

## Original Research Article

### The Factors Related to Using Evidence-Based Guideline in Patients with Acute Ischemic Stroke

**Running title: Evidence-Based Practice in Patients with Acute Ischemic Stroke**

#### **Abstract:**

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**Introduction:** Stroke is the most common cerebrovascular disease and the third most common cause of disability in the world. The study aimed to assess the knowledge of nurses in emergency departments based on evidence-based care guidelines in the acute phase of ischemic stroke.

**Methods:** This cross-sectional analytical study was performed on 129 nurses working in emergency departments of 16 hospitals of Guilan University of Medical Sciences in 1396. Samples were selected randomly. The study tool was a questionnaire with 10 multiple choice questions about the care of acute phase of ischemic stroke patients. Data were analyzed by SPSS software ver. 21 using descriptive tests, ANOVA, T-test, Chi-square.

**Results:** The mean of the participants' knowledge about acute phase of ischemic stroke care was  $40.07 \pm 16.46$ . The highest response rate was related to the symptoms of stroke (%85.27). There was a significant relationship between the number of beds in the hospitals and the nurses' knowledge about beginning treatment of Tissue Plasminogen Activator (tPA) ( $P < 0.005$ ), optimal level of blood pressure prior to administering intravenous tPA ( $P < 0.001$ ), and recommended dosage of tPA ( $P < 0.001$ ). Also, a significant relationship was reported between the number of beds in the emergency departments and the nurses' knowledge about optimal level of blood pressure prior to administering intravenous tPA ( $P < 0.001$ ), and recommended dosage of tPA ( $P < 0.001$ ).

**Conclusion:** The nurses' knowledge was not satisfactory about the guideline of the acute stage of ischemic stroke. Therefore, provision of evidence-based continuing education courses and mandatory attendance of emergency nurses in these courses is recommended.

**Keywords:** Evidence based-practice, ischemic stroke, emergency department, Knowledge of nurses.

19 **1. INTRODUCTION**

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21 It is generally accepted that stroke is the first and foremost vascular disease of the brain in  
22 the world(1, 2). This complication, which is considered the third most common cause of  
23 disability in the world, can have destructive effects on movement, vision, speech, feeling and  
24 perception of social world in affected individuals (3, 4). According to the statistics,  
25 approximately 795,000 individuals experience stroke in the United States each year, and  
26 subsequently every 4 minutes one affected person dies (5). The annual cost of stroke in the  
27 United States is estimated about 54 billion dollars(6). In Iran, each year more than 150,000  
28 people suffer from acute stroke and it is second major cause of death in the country. In a  
29 study in northern Iran, researchers warned that the incidence of this disease is increasing  
30 and so, prevention and treatment of acute ischemic stroke (AIS) in Iran is a priority(3).

31 Over the past decade, to improve the quality of care (7) and prevent the injury of acute  
32 diseases, and also reduction in the use of some unprofessional and ineffective methods  
33 much attention has been paid to the evidence-based clinical guidelines (8, 9). Evidence  
34 suggests that treatment with intravenous recombinant Tissue Plasminogen Activator(tPA) as  
35 a primary measure in the care of AIS can significantly reduce mortality and disability(10).  
36 The most important predictor of the response to treatment is the interval between  
37 emergence of AIS symptoms and onset treatment(11). According to the research every15-  
38 minute delay in treatment the patients will have one month delay in independent life after a  
39 stroke (12).

40 Regarding the impact of tPA, the study of Baudreau et al. in the United States (2014)  
41 indicated that treatment with tPA improves quality of life up to 39% and reduces costs by  
42 25,000\$ for each affected person compared to non-use of tPA (13).

43 In order to improve the care for stroke patients, health care providers and institutions are  
44 expected to provide evidence-based care (14). Evidence-based practice based on  
45 international standards increases the quality of clinical performance and is a way for clients  
46 to receive the best care(15). Stroke is a complicated disease that requires the effort and skill  
47 of all members of the treatment team. A glance at the instructions of the Joint Commission,  
48 the American Heart Association and the American Stroke Association clearly indicates that  
49 nurses are the core of these guidelines and should professionally be involved in assessing  
50 and implementation of the measures required during the sensitive period (16, 17). Although  
51 nurses' attitude toward evidence-based practice is positive according to the studies(3, 15),  
52 unfortunately, nurses in the emergency department do not have an acceptable knowledge in  
53 this regard. Accordingly, Mirhaghi and Roodbari (2013) in a study showed that the  
54 knowledge of emergency nurses about hospital triage and evidence-based guidelines in  
55 acute conditions are in a poor situation. The reasons, according to the authors, are lack of  
56 formal training courses for triage and non-obligation of emergency departments to make  
57 evidence-based decisions(18) .

