

Performance of staff nurses providing care to patients with cerebrovascular stroke at intensive care units: prevalence and influencing factors

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ABSTRACT

Background: Nurses have a critical role in the care of stroke patients, especially in the first 24 hours. Their performance needs to be scrutinized. **Aim of the study:** to assess staff nurses' knowledge and practices regarding patients with cerebrovascular stroke (CVS) at intensive care units (ICUs) and identify their influencing factors. **Subjects and methods:** The study was conducted in at Zagazig University Hospitals' ICUs using a cross-sectional analytic design on 80 staff nurses in the setting. Data were collected using a self-administered questionnaire for knowledge and an observation checklist for their practice. All administrative and ethical requirements were fulfilled. **Results:** Nurses' median age 28.5 years, with more females (68.8%), having diploma degree (77.5%). Overall, 56.3% had satisfactory knowledge, and none had adequate total practice. In multivariate analysis urban residence, the number of training courses attended and the number of sources of information were significant positive predictors of staff nurses' knowledge score, while urban residence, higher qualification, and the number of sources of information were significant positive predictors of their performance while age was a negative predictor. **Conclusion and recommendations:** The staff nurses providing care to CVS patients in the study settings have deficient knowledge and practice that are influenced by their age, residence, qualification, training, and sources of information. Specialized training programs, clear guidelines, and close performance monitoring are recommended.

Keywords: Cerebrovascular Stroke, Knowledge, Performance, Nurses,

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INTRODUCTION

Stroke is a leading cause of death and disability. It is defined as rapidly developing signs of focal or generalized disturbance of cerebral functions lasting more than 24 hours or leading to death (*Patel et al., 2019*). It might be due to cerebral hemorrhage or ischemia (*Khaku and Tadi, 2020*). The commonest underlying risk factors include hypertension, diabetes mellitus, hypercholesterolemia, physical inactivity, obesity, genetics, and smoking (*Hui et al., 2020*). Meanwhile, cerebral emboli commonly originate from the heart, and may lodge in areas of preexisting stenosis (*Tadi and Lui, 2020*). The etiologic cause affects both the prognosis and outcomes of stroke patients (*Ntaios, 2020; Pierik et al., 2020*).

The first 24 hours are critical and strongly affect the prognosis of stroke patients. In the first 12 hours, there are no significant macroscopic changes, but only cytotoxic edema related to energy production failure with neuronal cellular swelling. Such edema causes swelling of the infarcted area and increases in intracranial pressure. This phase may be best visualized with MRI (*Chung et al., 2018*). The complications of stroke may include pneumonia, urinary tract infection and/or incontinence, fits, decubitus ulcers, muscle contractures, as well as hypotension or hypertension (*Fekadu et al., 2019; Verma, 2019; Vyas et al., 2019*).

When a suspected acute stroke patient presents to the accident and emergency unit, a rapid initial stroke screen is conducted by clinicians. Care providers ensure a patent airway, adequate oxygen saturation, and temperature control. Close monitoring and management of neurological status, blood glucose, blood pressure, hydration status and temperature are done at 4 to 6 hourly intervals or shorter as per case protocol (*Purvis et al., 2018*). Oral medications or fluids are not permitted, until a bedside swallow evaluation is done. Tissue Plasminogen Activator (tPA) is the gold standard for treating ischemic stroke. It digests fibrin strands and restores oxygen-rich blood flow to the brain but puts patient at risk for bleeding (*American Heart Association, American Stroke Association, 2020*). Innovative endovascular catheter devices have been shown to be the most effective at restoring blood flow and removing thrombi (*The Joint Commission, 2020*).

Patients with stroke need quality nursing care to improve their prognosis. Nurses' role in providing such care involves caring not only for their physical needs but also for their psychosocial wellbeing (*Loft et al., 2022; Wang et al., 2022*). Thus, in dealing with stroke patients, nurses must apply the main nursing principle of delivery of holistic care (*Saban et al., 2022*). Early detection of any abnormal symptoms/signs and proper management and follow-up is effective in reducing the rate of hospital re-admissions of stroke survivors (*Chauhdry, 2022; Mitchell et al., 2022*).

