



Original Article

Validity and reliability test of NIHSS-SDKI and CNS-SDKI in determining actual nursing diagnosis and severity of stroke patients

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A B S T R A C T

Background: The National Institutes of Health Stroke Scale (NIHSS) and The Canadian Neurological Stroke Scale (CNS) are two assessment tools often used for the assessment of neurological status in stroke patients. However, there are no assessment tools that use the standard nursing diagnoses developed in Indonesia, namely the Standar Diagnosis Keperawatan Indonesia (SDKI), developed by the Indonesian National Nurses Association organization.

Objective: This study aims to test the validity and reliability of the NIHSS and CNS combined with the SDKI so that they can be used to ensure the accuracy of the measuring instrument, determine its consistency, improve the quality of the assessment, and provide a basis for further research.

Methods: This study is an observational study with a cross-sectional study design. The study was conducted at hospitals in Pontianak City, namely Tanjungpura University and Sultan Syarif Mohammad Alkadrie Hospital. The population in this study were all non-hemorrhagic stroke patients treated in the hospital, with a sample size of 30 patients. Sampling in this study was conducted using purposive sampling. Data collection began with the preparation of NIHSS and CNS instruments combined with SDKI, and then respondents' demographic data were collected. Data were analyzed using Pearson Correlation with SPSS statistical tools.

Results: Based on the results of the validity and reliability tests, it was found that the NIHSS-SDKI and CNS-SDKI had a calculated r value > from the r table and Cronbach alpha value > 0.7 so that the NIHSS and CNS instruments were declared valid and reliable.

Conclusion: Research on the NIHSS-SDKI and CNS-SDKI is valid and reliable, and it can be used as a tool to measure severity and help nurses make nursing diagnoses in accordance with the Indonesian Nursing Diagnosis Standards.

INTRODUCTION

Stroke is the third leading cause of disability and the second leading cause of death worldwide.²⁻²¹ The incidence rate of stroke in people older than 15 years in Indonesia was 10.9 cases per 1,000 people.³ Therefore, Indonesia is in second place in the world after Mongolia.¹² In West Kalimantan, the prevalence of stroke is 5.8% per 1,000 diagnosed people and 9.82% per 1,000 people who have no symptoms or symptoms. Based on preliminary studies conducted in several hospitals in Pontianak, it was found that there are currently no nurses using the combined NIHSS and CNS with SDKI to measure the severity of stroke patients. There are several other stroke severity assessments commonly used in clinical practice, including Glasgow Coma Scale

(GCS), Scandinavian Neurological Stroke Scale (SNSS), Orgogozo Stroke Scale (OSS), Canadian Neurological Stroke Scale (CNSS), Hemispheric Stroke, Mathew Stroke Scale (MSS), European Stroke Scale (ESS).²³ The NIHSS and CNS are assessment tools developed overseas, which have not been fully adapted to the local context and culture of Indonesia, especially in Pontianak. Combination with SDKI (Indonesian Nursing Diagnosis Standards) can make these tools more relevant and contextualized in the nursing care environment in Indonesia.²⁶

Tested measurement tools are essential to maintain the quality and validity of research.²⁰ The NIHSS has shown validity with an r count of 0.40, and a reliability test yielded a Cronbach alpha of 0.86, confirming its effectiveness as a data collection tool.¹⁰ The CNS also demonstrated validity

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with an *r* count of 0.94 and a Cronbach alpha of 0.96.¹⁹ NIHSS includes eleven items scored from 0 to 4, with total scores ranging from 0 to 42, indicating higher neurological deficits with higher scores.¹¹ CNS provides a standardized assessment of cognitive and motor functions in stroke patients, categorizing strokes as mild (CNS \geq 8), moderate (5-7), or severe (1-4).²²

Research on the effectiveness of neurological deficit assessment tools on the enforcement of nursing diagnoses in stroke patients has been done before. Still, it has not yet measured validity with a combined SDKI. NIHSS and SSS are also equally effective in determining the actual nursing diagnosis in stroke patients. Likewise, the NIHSS and ESS are also equally effective in determining nursing diagnoses in stroke patients.⁹ Furthermore, researchers want to test the validity and reliability of the NIHSS-SDKI and CNS-SDKI in determining the degree of severity and determining nursing diagnoses. CNS, when compared to other measurement scales, is easier and faster and does not require in-depth neurological evaluation.²²

In Indonesia's healthcare context, particularly in hospitals with limited resources, the CNS is an easy and quick tool. The National Stroke Foundation recommends the NIHSS for assessing stroke severity. Combining the CNS's simplicity with the NIHSS's proven validity offers a comprehensive stroke assessment approach that aligns with Indonesian nursing standards and culture. Before incorporating these tools with the SDKI, their validity and reliability were tested. This research aims to address gaps in stroke care, improving the quality of care, severity assessment, and nursing diagnoses.

METHOD

Study Design

This study is an observational study with a cross-sectional design.

