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Original Article

Psychometric properties of the Care Dependency Scale in stroke survivors in Indonesian hospitals

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ABSTRACT

Purpose: This study aimed to evaluate the psychometric properties of the Indonesian version of the Care Dependency Scale (CDS) among stroke survivors.**Methods:** The study was undertaken in four hospitals. We analysed datasets obtained from 109 stroke survivors on inpatient wards and in outpatient clinics, who were rated by nurses to determine the CDS reliability coefficients. The Cronbach's α and Cohen's kappa coefficients were applied. Concurrent validity was conducted for the data on care dependency, which were collected from 49 of these 109 participants on inpatient wards by nurses using the CDS and the Barthel Index. A Spearman's rank correlation analysis was conducted to measure the association between the CDS and the Barthel Index results.**Results:** An analysis of the results of the CDS tested on the inpatient ward and in the outpatient clinic revealed a high level of internal consistency. The reliability analysis yielded the same Cronbach's α coefficient of 0.98 for both the inpatient and outpatient data. A significant, moderate correlation was observed between the CDS and Barthel Index results.**Conclusion:** The CDS can be recommended for use as a tool for the assessment and evaluation of stroke survivors who are receiving acute or long-term care.© 2020 The authors. Published by Elsevier B.V. on behalf of the Chinese Nursing Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

What is known?

- The Care Dependency Scale (CDS) was developed based on nursing theory of needs and has been well-tested in many countries and settings.
- Few studies have been carried out to evaluate the reliability and validity of THE CDS in stroke survivors in the outpatient clinic setting.

What is new?

- This study revealed that the CDS is a reliable and valid instrument when tested in stroke survivors.
- This study revealed that THE CDS is valid and reliable instrument for use on inpatient wards and in outpatient clinics.

- THE CDS was valid comparing with Barthel Index, indicated that the phenomenon of care dependency, as assessed by THE CDS and BI, was represented.

1. Introduction

The World Health Organization (WHO) has reported that 17 million people suffer from strokes annually [1]. In Indonesia, the results of a basic health research study conducted in 2018 indicated that the prevalence of stroke among members of the population older than 15 years of age was 1.9% as opposed to the 0.7% stroke prevalence rate measured in 2013. These findings indicate that the stroke prevalence has increased over the past five years [2]. Stroke is a leading cause of long-term disability, which limits the cognitive and functional abilities of affected persons [3,4]. The severity of this long-term disability determines the subsequent level of care [5–7]. Disabilities related to chronic diseases not only affect the level of care dependency but also add to nursing care burdens, including mental health problems [8,9].

Nurses must provide stroke survivors with varying levels of

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support that are appropriate for their care dependency levels. This support influences the stroke survivor's physical and psychosocial conditions and presents multiple challenges. The caregiver must be able to determine the level of assistance required or the stroke survivor's degree of care dependency to offer him or her appropriate support. The degree of care dependency can vary dramatically on a case-dependent basis but can also change within a case over the course of the disease [10]. Therefore, it is necessary to regularly monitor the degree of care dependency. This helps caregivers identify the outcome of caring and management processes in stroke survivors [11] and also enables them to offer appropriate support once the patient has been discharged from the hospital inpatient ward to an outpatient clinic or another follow-up care facility, such as institutional care. According to Fisher et al. (2011), routinely monitoring the degree of care dependency supports early discharge management [12]. Overall, research results have indicated that monitoring care dependency in stroke survivors is extremely important [13,14]. However, exactly how monitoring supports the evaluation of the stroke survivor's psychosocial dependency level is not yet well-understood.

Several instruments exist that can be used to monitor care dependency, such as the Barthel Index (BI) and the Katz Index of Independence in Activities of Daily Living, although most of these are used to assess physical parameters. While a care dependency instrument that can be used to measure physical and psychosocial aspects has been tested in the hospital and long-term care settings [15], the Care Dependency Scale (CDS) has been tested internationally over a broad range of cases. The CDS was developed based on the Virginia Henderson nursing theory and includes not only physical aspects but also psychosocial aspects that are used to measure care dependency [16]. The CDS has also been tested in surgical and non-surgical settings [17], as well as with more homogenous populations, such as geriatric patients [18–20] and hospitalised, school-aged children [21]. The CDS contains 15 items allowing researchers and clinicians to obtain concise information regarding care dependency in a relatively short period of time. The CDS is available in many languages and requires only 10 min to complete [19]. Moreover, a cutoff point is available that allows nursing staff to determine whether a patient is dependent on nursing care or not [16]. The CDS allows those using it to assess the extent to which the patient is able to meet their personal needs by offering clear categorisations [15]. Therefore, conducting a CDS assessment can provide useful information for stroke survivors who have disabilities and experience difficulties meeting these needs. This study evolved from a larger study in which data on the care dependency of stroke survivors were collected over time [22]. However, equal priority was assigned to evaluating the reliability and validity of these data, and the data collection took place at the same time.