Stroke is a major health problem in Egypt. The nurses providing care to stroke patients have a critical role, particularly in the first 24 hours, in reducing the risk of complications and improving functional recovery. Therefore, this study will provide important information regarding the performance of these nurses, with elucidation of the factors affecting their performance.

AIM OF THE STUDY

The aim of this study was to assess staff nurses' knowledge and practices regarding patients with cerebrovascular stroke (CVS) at intensive care units (ICUs) and identify their influencing factors.

SUBJECTS AND METHODS

Research design and study setting: This cross-sectional analytic study was conducted in at the medical, stroke, and neurological Intensive Care Units (ICUs), at Zagazig University Hospitals.

Subjects: The study sample consisted of all 80 staff nurses providing care for the patients having cerebrovascular stroke in the setting and who agreed to participate.

Data collection tools: The data were collected using a self-administered questionnaire and an observation checklist.

The self-administered questionnaire was intended to assess staff nurses' knowledge regarding stroke and related nursing care. It was developed by the researcher based on review of pertinent literature (*Endacott et al., 2009; Morton and Fontaine, 2009*). It included a section for nurse's personal characteristics as age, gender, marital status, nursing qualification, experience years, residence, and previous training courses. It also collected information about the unit instructions and resources related to the care provided to stroke patients and asked about the occurrence of nursing errors. The knowledge part consisted of 26 Multiple Choice Questions (MCQs), 30 True/False questions and one 8-item ranking question about cerebrovascular stroke (CVS) and related nursing care. For Each question correctly answered had a score "1" and "0" if incorrect. The scores were summed-up and converted into percent scores. The knowledge was categorized as "satisfactory" if the percent score was 60 or higher, and "unsatisfactory" if less than 60.

The observation checklist was used to assess nurse's practice. It was quoted from the researcher's master's degree Thesis (*Mohammed, 2017*) where it was adopted from *Lynn and Lebon (2008)* and *Miller and Mink (2009)*. It included sections for primary assessment (18 items), secondary assessment (42 items), and nursing care practice (47 items). Each item was checked as "done," "not done," or "not applicable." The "done" and "not done" were scored "1" and "0" respectively, whereas the "not applicable" were left blank and discounted from the total

attainable score. The scores of the items of each area and of the whole checklist were summed-up and converted into percentage scores. The nurse's practice was regarded as adequate if the score was 80% or higher, and inadequate if less.

Tools validity and reliability: This was carried out by 2 professors and 2 assistant professors in medical-surgical nursing, and 3 lecturers in internal medicine from zagazig University. They reviewed the tool for clarity, relevance, comprehensiveness, simplicity, and applicability; minor modifications were done according to their comments. The reliability of the observation checklist was assessed through its internal consistency using the split-half method. It showed a high level of reliability with Guttman split-half coefficient = 0.83.

Pilot study: Before performing the main study, a pilot study was conducted on 10% of the sample to test the feasibility and applicability of the tools used in this study. The staff nurses included in the pilot study were not included in the main study sample.

Fieldwork: After securing official permissions to conduct the study, the researcher met with the units' nursing directors to set a schedule for data collection. The researcher explained the aim of the study and its processes to all staff nurses. They were all informed about their ethical rights and provided their verbal consents. The researcher assessed staff nurses' practice using the observation checklist during morning and afternoon shifts of post patient admission while providing care to CVS patients. Then, the self-administered questionnaire was handed to each staff nurse with clear instructions about its filling. They completed it in the presence of the researcher to ensure validity of responses. It took about 35-45 minutes by each nurse to fill the form.

Limitation of the study: The patients' turnover was high so that the staff nurses had not enough time to answer the questionnaire sheet according to estimated time.