58 Considering the fact that in recent studies, the incidence of stroke in Iran has been reported  
59 more than that of developed countries, so that it even occurs one decade sooner (1)and also  
60 given that in the current study the authors did not find similar studies in Iran, the present  
61 study aims to determine the level of the knowledge of nurses in emergency departments to  
62 provide evidence-based care for AIS patients and its related factors.

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## 2. MATERIAL AND METHODS

### 2.1 Study design

A cross-sectional study was conducted in 2017 to determine the level of nurses' knowledge about care provision in AIS patients based on evidence-based guidelines and related factors in emergency department of educational and non-educational hospitals affiliated to Guilan University of Medical Sciences(GUMS)(a university in northern Iran).

### 2.2 Setting and sample

The employed nurses in emergency departments were selected from 16 public hospitals of GUMS by random sampling. The required sample size was determined 129 individuals based on the values of SD = 17, d = 3,  $\bar{X} \leq 58$ ,  $\alpha = 5\%$ , and according to the study of Traynelis (2012) (19). To that end, the following formula and an attrition rate of 5% was used.

$$n = \frac{Z_{\alpha}^2 SD^2}{d^2}$$

The desire to participate in the research and having at least one year of work experience in the emergency department were considered as inclusion criteria and unwillingness to continue the collaboration was the exclusion criteria.

### 2.3 Ethical Consideration

In the present study, the ethical permission was received from the ethical committee of GUMS with the ethics code No: IR.GUMS.REC.1396.335. Also, after explaining the goals of the study, the method of implementation, and assuring confidentiality of the collected information and the possibility to terminate cooperation at each stage of the study, the written informed consent was received from the participants.

### 2.4 Measurement

The data collection tool used for the purposes of the study was a two-part questionnaire. The first part contained the personal-social information of the participants such as age, gender, education, position, clinical experience, work experience in the emergency department, participating the courses of ischemic stroke training, having experience in care of stroke patients, studying scientific resources of the stroke, number of hospital beds, number of emergency beds, grade or ranking of the hospital, duration of working in the emergency department, type of emergency department, and presence of CT scan equipment in the hospital.

The second part of the questionnaire, designed by Harper in 2007(20), aimed to assess the knowledge of emergency nurses about the principles of caring AIS patients. The questionnaire consisted of 10 true or false questions and the range of the scores were evaluated based on the correct answers and according to the mean score. Score 10 was assigned to the correct answers and score 0 was assigned to the false scores. The face validity of the data collection tool was approved by 10 experts in Shahid Beheshti Nursing and Midwifery School, Rasht. The reliability of the questionnaire was also confirmed by Cronbach's alpha (0.91) and the test-retest method (0.93).

115 **2.5 Data Collection**

116 To collect the data, first, some information about the research objectives was provided to the  
117 participant. Then, the questionnaires were distributed and while providing explanations on  
118 how to complete the questionnaires, they were asked to complete the questionnaire  
119 carefully.

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122 **2.6 Data Analysis**

123 Statistical analyses were performed using the SPSS software v. 21. Data analysis was  
124 performed using descriptive and inferential tests with a significant level of  $P = .05$ . According  
125 to the Kolmogorov–Smirnov test, all study variables had a normal distribution. Therefore,  
126 one-way variance analysis (for variables of more than two groups), t-test (for two-group  
127 variables), and chi-square test were performed.

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130 **3. RESULTS**

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132 Of total 129 participants, the majority of them were female (89.9%) with an average age of  
133  $32.74 \pm 7.108$  years and in a 20- to 30-year-old age group (%44.96). Regarding educational  
134 degree, %97.70 of the nurses had a bachelor's degree and %63.57 had a clinical experience  
135 of 1 to 10 years. Also, %70.54 of them had a work experience of 1 to 6 years in the  
136 emergency department. The mean and standard deviation of the knowledge of nurses  
137 working in emergency departments about provision of care for ischemic stroke patients  
138 based on evidence-based guidelines was  $40.07 \pm 16.46$ . Also, %81.40 of nurses had  
139 experience in the care of patients with AIS and % 46.51 of them had studied the disease  
140 during two recent years. Other individual-occupational characteristics are presented in Table  
141 1.

142 In examining the relationship between nurses' knowledge and their personal and  
143 occupational characteristics, independent t-test showed a significant relationship between  
144 nurses' knowledge and the total number of the beds in the hospitals they were working ( $P$   
145  $< .001$ ) and the number of the beds existing in emergency department ( $P < .001$ ) (Table 1).

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165 According to the findings, the lowest levels of knowledge (%84.50) were related to the

166 knowledge of the nurses about the range of blood pressure requiring treatment in AIS

167 patients and then the range of temperature requiring treatment in this group of patients

168 (%79.07), respectively (Table 2).