High-quality, reliable and valid instruments must be used to assess the level of care dependency so that they can be useful for clinical practice and research. The results of these assessments must be unbiased and precise, so that health care problems can be properly identified and appropriate decisions can be made [23]. In addition, the use of a valid and reliable care dependency instrument for research purposes supports more applicable clinical outcomes, because reliability and validity coefficients are population-specific and depend on the prevalence of the examined characteristics.

It is also important to assess the psychometric properties of the instrument in specific populations [24]. The psychometric properties of the Indonesian version of the CDS have been tested on a wide range of wards, although a specific focus was placed on pressure ulcers [25]. In our previous study, we reported only the internal reliability (Cronbach α coefficient and kappa values) of the CDS in

stroke survivors [22]. No information was provided about other psychometric properties of the instrument in a stroke population. Therefore, more information is provided in the present study on the reliability and validity of the instrument, and the agreement between raters when used to assess the care dependency of stroke survivors. This study was carried out to determine the validity and reliability of the Indonesian version of CDS among stroke survivors on the inpatient wards and in outpatient clinics in Indonesian hospital settings.

2. Methods

2.1. Study design

This study was conducted to perform psychometric testing of the CDS in stroke survivors. This study was carried out to determine the validity and reliability of the CDS instrument in particular settings: four Indonesian hospitals. First, data for the care dependency of stroke survivors, as measured by the CDS and BI, were collected on inpatient wards at the timepoint of their admission. Second, the care degree of care dependency was once again measured using the CDS in the same stroke survivors who visited the outpatient clinics at a timepoint one week after their discharge from the hospital.

2.2. Participants

Participants on five inpatient stroke wards and in four outpatient clinics at four general hospitals located on the island of Java, Indonesia, were included in the study. Detailed participant information can be found in our previous study [22]. To be included in the study, the participants had to be stroke survivors who were at least 21 years old and had been diagnosed either with an ischemic stroke or intracerebral haemorrhagic stroke. As care dependency levels among stroke survivors on stroke wards were assessed for the early stage of acute management, stroke survivors who had experienced a transient ischemic attack or subarachnoid haemorrhagic stroke were excluded. The two types of stroke patients were considered to have different characteristics; Patients who suffer subarachnoid haemorrhagic strokes usually receive care from early acute management staff in the intensive care unit, and patients who have experienced transient ischemic attacks usually require minimal care and are rarely admitted to the stroke ward.

We expected that a sample size of 125 was necessary with an effect size of 0.25 and a two-sided, 5% significance level and 80% power. We anticipated a 10% attrition rate, and the final recruited sample comprised 138 participants. Twenty-nine CDS data points were lost during the course of the study: Eight participants died on inpatient wards, eleven participants were recommended to continue their health monitoring in the district hospital, and ten participants did not visit the outpatient clinics again for unknown reasons. Eleven participants, who subsequently continued their health monitoring in the district hospital, met the study criteria and were assessed upon their admission to the inpatient ward, but we could not collect any follow-up data, because we were not given permission to collect data from these district hospitals. The characteristics of the stroke survivors included in the study were: 65.1% of the participants were male, 63.3% were younger than 65 years, 71.6% had been diagnosed with ischemic stroke, and 49.5% had comorbidities [22].

2.3. Data collection

All participants were assessed by two trained nurses from the same ward or clinic using the CDS to increase the objectivity of the measurements and minimise measurement errors. The heads of the

respective nursing departments chose a team of raters based on their experience and the availability of nurses. The researcher (NN) delivered 2 h of training and simulation regarding the utilisation of the CDS to all nurses who participated at each hospital. The nurses also received a booklet that contained an explanation of the CDS and instructions on how to complete the CDS instrument. Each trained rater team conducted the assessments on their own ward. At the time the study was carried out, all trained nurses were familiar with the application of the BI. The first and second raters conducted the assessments on the same day, and they were asked not to share their results with each other. The CDS assessment was made by observing each stroke survivor; the nurses reported that the assessment took approximately 15 min per patient. The BI instrument was embedded in the assessment form that was used at each of the hospitals that participated, and this assessment was carried out by the first rater. All participating nurses were instructed in how to use the BI during their initial assessment; only 49 of 109 stroke survivors were assessed by these nurses using the BI. A random selection method was applied to assign the raters and rated participants, whereby the participants were randomly assessed to the nurses. This investigation was conducted from October 2015 to May 2016.