Setting and Respondents

This study was conducted at Sultan Syarif Mohammad Alkadrie Hospital and Tanjungpura University Hospital Pontianak from April to May 2024. The population in this study were stroke patients treated in the neurology room. The research sample in this study were all non-hemorrhagic stroke patients who were hospitalized in the hospital, with a total sample of 30 patients. The inclusion criteria in this study were non-hemorrhagic stroke patients who were over 18 years old and willing to be respondents, and the exclusion criteria that were not included in this study were patients under 18 years old, hemorrhagic stroke patients, and unwilling respondents. Sampling in this study was carried out using purposive sampling.⁶

The Variable, Instrument, and Measurement

The variables in this study are the severity of stroke and nursing diagnoses based on the SDKI that appear in stroke patients. The instruments used in the assessment were the

NIHSS and CNS assessments combined with the SDKI.8-9 Measurement using Pearson correlations by comparing the calculated *r* count with the *r* table.

Data Analysis

Testing was conducted with the help of a computer software program in the form of SPSS to test the validity and reliability of the NIHSS-SDKI and CNS-SDKI assessments as tools to determine nursing diagnoses and severity in stroke patients. Validity testing was conducted using Pearson correlation analysis to measure the correlation between each item and the overall scale, ensuring that each item accurately reflects the measured concept.

Ethical Consideration

The Ethics Commission of The ITEKES Muhammadiyah Kalimantan Barat registered the research protocol with registration number 71/II.I.AU/KET.ETIK/II/2024.

RESULTS

Table 1 shows the characteristics of the respondents. The most significant number of respondents were male (56.7%), with an average age of <60 years (53.3%). Respondents' occupations included civil servants, self-employed, and retirees, representing 23% of the sample. The average educational background was high school graduates and college graduates, each 40%. Respondents had comorbidities other than stroke, representing 63.3%, and 62.1% had never had a stroke before.

Table 1. Characteristics of Respondent (n=30)

Characteristics	Result
Gender	
Male	17 (56.7%)
Female	13 (43.3%)
Age, years	
< 60	16 (53.3%)
\geq 60	14 (46.7%)
Occupation	
Civil Servant	7 (23%)
Self-employed	7 (23%)
Unemployed/House Mother	6 (20%)
Retirement	7 (23%)
Others	3 (10%)
Education	
Elementary School	3 (10%)
Junior High School	3 (10%)
Senior High School	12 (40%)
No Formal Education	12 (40%)
Medical History	
No history of disease other than stroke	11 (36.7%)
Having a disease other than stroke	19 (63.3%)
Stroke History	
There was a previous stroke	11 (37.9%)
No previous stroke history	19 (62.1%)

Table 2. Validity test of NIHSS-SDKI

Assessment Components	r-table	r-count	r-count	Result
		NIHSS (SDKI)	NIHSS (Severity)	
Degree of consciousness	0.361	0.888	0.884	Valid
Answer the question	0.361	0.667	0.806	Valid
Following orders	0.361	0.775	0.797	Valid
Horizontal conjugate eye movement	0.361	0.634	0.832	Valid
Field of view	0.361	0.482	0.609	Valid
Facial Paresis	0.361	0.398	0.500	Valid
Right arm motor	0.361	0.571	0.740	Valid
Left arm motor	0.361	0.665	0.699	Valid
Right limb motor	0.361	0.648	0.730	Valid
Left limb motor	0.361	0.681	0.713	Valid
Limb ataxia	0.361	0.509	0.755	Valid
Sensation or grinning	0.361	0.658	0.826	Valid
Commands in the general neurology examination process	0.361	0.775	0.893	Valid
Disartria	0.361	0.818	0.537	Valid
Unilateral Negleg or no attention	0.361	0.658	0.797	Valid

Table 3. Validity Test of CNS SDKI

Aspects	Assessment Components	r-table	r-count	r-count	Result
			CNS (SDKI)	CNS (Severity)	
Mental Functions	Awareness Level	0.361	0.525	0.927	Valid
	Orientation	0.361		0.908	Valid
	Communication	0.361		0.934	Valid
Section A1 (Impairment In Cognitive Function) Motor Function (Weakness)	Face	0.361	0.525	0.711	Valid
	Arm (Proximal)	0.361	0.902	0.713	Valid
	Arm (Distal)	0.361		0.985	Valid
	Leg (Proximal)	0.361		0.887	Valid
	Leg (Distal)	0.361		0.985	Valid
Section A2 (Disability In Cognitive Function) Motor Response	Face	0.361	0.967	0.677	Valid
	Both Arms	0.361	0.570	0.677	Valid
	Both Legs	0.361		1.000	Valid

The results listed in Table 2 show the correlation value of each question of 0.361, which refers to the r-table where the test results obtained the calculated r-value > from the r-table so that this shows that the NIHSS questionnaire has been declared valid and can be used in measurements to determine nursing diagnoses and measure the severity of stroke patients.