**Table 1.** Comparison of the mean score of knowledge about care in the acute phase of ischemic stroke patients based on evidence-based guidelines based on demographic and other characteristics of the participants. n =129

Variables		Knowledge score Mean $\pm$ SD	No(%)	P Value	Variables		Knowledge score Mean $\pm$ SD	No(%)	P Value
Experience in the care of AIS	Yes	43.63 $\pm$ 10.26	105(81.40)	*P=0.38	Sex	Female	40/68 $\pm$ 16/19	116(89.9)	**P=0.73
	No	39.04 $\pm$ 17.01	24(18.60)			Male	34.61 $\pm$ 18.53	13(10.10)	
Studying about Stroke	During 2 recent years	39.83 $\pm$ 18.17	60(46.51)	**P=0.9	Age (Year)	20-30	40 $\pm$ 17.77	58(44/96)	
	Over 2 recent years	40 $\pm$ 16.15	37(28.69)			30-40	37.56 $\pm$ 14.45	41(31.79)	
	Never	40 $\pm$ 12.79	32 (24.80)			40-50	38.18 $\pm$ 13.32	30(23.25)	
Number of hospital beds	<100 Beds	48.82 $\pm$ 16.47	34(26.35)	*P=0.001	Educational Degree	bachelor	36.68 $\pm$ 16.39	126(97.70)	*P=0.07
	>100Beds	36.94 $\pm$ 15.37	95(73.65)			Master	56.66 $\pm$ 11.54	3(2.30)	
Number of emergency department beds	<10 Beds	49.16 $\pm$ 15.92	36(27.91)	*P=0.001	Job position	Nurse	39.46 $\pm$ 16.46	113(87.60)	P= 0.53 **
	>10 Beds	36.55 $\pm$ 16.35	93(72.09)			In charge	43.75 $\pm$ 16.46	8(6.20)	
Rank of hospital	1 degree	38.81 $\pm$ 13.52	59(45.74)	*P=0.42		Head Nurse	45 $\pm$ 11.95	8(6.20)	
	2 degree	41.14 $\pm$ 18.61	70(54.26)		Work experience (Year)	1-10	40.12 $\pm$ 16.95	82(63.57)	P=0.97 **
Working in other wards	Yes	39.83 $\pm$ 16.32	5(3.88)	*P=0.41		10-20	39.42 $\pm$ 15.35	35(27.13)	
	No	46 $\pm$ 20.73	124(96.12)		20-30	40 $\pm$ 15.81	12(9.30)		
Type of emergency department	General	42 $\pm$ 11.96	109(84.50)	*P=0.57	Years of experience in emergency department	1-6	39.01 $\pm$ 16.53	91(70.54)	**P=0.52
	Special	39.72 $\pm$ 17.18	20(15.50)			6-12	42.66 $\pm$ 17.20	30(23.26)	
						12-18	42.50 $\pm$ 12.81	8(6.20)	
Participate in the stroke care course	During 2 recent years	37.46 $\pm$ 20.30	34(26.36)	**P=0.37	Hospital equipped with a CT scan	Yes	42.22 $\pm$ 15.49	66(51.16)	*P=0.14
	Over 2 recent years	37.91 $\pm$ 15.31	29(22.48)			No	38.03 $\pm$ 17.20	63(48.84)	
	Never	41.96 $\pm$ 14.90	66(51.16)						

\*Independent t-test

\*\* ANOVA

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**Table2.** Frequency of nurses' response status to questionnaire of knowledge of Evidence-Based Ischemic Stroke Care