2.4. The instrument

The CDS was originally developed in The Netherlands as a tool used to assess care dependency in residents with dementia, and it was developed based on Virginia Henderson's theory [15]. The latter study reported a 45% level of exact interrater agreement on the CDS sum scores (between a pair of raters), and the interrater reliability was measured as 88%. In the current study, the level of care dependency was assessed using the Indonesian version of the CDS. The Indonesian version was developed in 2012 in three steps that included backward and forward translation, content validity by an expert and a reliability test [25]. The adaptation of the CDS was tested by Amir, who reported that a three-phase design was used with questionnaire translation and psychometric testing. The CDS was translated into Indonesian, and then the content validity was assessed by 18 Indonesian experts. The study showed most Indonesian experts (91.8%) rated the Indonesian version of the questionnaire as "good" based on the clarity of the wording. The interrater reliability intraclass correlation coefficient (ICC) of the Indonesian version of CDS sum score was 0.88 based on this study. In the current study, the level of care dependency was assessed using the Indonesian version of the CDS which includes 15 items. The CDS assessments were scored using a five-point Likert scale that ranged from one (completely care dependent) to five (almost care independent). Between 15 and 75 points per patient can be accrued, with lower values indicating higher levels of care dependency. As in the original classification, the sum scores of the Indonesian version CDS of 15–24 are classified as completely care dependent; 25–44, as to a great extent care dependent; 45–59, as partially care dependent; 60–69, as to a limited extent care dependent; and 70–75, as almost care independent [26]. The term "recreation" refers to the extent to which the patient was able to participate unaided in any leisure activities that provide entertainment inside or outside the hospital [22].

The BI is an instrument that can be used to measure the ability of the patient to perform personal activities necessary for daily life. It was used in the four participating hospitals prior to the study. The BI contains ten items, including personal hygiene, bowel and bladder functions, food preparation and consumption and movements and mobility. A score that ranges from 0 to 100 is generated, and the patient is classified along a scale from completely dependent to independent. The BI has been psychometrically tested in a

stroke care setting and demonstrated to be an acceptable instrument in other countries [27]. No studies have reported an adaptation process for an Indonesian version of BI. However, one study reported a Cronbach α of 0.938 for the Indonesian version of BI in older people [28]. The BI is used to categorize care dependency levels: completely dependent (0–20), severely dependent (25–40), moderately dependent (45–55), mildly dependent (60–95) and independent (100) [28]. The nurse was instructed to use the BI during their initial assessment –at the point of admission –of the stroke survivor on inpatient wards.

2.5. Ethical considerations

Ethical approvals were obtained. The institutional review board numbers for this study are 27–440 ex 14/15 from the Medical University of Graz, Austria, 565/UN6.C1.32/Kep/PN/2015 from the Faculty of Medicine, Padjadjaran University, Indonesia and 589/Panke.KKE/XI/2015 from the Soetomo Hospital, Indonesia. The researcher (NN) explained the study to the nurses and their managers at the participating hospitals. All trained nurses agreed to collect the data after receiving information about the study in written and verbal forms, including its aim, methods and the questionnaires. The nurses who collected data provided the stroke survivor or their legal representative with written information about the study and then received the written informed consent of all participants.

2.6. Data analysis

The data analysis was conducted using the SPSS version 23.0 statistical software Statistical Package for the Social Sciences, IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp. The internal consistency and equivalence of the data were examined for their reliability by calculating the Cronbach's α and Cohen's kappa coefficients. Cronbach's α is a measure of the average correlation among all items in the measurement. Cronbach's α values were interpreted as recommended by Polit and Beck [29], with the coefficient 0.80 or higher considered to be especially important. The Cohen's kappa coefficient is calculated to determine the consistency or equivalence of an instrument by different raters [30]. Cohen suggested the kappa result be interpreted as follows: Values ≤ 0 indicate no agreement, 0.01–0.20 indicate no to slight, 0.21–0.40 indicate fair, 0.41–0.60 indicate moderate, 0.61–0.80 indicate substantial, and 0.81–1.00 indicate almost perfect agreement [31]. Therefore, an interrater procedure was used and the results were analysed by determining the ICC. A value of 0.60 is considered minimally acceptable, and values of 0.75 or higher are considered good [29].