Administrative design and ethical considerations: An official letter was issued from the Dean of the Faculty of Nursing, Zagazig University, to the Director of Zagazig University Hospitals explaining the aim of the study and its maneuvers and requested the permission for data collection.

An approval of the research protocol was taken from the scientific research ethics committee in the Faculty of Nursing at Zagazig University before starting the study. The researcher clarified the aim of the study and its process to the staff nurses. Each participant was informed about the right of voluntary participation and of withdrawing from the study at any time without giving any reasons. They were also reassured about anonymity and confidentiality of any collected data.

Statistical analysis: Descriptive statistics were used to present data as frequencies and percentages for qualitative, and means, standard deviations and medians for quantitative ones. Analytic statistics included Spearman's rank correlation for the relations among quantitative and

ranked variables. Multiple regression analysis was applied for identification of the independent predictors of staff nurses' scores of knowledge and practice. The level of statistical significance was set at p -value <0.05 . All analyses were performed on SPSS 20.0 statistical package.

RESULTS

The study sample consisted of 80 staff nurses 23 to 54 years old, median 28.5 years as presented in Table 1. The highest percentages were females (68.8%), married (65.0%), and carrying a diploma degree in nursing (77.5%). Their medians of total and current position experience were 11.4 and 5.0 years, respectively. Slightly less than three-fourth of them were residing in rural areas (73.8%), and more than two-thirds reported having previously attended training courses. The most commonly reported were the training courses in infection control (88.8%).

Table 2 indicates that around two-thirds of the staff nurses (67.5%) reported that their units had instructions for stroke patient care, and these were mostly clear (71.3%). The unit related resources were lowest regarding the manpower (32.5%). Meanwhile, slightly more than half of the staff nurses (52.5%) admitted that there are nursing errors in stroke patient care. The most commonly reported cause of such errors was the manpower shortage (88.1%), while the least was the lack of equipment (28.6%). Experience was the most frequently reported source of information (53.8%), followed by study (42.5%). On the other hand, only 2 (2.5%) of them reported reading.

Table 3 shows that staff nurses' knowledge of stroke patient care was variable. The percentages of staff nurses having satisfactory knowledge were as low as 27.5% and 37.5% in the areas of nursing management and risk factors, respectively. On the other hand, the majority of the staff nurses had satisfactory knowledge regarding definition (76.3%), complications (72.5%) and prognosis (83.8%). Slightly more than half of the staff nurses had satisfactory total knowledge (56.3%). The median knowledge score was 63.30.

As Table 4 displays, staff nurses' practices related to care of stroke patient was very low, particularly regarding secondary assessment where none of them had total adequate practice. On the other hand, the most adequate practice was related to airway assessment (46.3%). The median practice score was 53.0 (out of 88.0). Meanwhile, none of the staff nurses had adequate total practice.

Table 5 demonstrates no statistically significant correlations between staff nurses' scores of knowledge and practice areas or total practice. Meanwhile, statistically significant positive correlations were found between primary assessment and secondary assessment and nursing interventions scores. The table also indicates statistically significant weak negative correlations

between staff nurses' scores of nursing interventions and total practice and their age and experience years, the strongest being between total practice score and total experience years ($r=0.32$). Lastly, a statistically significant weak negative correlation was identified between staff nurses' scores of secondary assessment and their current experience years ($r=0.26$).

The multivariate analysis (Table 6) identified urban residence, as well as the number of training courses attended and the number of sources of information as statistically significant independent positive predictors of staff nurses' knowledge score. The model explains 19% of the variation in their knowledge score. None of the other staff nurses' characteristics had a significant influence on this score.

As regards performance, the table shows that urban residence, higher nursing qualification, and the number of sources of information were its statistically significant independent positive predictors. On the other hand, age was a statistically significant independent negative predictor. The model explains 20% of the variation in staff nurses' performance score. It is to be noted that the knowledge score was not a significant predictor of the performance score.