Table 4. Reliability Test

Assessment Components	Cronbach alpha	Result
NIHSS SDKI	0.799	Reliabel
NIHSS Degree of Severity	0.834	Reliabel
CNS Degree of Severity	0.857	Reliabel
CNS Degree of Severity A1	0.866	Reliabel
CNS Degree of Severity A2	0.911	Reliabel
CNS-SDKI	0.834	Reliabel
CNS-SDKI A1	0.866	Reliabel
CNS-SDKI A2	0.811	Reliabel

Table 3 shows the correlation value of each question of 0.361, which refers to the r-table where the test results obtained the calculated r-value > from the r-table. This shows that the SSP questionnaire can assess the severity level and establish nursing diagnoses in stroke patients.

While Table 4 shows the reliability test results that the researcher conducted, the Cronbach alpha value > 0.6 results show that all measuring instruments tested have been declared reliable and can be used to collect research data.

DISCUSSION

Findings This study demonstrated that the NIHSS-SDKI and CNS-SDKI instruments are highly valid and reliable for assessing stroke severity and determining relevant nursing diagnoses. Development of these instruments involved integrating specific nursing diagnoses with NIHSS and CNS items related to common stroke symptoms, resulting in 12 standardized diagnoses. This integration improved diagnostic accuracy by allowing nurses to select the appropriate diagnosis based on symptoms and patient assessment findings.

For the NIHSS, assessment items related to consciousness, motor function, and sensation were combined with the IDHS to reflect common stroke-related complaints such as impaired verbal communication, physical mobility, and self-care deficits. This integration supports the implementation of these scales in local nursing

practice in Indonesia. The NIHSS has demonstrated high validity ($r = 0.500-0.893$) and reliability (Cronbach's $\alpha = 0.834$) in assessing stroke severity, which is consistent with previous studies that have demonstrated the effectiveness of the NIHSS in documenting neurological status and predicting treatment outcomes, especially when used in conjunction with a neurologist for rapid intervention.¹³⁻¹⁵

In the NIHSS assessment, several items were combined with the SDKI because of their alignment with the assessment results and patient complaints. For example, consciousness items correlate with nursing diagnoses such as ineffective airway clearance, decreased intracranial adaptive capacity, impaired sensory perception (vision, touch, kinesthetic), impaired verbal communication, urinary incontinence, fecal incontinence, and cerebral perfusion risk.⁷ The Canadian Neurological Scale (CNS) consists of 8 items that measure consciousness, orientation, speech ability, motor function, and facial weakness, with a maximum score of 11.5 in normal individuals. The CNS is easier and faster to use than the NIHSS, although it detects fewer stroke-related disorders. The CNS has also been validated for retrospective use based on information on the available patient medical records.¹

This study shows that the CNS and NIHSS are valid and reliable instruments for determining stroke severity and nursing diagnoses. Validity testing was carried out by selecting non-hemorrhagic stroke patients, who were assessed using both instruments simultaneously by two nurses. This study was conducted in a hospital equipped with CT-Scan facilities and neurologists, which allows effective NIHSS assessment to detect intracranial hemorrhage and determine rt-PA therapy.^{13,16-18}

NIHSS and CNS were reliable in assessing stroke patients in hospitals with or without neurology consultation services. One of the main advantages of CNS is its ease of use, making it more suitable in situations where neurologists are unavailable. However, NIHSS remains superior for more detailed neurological documentation and prediction of treatment outcomes.^{4,5} Overall, this study confirms that NIHSS and CNS are effective and reliable tools for assessing stroke severity and determining appropriate nursing diagnoses for stroke patients, thus significantly contributing to improving hospital stroke care.

CONCLUSIONS AND RECOMMENDATION

This study has demonstrated that the NIHSS-SDKI and CNS-SDKI instruments are valid and reliable for assessing stroke severity and determining relevant nursing diagnoses. By integrating nursing diagnoses with specific stroke-related items from NIHSS and CNS, diagnostic accuracy has been significantly enhanced, allowing nurses to make more informed decisions based on patient symptoms and assessment findings. The NIHSS has proven to be a highly valid and reliable tool for measuring stroke severity. At the

same time, due to its simplicity and ease of use, the CNS is particularly advantageous in settings where neurologists may not be immediately available. Both instruments effectively identified key nursing diagnoses and can be confidently used in clinical practice to improve stroke patient care.

Future research should consider broader validation studies involving larger and more diverse stroke patient populations, including those with hemorrhagic strokes, to further establish the reliability and validity of both the NIHSS-SDKI and CNS-SDKI instruments across various stroke types. Furthermore, future research must focus on structured training programs for nurses, ensuring that these instruments are applied consistently and accurately across healthcare settings to optimize patient outcomes. Lastly, expanding research to primary care or community healthcare settings would be valuable in assessing how these tools perform in non-hospital environments, particularly in areas with limited access to neurologists. These directions will help further enhance the application of these tools in stroke care, improving diagnostic accuracy, intervention timing, and overall patient outcome.

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