Moreover, Bland-Altman plots were created to measure the level of agreement between the two raters [32]. The Spearman's rank correlation coefficient was determined to measure the correlation scores of an instrument with another external criterion. This coefficient indicates whether a measure is consistent with another criterion that is measured at the same time [29]. This was examined by comparing the data for care dependency based on the values obtained from the CDS and BI assessments. We removed all cases with missing values from all analyses, for example, when we found that the participant could not be rated by the nurses in the outpatient clinic. We analysed the complete datasets obtained from 109 stroke survivors on the inpatient wards and in outpatient clinics, who were rated by nurses to determine the CDS reliability coefficients. In addition, we analysed data collected on care dependency from 49 of these 109 participants on inpatient wards, who were rated by nurses using the BI to assess their concurrent validity.

3. Results

Our research data were collected by a total of 36 nurses from five inpatient wards and four outpatient clinics. The overview of stroke survivor's and nurse's characteristics are shown in Table 1. The results of the reliability analyses of the inpatient data and outpatient data yielded the same Cronbach's α coefficient of 0.98 for the total scores on the fifteen items. The corrected item-total correlation for all items from the inpatient data fell between 0.83 and 0.94, and from the outpatient data, fell between 0.67 and 0.91. The interrater reliability measures are shown in Table 2. The result of the analysis of the inpatient ward data revealed that the highest degree of exact agreement for the item level was observed for the "daily activities" item (0.87), and the lowest degree of agreement, for the "hygiene" item (0.71). From the outpatient unit data, the highest degree of exact agreement for the item level was observed for the "getting (un) dressed" item (0.79), and the lowest degree of agreement was observed for the "learning ability" item (0.68). The ICC values fell between 0.53 and 0.95 for the inpatient data and between 0.80 and 0.92 for the outpatient data.

The results of the interrater agreements can also be seen in Figures (Appendix A), which show the differences between the two raters' assessments of the scale levels and the distributions of care dependency for the stroke survivors. The limits of agreement for the inpatient data were between -14.57 and 14.57 , while the limits of agreement for the outpatient data were between -23.94 and 23.94 , indicating that 95% of scores fell within these ranges.

The result of an analysis of the data from the inpatient wards showed that the score differences ranged from 0 to 43. A minor percentage (i.e. 3.67% of the rating scores) differed by more than 15 points, and the three largest CDS score differences between the raters were 30, 35 and 43. An analysis of the data collected from the outpatient clinics revealed that the score differences ranged from 0 to 59. In this case, 16.51% of the rating scores for these data differed by more than 15 points, and the three largest CDS score differences between the raters were 33, 38 and 59.

To test the validity of the CDS, the Spearman's rank correlation coefficient was calculated to obtain a nonparametric measure of the statistical dependence between the ranking of the CDS and BI total scores for data from 49 out of 109 participants. A correlation coefficient of 0.54 was obtained, which was highly significant ($P < 0.001$, two-tailed test). Table 3 shows the comparison between BI and the CDS.

4. Discussion

4.1. Validity and reliability of the Indonesian version of the Care Dependency Scale

In this study, the CDS was psychometrically tested for its internal consistency, inter-rater reliability/agreement and concurrent validity. This result offers new, valuable information regarding the use of the care dependency instrument in stroke patients. The three most common and popular tools that have been used to measure care dependency in stroke research and practice, namely, the National Institutes of Health Stroke Scale (NIHSS), BI, and Modified Rankin Scale (mRS), were thoroughly reviewed, and we have determined that they address fewer psychosocial aspects [33]. The reliability of the overall CDS in terms of its internal consistency was high in both the inpatient and outpatient settings. If a high level of internal consistency is measured among the CDS items, these items are highly inter-correlated, which is indicative of the fact that the items measure the same thing [29]. The results obtained in this study are comparable with those that have been obtained in previous studies conducted in Germany and Switzerland [17,20].

Table 1

Overview of stroke survivor's and nurse's characteristics [n (%)].

