physical disability.

Recommendations

Further research is recommended on the psychometric properties of the SODS-R in a larger and more various sample of stroke patients and, if available, compared to outcomes of a psychiatric interview. Also, research of the SODS-R is needed in patients with communicative impairments as about 33% of the stroke patients develop aphasia [62-66]. The use of depression screening instrument in the daily care of stroke patients is of value and nurses are willing to fulfill this task [17]. Regarding the feasibility of the SODS-R, this instrument might be of value in clinical nursing practice. Still, nurses may need more instruction on the response format. Above all, screening for PSD should be part of routine care.

Tables/Figures

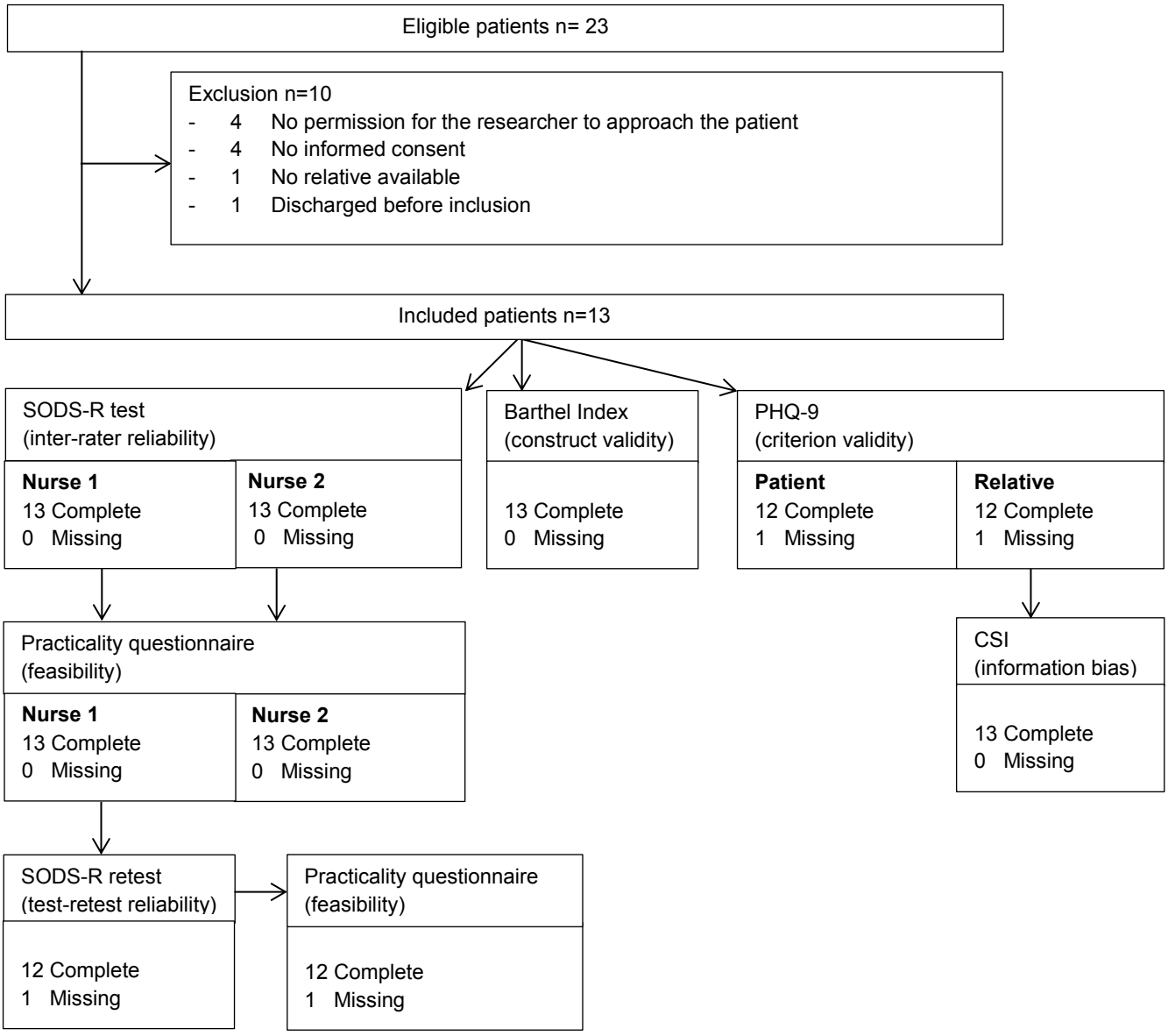

Figure 1 Flow chart of the patients eligible, included, excluded and number of administrations in data collection