DISCUSSION

The aim of the present study was to assess the performance of the staff nurses providing care to patients with cerebrovascular stroke in intensive care units at Zagazig University Hospitals and identifying the related influencing factors. This was done through measuring their related knowledge and practice. The results revealed generally deficient knowledge and inadequate practice. These are influenced by staff nurses' personal as well as job characteristics.

The study sample included staff nurses with a wide range of age and experience years. However, a majority of them were carrying a diploma degree in nursing. Such a lower level of qualification might be an underlying factor explaining their deficient performance. Nonetheless, a considerable proportion of them had previously attended relevant training courses, a factor that could compensate for their low qualification level. In fact, the present study results identified a higher level of nursing qualification as a statistically significant independent positive predictor of staff nurses' practice score. A similar finding was reported in a study of staff nurses' awareness of stroke patients' care in Japan (*Hisaka et al., 2021*).

According to the present study, around two-thirds of the units had clear instructions for stroke patient care. This means that about one-third of the units had no such instructions, which is an alarming situation that may jeopardize the quality of CVS patients' care given that their staff nurses work without guidance. The finding might explain the relatively high rate of nursing errors in stroke patient care, where more than a half of them confirmed the occurrence of such errors in their units. In congruence with this, a study in Iran identified the lack of guidelines and clear instructions as a main factor underlying the occurrence of nursing errors (*Monfareddi et al., 2022*).

As regards the resources in the present study units, the main shortage was in manpower. This would lead to high workload and job stress, which would certainly increase the chances of occurrence of nursing errors. In fact, a majority of the staff nurses admitted that the nursing errors in stroke patient care were mostly due to manpower shortage. In agreement with this, a study of the factors influencing medical errors among staff nurses in China, a significant association was found between the frequency of errors and the shortage of nursing staff (**Wang et al., 2022**).

As reported by the staff nurses in the present study sample, the main source of information was their experience, followed by their study. These could constitute another factor underlying their deficient knowledge and practice, depending on their experience, which could be faulty, and on their study information that have certainly waned by time and became outdated. In support of this, significant negative correlations were revealed between staff nurses' practice scores and their experience years, both current and total. Surprisingly, only two of them reported reading as a source of information. This could be attributed to the general negative attitude towards reading, but also could be due to lack of suitable reading materials or lack of time. For this, **Sinan et al. (2023)** in a study of eHealth literacy in nursing in Ankara recommended integration of the eHealth concept in nursing schools' curricula to encourage and improve nurses' utilization of the internet as a source of information.

The current study assessed staff nurses' knowledge related to stroke and stroke patients' nursing care. The results demonstrated markedly low scores of staff nurses' knowledge, with only slightly more than half of them having satisfactory knowledge. The deficiency was evident in most of the tested knowledge areas. Unexpectedly, staff nurses' knowledge in the areas of CVS definition, complications, and prognosis was more satisfactory in comparison to their knowledge related to nursing management where only around one-fourth of them had satisfactory knowledge. This indicates a lack of education and training in this important area directly related to their roles. A similarly moderate to low level of knowledge about stroke was revealed among nurses in South Africa (**Knight et al., 2020**). On the same line, a low level of knowledge about stroke was reported in a study among healthcare professionals, where nurses turned to have low scores of knowledge (**Rababah et al., 2021**).

Regarding the personal factors significantly associated with current study staff nurses' knowledge, the results of the multivariate analysis identified the residence in urban areas as an independent positive predictor of the knowledge score. The positive effect of urban residence could be due to more access to training and other sources of information. The finding is in congruence with **Hisaka et al. (2)** in their study on Japanese staff nurses.

As for the work-related factors affecting present study staff nurses' knowledge, the multivariate analysis identified the number of attended related training courses in addition to the number of reported sources of information as positive predictors of the knowledge score. The findings

underscore the positive impact of training and of seeking information from different sources. The importance of using multiple source of information has been highlighted by *Al-Jaber (2022)* in a study in Emirates on the basis that no single source can provide full evidence. Furthermore, a study of nurses' knowledge of acute stroke in China concluded that nurses need more access to training and related sources of information (*Deng et al., 2021*).