Characteristics	Stroke Survivor	Nurse
Age, Mean \pm SD	59.9 \pm 12.2	36.9 \pm 9.2
Sex		
Male	71 (65.1)	4 (11.1)
Female	38 (34.9)	32 (88.9)
Education		
Diploma nursing program	–	15 (41.7)
Bachelor's degree program	–	21 (58.3)
Education		
None	3 (2.8)	–
Elementary school	31 (28.4)	–
Junior high school	22 (20.2)	–
Senior high school	39 (35.7)	–
University	14 (12.8)	–

The inter-rater reliability of the single items of the CDS was measured by calculating the kappa coefficients, and the results indicated that these were robust for the inpatient data, a finding that agrees with Polit and Beck's recommendation [29]. The obtained scores for the ICC revealed that most values were higher than 0.75, a finding that is also in line with the recommendations of Polit and Beck [29]. These scores (Cohen's kappa and ICC) indicate excellent levels of consistency and conformity among raters when using the CDS. This result is also comparable with that found in the study of Amir [25], who reported a superior level of agreement between the two raters. The values for outpatient data were good for eight items and acceptable for seven items. The authors know of no other study in which the inter-rater reliability of the CDS for outpatients has been tested. These findings indicate that other stroke outpatient care facilities can apply the CDS during the assessment stage. The measured degree of inter-rater agreement provides insights into the extent of the raters regarding specific qualitative items [34]. Nearly perfect agreement was observed among the raters regarding the inpatient data, and moderate agreement was noted among the raters regarding the outpatient data, according to Cohen [31]. Nevertheless, the limits of agreement for both inpatient and outpatient data were comparable with those reported by Amir [25].

The facts that nurses in the outpatient setting have less time to perform the assessment than they do on inpatient wards, and that outpatient nurses might not be as familiar with the use of the assessment instrument as nurses on inpatient wards, may have contributed to the differences observed in the inter-rater reliability and inter-rater agreement between the inpatient and outpatient data.

Because it was desirable to measure concurrent validity, the Indonesian version of the CDS was compared with the BI as another well-established test. The fact that only 49 of 109 stroke survivors were assessed by nurses using BI might be related to their time limitations. For this reason, the BI data were available for 49 participants. A significant correlation was observed between the results obtained using the BI and the CDS, and higher values of care dependency were measured in stroke survivors screened using both instruments. According to Polit and Beck (2017), the higher the value of the correlation coefficient (r), the stronger the evidence for concurrent validity is. However, only a moderate correlation was obtained in this study. In another study in which the relationship between the results obtained using the CDS and the Braden Scale was explored, a strong, positive association was shown between the degree of care dependency and potential risk of developing pressure ulcers [35]. A high degree of correlation has also been shown between results obtained using the CDS and results obtained using another instrument, the Visual Analog Scale, which is

Table 2
Interrater reliability coefficients for CDS items.

CDS items	Inpatient		ICC (1,1) (95% CI)	Outpatient	
	Cohen's kappa			Cohen's kappa	
Eating/drinking	0.84		0.94 (0.91–0.96)	0.78	0.88 (0.83–0.92)
Continence	0.82		0.93 (0.90–0.95)	0.78	0.86 (0.80–0.90)
Body posture	0.76		0.53 (0.38–0.65)	0.76	0.82 (0.74–0.87)
Mobility	0.77		0.77 (0.69–0.84)	0.76	0.84 (0.77–0.89)
Day/night patterns	0.83		0.89 (0.84–0.92)	0.74	0.80 (0.73–0.86)
Getting (un)dressed	0.79		0.92 (0.88–0.94)	0.79	0.88 (0.83–0.92)
Body temperature	0.80		0.81 (0.73–0.87)	0.74	0.82 (0.75–0.87)
Hygiene	0.71		0.91 (0.87–0.93)	0.72	0.89 (0.85–0.93)
Avoidance of danger	0.83		0.93 (0.90–0.95)	0.76	0.88 (0.83–0.92)
Communication	0.83		0.89 (0.84–0.92)	0.78	0.92 (0.89–0.95)
Contact with others	0.85		0.91 (0.88–0.94)	0.71	0.82 (0.74–0.87)
Sense of rules/values	0.84		0.88 (0.82–0.91)	0.71	0.82 (0.75–0.88)
Daily activities	0.87		0.95 (0.93–0.97)	0.76	0.89 (0.84–0.92)
Recreational activities	0.84		0.93 (0.91–0.96)	0.73	0.84 (0.77–0.89)
Learning ability	0.83		0.92 (0.88–0.94)	0.68	0.81 (0.74–0.87)
Sum Score	0.82		0.94 (0.92–0.96)	0.60	0.75 (0.66–0.82)

Note: CDS=Care Dependency Scale; ICC = intraclass correlation coefficient; CI = confidence interval; ICC (1,1) = one-way random, single score; An ICC value of 0.60 is considered minimally acceptable.