Table 1 Demographic characteristics of participants

Patients	**Included n = 13**		
Gender *n* (%)			
Female	3	(23.1)	
Age in years			
Mean (SD) (min-max)	61.85	(12.38)	(39-78)
Marital status *n* (%)			
Married/living together	11	(84.6)	
Partner not living together	2	(15.4)	
Living situation *n* (%)			
Alone	2	(15.4)	
Living with relative	11	(84.6)	
Level of education *n* (%)			
Low	7	(53.8)	
Middle	5	(38.5)	
High	1	(7.7)	
Occupation			
Elementary	1	(7.7)	
Low	4	(30.8)	
Middle	6	(46.2)	
High	2	(15.4)	
Type of stroke *n* (%)			
Ischemia	11	(84.6)	
Subarachnoid haemorrhage	2	(15.4)	
Localization *n* (%)			
Left	5	(38.5)	
Right	3	(23.1)	
Cerebellum	2	(15.4)	
Truncus cerebri	2	(15.4)	
Time since stroke onset in days			
Mean (SD) (min-max)	15.08	(15.75)	(3-60)
MMSE score ≥ 18 *n* (%)	11	(84.6)	
Abbreviated FAST score >15-17 *n* (%)	10	(76.9)	
Modified Rankin Scale	3	(0.91)	(2-4)
Mean (SD) (min-max)			
Psychiatric interview on DSM-criteria *n* (%)			
Not requested	5	(38.5)	
Missing	5	(38.5)	
Not depressed	3	(21.3)	
Relatives	**Included n = 13**		
Gender *n* (%)			
Female	9	(69.2)	
Age in years			
Mean (SD) (min-max)	55.8	(10.57)	(41-71)
Relation with patient *n* (%)			
Partner (married/living together)	9	(69.2)	
Partner (not living together)	1	(7.7)	
Child	2	(15.4)	
Friend	1	(7.7)	
Marital status *n* (%)			
Married/living together	11	(84.6)	
Partner not living together	2	(15.4)	
Living situation *n* (%)			
Alone	1	(7.7)	
Living with relative	12	(92.3)	
Level of education *n* (%)			
Low	5	(38.5)	
Middle	5	(38.5)	
High	3	(23.1)	
Occupation			
Elementary	3	(23.1)	
Low	3	(23.1)	
Middle	5	(38.5)	

High	2	(15.4)	
CSI score ≥ 7 *n* (%)	2	(15.4)	
Nurses	**Included n = 18**		
Gender *n* (%)			
Female	17	(94.4)	
Age in years			
Mean (SD) (min-max)	41.44	(13.65)	(20-64)
Education level *n* (%)			
RN with Bachelor of Nursing	2	(11.1)	
In service training, general nurse	3	(16.7)	
Secondary nurse level 4	8	(44.4)	
Secondary nurse level 3	4	(22.2)	
Student nurse for RN Bachelor	1	(5.6)	
Years of experience as nurse			
Mean (SD) (min-max)	15.60	(12.14)	(0-35)
Years of experience in neurology			
Mean (SD) (min-max)	3.25	(7.01)	(0-28.5)
Years of experience at the unit			
Mean (SD) (min-max)	8.11	(9.26)	(0-34)
Hours working weekly			
Mean (SD) (min-max)	28.61	(6.03)	(16-36)
MMSE = Mini Mental State Examination, FAST = Frenchay Aphasia Screening Test (abbreviated cut-point age ≤60:<17, age 61-70:<16, ≥71:<15), RN = Registrated Nurse			

Table 2 Diagnostic accuracy of the SODS-R

	SODS-R		
Cut-point	*≥1*	*≥2*	*≥3*
Sensitivity	0.667	0.667	0,667
Specificity	0.556	0.889	1,000
Positive predictive value	0.333	0,667	1,000
Negative predictive value	0.833	0,889	0,900
SODS-R= Dutch 4-point rated Signs of Depression Scale			

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