The present study has also assessed staff nurses' practice of the nursing care provided to CVS patients. The study findings revealed clearly deficient staff nurses' practices in all areas. Thus, none of them had adequate total practice. The deficiencies were particularly noticed in their practice of secondary assessment where all of them had total inadequate practice. The finding is quite distressing and underscores the importance of practical training for these staff nurses. In congruence with this, a study in Australia revealed that the staff nurses from middle and low-outcome countries were not aware of guidelines for caring for stroke patients and were not using them due to logistic barriers. The authors recommended more training for these staff nurses (*Lynch et al., 2022*).

Regarding the staff nurses' factors influencing their practices, the current study identified staff nurses' age as a significant negative predictor of their practice score. This might be explained by the less likelihood that older age staff nurses update their knowledge and that use modern technology resources like the internet for their continuing nursing education. Moreover, with older age there is a tendency to commit errors due to over-confidence in own skills. In support of this, negative correlations were shown between their experience years and their practice scores in the bivariate analyses of the present study. A similar negative impact of nurses' age on their performance was found in a study of intensive care units in Poland (*Lange et al., 2023*).

The current study has also revealed that staff nurses' urban residence, higher nursing qualification, and the number of reported sources of information were significant positive predictors of their practice scores. The positive influence of urban residence could be, as previously explained, due to better access to training and other educational sources of information. As for the influence of higher qualifications, it is quite expected given the differences in curriculum content and learning process in the different levels. The finding is in agreement with *He et al., (2022)* whose study in China similarly revealed a positive association between higher nursing qualification and nurses' performance.

Lastly, the positive influence of a higher number of reported sources of information on nurses' practice could be attributed to the versatility of the information provided by each source, which might complement each other and would provide more sound and evidence-based data. In congruence with this, a study in the United States emphasized the importance of a specialized knowledge base for proper nursing care of stroke patients (*Power et al., 2022*).

CONCLUSION AND RECOMMENDATIONS

In conclusion, the staff nurses providing care to patients with Cerebrovascular stroke (CVS) in the Intensive Care Units (ICUs) in the study settings have deficient related knowledge and practice that are influenced by their age, residence, qualification, training, and sources of information. The study recommends implementation of specialized training programs, provision of clear guidelines, and close monitoring of their performance. Further research is proposed to assess the impact of educational training programs for staff nurses caring for patients with CVS on the quality of life of these patients.

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Table 1: Demographic characteristics of staff nurses in the study sample (n=80)

	Frequency	Percent
Age:		
<30	41	51.3
30+	39	48.8
Range	23-54	
Mean±SD	31.8±9.0	
Median	28.5	
Gender:		
Male	25	31.3
Female	55	68.8
Marital status:		
Married	52	65.0
Unmarried	28	35.0
Nursing qualification:		
Diploma	62	77.5
Bachelor	18	22.5
Experience years (total):		
<10	42	52.5
10+	38	47.5
Range	1-34	
Mean±SD	11.4±9.5	
Median	11.4	
Experience years (current):		
<5	36	45.0
5+	44	55.0
Range	<1-34	
Mean±SD	8.9±8.6	
Median	5.0	
Residence:		
Rural	59	73.8
Urban	21	26.3
Attended courses in:		
Stroke	54	67.5
Stroke patient nursing care	55	68.8
Infection control	71	88.8

Table 2: Unit instructions and resources for cerebrovascular stroke patient care and related errors as reported by staff nurses in the study sample (n=80)

	Frequency	Percent
Unit has instructions for stroke patient care	54	67.5
Unit instructions are:		
Clear	57	71.3
Abided by staff nurses	41	51.3
Updated	42	52.5
Availability of unit related resources:		
Manpower	26	32.5
Equipment	73	91.3
Supplies	65	81.3
There are nursing errors in stroke patient care	42	52.5
Causes:@		
Manpower shortage	37	88.1
Lack of equipment	12	28.6
Lack of supplies	18	42.9
Lack of training	17	40.5
Lack of supervision	11	26.2
Lack of compliance with instructions	18	42.9
Sources of information@		
Experience	43	53.8
Study	34	42.5
Nurse supervisor	27	33.8
Physicians	15	18.8
Conferences	6	7.5