Table 3
Comparison between barthel index and care dependency scale (n = 49).

Care dependency level	Barthel Index		Care Dependency Scale	
	n	%	n	%
1	15	30.6	16	32.7
2	14	28.6	9	18.4
3	9	18.4	7	14.3
4	7	14.3	11	22.4
5	4	8.2	6	12.2

used to assess the individual's perception of their symptoms [21].

Despite the fact that only a moderate correlation was observed between the BI and CDS assessment results, the CDS is considered a reliable and valid tool for use with stroke survivors in inpatient and outpatient settings. These two settings have different foci with respect to stroke survivor care; the inpatient ward is an acute-care setting in which patient support is provided after critical, life-threatening events –such as a stroke –have occurred, and the outpatient clinic staff is responsible for providing long-term care to treat stroke survivors with residual disabilities. In fact, the large changes observed in the levels of care dependency among stroke survivors from the time of their hospital admission to their discharge to inpatient wards were followed by more fluctuations in outpatient clinics [22].

The CDS can be used as a tool by staff to support continuity in care-dependency monitoring, in that the same instrument can be used in both the inpatient and outpatient settings. Furthermore, its use makes it easier for nurses and caregivers to track the care recipient's achievements in terms of alterations in their levels of care dependency after receiving treatments [36]. The use of a valid and reliable instrument during the assessment process is an important part of standardised care plans [37]. By assessing care dependency based on the physical and psychosocial aspects of stroke survivors, they can be fully engaged in the treatment process, which can be followed up by an outcome evaluation [38,39].

4.2. Strengths and limitations

The major strength of this study is that it is the first study of its type to have been conducted in stroke survivors on both inpatient wards and in outpatient clinics in Indonesia. Another strong point

of this study is that it was conducted in four different hospitals. During this study, the reliability of the data was evaluated by different raters, and powerful evidence for its reliability was collected. On the basis of these results, we determined whether a consensus in the scores of two raters could be obtained when they used the same measurement instrument [34].

One limitation of this study was that the number of participants was rather low with regard to the purpose of the validity analysis, and our sampling size might have had “small” effect size. However, we applied an acceptable power and significance level for the sampling calculation. In addition, although nurses were instructed to use the BI and CDS during their initial assessment of the patients, time limitations might have acted as barriers, preventing nurses from using two care dependency tools at the same time in the daily clinical practice.

In the future, data collection strategies for completing the two instruments (BI and CDS) can be defined in more restrictive or mandatory ways. Additional confirmatory and exploratory factor analyses need to be conducted to provide further support for construct validity and comprehensively test the CDS instrument in stroke survivors. Moreover, additional studies should be carried out to define the practicability and usefulness of the CDS in more detail in specific settings and, in particular, with patient and informal caregiver populations.

5. Conclusions

The CDS can be used by nursing professionals to assess and evaluate stroke survivors in both inpatient and outpatient settings. As a valid and reliable instrument, the use of the CDS may assist nurses in decision-making and allow them to more efficiently assess the individual care needs of stroke survivors in inpatient and outpatient settings. Based on the results of this study, we recommend the regular use of the CDS as a tool to assess the level of care dependency for the acute to long-term care of stroke survivors during the nursing process. This will also help physicians and nurses test the effectiveness of interventions used with this patient group. Additional nursing research should be conducted with a larger number of stroke survivors to investigate the usefulness of another kind of validity test, such as construct validity, and determine the practicability and usefulness of the CDS from the nurses' perspectives.

Author statement

Nursiswati Nursiswati: Conceptualization, Methodology, Investigation, Data curation, Writing- Original draft preparation. **Ruud J. G. Halfens:** Conceptualization, Methodology, Writing-Original draft preparation. **Christa Lohrmann:** Conceptualization, Methodology, Writing- Reviewing and Editing.

Declaration of competing interest

The authors declare no conflicts of interest, real or perceived, financial, or non-financial.

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Appendices. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2020.06.011>.

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