Peers	4	5.0
Internet	4	5.0
Reading	2	2.5

(@) Not mutually exclusive

Table 3: Staff nurses' knowledge about stroke patient care

Knowledge areas	Satisfactory (60%+) knowledge of stroke:	
	No.	%
Definition	61	76.3
Etiology	46	57.5
Types	36	45.0
Risk factors	30	37.5
Symptoms/signs	53	66.3
Ischemic vs hemorrhagic	36	45.0
Right vs left	33	41.3
Diagnosis	44	55.0
Treatment	51	63.8
Complications	58	72.5
Prognosis	67	83.8
Prevention	34	42.5
Nurse role	49	61.3
Nursing management	22	27.5
Total:		
Satisfactory	45	56.3
Unsatisfactory	35	43.8

Total score (max=100):	
Mean±SD	63.2±12.0
Median	63.30

(*) Statistically significant at $p<0.05$

Table 4: Staff nurses' total practice related to stroke patient care throughout intervention phases

	Adequate (80%+) practice	
	No.	%
Airway assessment	37	46.3
Breathing assessment	24	30.0
Circulation assessment	36	45.0
Total primary assessment	28	35.0
Secondary assessment	0	0.0
Nursing interventions	7	8.8
Total:		
Adequate	0	0.0
Inadequate	80	100.0
Total score (max=88):		
Mean±SD	52.5±9.2	
Median	53.0	

Table 5: Correlation matrix of staff nurses' scores knowledge and practice areas

	Spearman's rank correlation coefficient				
	Knowledge	Practice areas			Total Practice
		1ry assessment	2ry assessment	Nursing interventions	
Total practice	0.10				

Practice areas:					
1ry assessment	0.13	1.00			
2ry assessment	-0.10	0.42**	1.00		
Nursing interventions	0.16	0.27*	0.04	1.00	
Characteristics:					
Age	0.09	-0.20	-0.19	-0.25*	-0.30**
Qualification level	0.14	-0.06	0.17	0.19	0.14
Experience years (total)	0.11	-0.17	-0.21	-0.29**	-0.32**
Experience years (current)	-0.02	-0.16	-0.26*	-0.25*	-0.31**
No. of courses attended	0.27*	0.05	-0.10	-0.07	-0.06

(*) Statistically significant at $p < 0.05$ (**) Statistically significant at $p < 0.01$

Table 6: Best fitting multiple linear regression model for the knowledge and practice scores

	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Knowledge score							
Constant	39.86	5.85		6.818	<0.001	28.22	51.51
Urban residence	8.81	2.99	0.33	2.946	0.004	2.86	14.77
No. of courses attended	2.37	1.36	0.19	1.742	0.086	-0.34	5.07
No. of information sources	4.10	1.91	0.23	2.141	0.035	0.29	7.91

r-squared=0.19 Model ANOVA: F=5.889 (p<0.001)							
Variables entered and excluded: age, gender, qualification, experience, marital status, unit has instructions, instructions followed, supplies, training courses							
Practice score							
Constant	58.28	5.93		9.824	<0.001	46.46	70.10
Age	-0.43	0.13	-0.37	-3.332	<0.001	-0.68	-0.17
Urban residence	5.03	2.59	0.21	1.940	0.056	-0.14	10.19
Nursing qualification level	1.56	0.85	0.19	1.828	0.072	-0.14	3.26
No. of information sources	3.29	1.68	0.21	1.961	0.054	-0.05	6.63
r-square=0.20 Model ANOVA: F=4.693, p=0.002							
Variables entered and excluded: gender, experience, marital status, unit has instructions, instructions followed, supplies, training courses							