Test Items	True		False		Total	Mean± SD
	n	%	n	%		
1.A patient presenting to triage with an ischemic stroke may likely exhibit which of the following symptoms? a. Disorientation, photophobia, headache b. Unilateral arm/leg weakness, droopy or asymmetrical face, difficulty speaking c. Seizure, dizziness, vomiting d. Decreased level of consciousness, left leg weakness, right arm weakness	110	85.27	19	14.73	129	40.07±16.46
2. It is recommended that treatment with intravenous tPA begin within how many hours of stroke symptom onset? a. 3 h      b. 6 h      c. 9 h      d. 12 h	85	65.90	44	34.1	129	
3. Which of the following is the recommended door-to-drug time for administration of tPA for ischemic stroke? a. 30 min    b. 60 min    c. 90 min    d. 120 min	37	28.68	92	71.32	129	
4. Prior to administering intravenous tPA for ischemic stroke, labetalol is recommended for lowering the blood pressure to which of the following levels? a. Less than 185/110      b. Less than 200/115 c. Less than 215/120      d. Less than 230/125	68	52.71	61	47.29	129	
5.Which of the following is the recommended dosage of tPA for patients who have had an ischemic stroke? a. 0.3 mg/kg    b. 0.5 mg/kg    c. 0.7 mg/kg    d. 0.9 mg/kg	29	22.48	100	77.52	129	
6.An ischemic stroke patient's neurologic status and vital signs should be assessed frequently for how long after tPA administration? a. 12 h    b. 24 h    c. 36 h    d. 48 h	37	28.68	92	71.32	129	
7. Which of the following types of intravenous fluid is recommended for patients with ischemic stroke? a. D5W      b. 0.9% Normal saline solution c. D5NSS      d. Lactated Ringer's	64	49.61	65	50.39	129	
8.Which of the following temperatures should be treated in a patient with ischemic stroke? a. 998F      b. 1008F      c. 1018F      d. 1028F	27	20.93	102	79.07	129	
9. Which of the following medications is recommended within 24-48 hours of ischemic stroke onset? a. Heparin    b. Aspirin    c. Plavix    d. Aggrenox	38	29.46	91	70.54	129	
10. For patients with ischemic stroke not treated with tPA, it is recommended that the blood pressure be treated if it exceeds which of the following levels? a. 165/105    b. 185/110    c. 200/115    d. 220/120	20	15.50	109	84.50	129	

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173 A significant relationship was also observed between working in hospitals with fewer than

174 100 active beds with the level of nurses' knowledge about the interval between the onset of

175 the AIS symptoms and taking tPA ( $P < .005$ ), optimal level of blood pressure with the

176 prescribing labetalol prior to administering intravenous tPA ( $P < .001$ ) and the recommended  
 177 dose of labetalol ( $P < .001$ ) for patients with ischemic stroke (Table 3).

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**Table 3.** Comparison of participants' responses based on the number of beds in the hospitals of their workplace

Items of knowledge	Number of hospital beds												*P value
	<100 beds						>100 beds						
	True		False		Total		True		False		Total		
	n	%	n	%	n	%	n	%	n	%	n	%	
2. It is recommended that treatment with intravenous tPA begin within how many hours of stroke symptom onset?	31	91.18	3	8.82	34	100	54	56.84	41	43.16	95	100	$P < .005$
4. Prior to administering intravenous tPA for ischemic stroke, labetalol is recommended for lowering the blood pressure to which of the following levels?	30	88.23	4	11.77	34	100	38	40	57	60	95	100	$P < .001$
5. Which of the following is the recommended dosage of tPA for patients who have had an ischemic stroke?	24	70.59	10	29.41	34	100	5	5.26	90	94.74	95	100	$P < .001$

\* Chi-Square

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193 A significant relationship was also observed between working in hospitals with emergency  
 194 departments of less than 10 active beds and the nurses' knowledge about the purpose of  
 195 labetalol administration in regulating blood pressure before treatment with tPA ( $P < .001$ ),  
 196 and its recommended dose in the patients with stroke ( $P < .001$ ) (Table 4).

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**Table 4.** Comparison of participants' responses based on the number of beds in the emergency departments of the hospitals of their workplace

Items of knowledge	Number of emergency department beds												*P value
	<10 beds						>10 beds						
	True		False		Total		True		False		Total		
	n	%	n	%	n	%	n	%	n	%	n	%	
4. Prior to administering intravenous tPA for ischemic stroke, labetalol is recommended for lowering the blood pressure to which of the following levels?	30	88.23	6	11.77	36	100	38	40	55	60	93	100	<i>P</i> < .001
5. Which of the following is the recommended dosage of tPA for patients who have had an ischemic stroke?	26	72.22	10	27.78	36	100	3	3.22	90	96.78	93	100	<i>P</i> < .001

\* Chi-Square

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202 **4. DISCUSSION**

203 According to the findings, nurses' knowledge of evidence-based care principles in patients  
 204 with AIS was lower than the mean score of the questionnaire. The lowest level of nurses'  
 205 knowledge was about the range of blood pressure and temperature requiring treatment in  
 206 these patients.

207 In examining the factors related to the level of nurses' knowledge, the findings showed that  
 208 in larger hospitals, nurses were less aware of the appropriate interval between the onset of  
 209 AIS symptoms and administering tPA, the reason of prescribing labetalol in regulating blood  
 210 pressure in patients with AIS before treatment with tPA and its permitted dose.

211 Also, according to the findings, in emergency departments with more than 10 beds that had  
 212 more referrals, nurses' knowledge of the reason of prescribing labetalol in regulating blood  
 213 pressure in patients with AIS before treatment with tPA was significantly lower than other  
 214 departments.

215 In line with the results of the present study regarding the lack of knowledge on evidence-  
 216 based guidelines of care for AIS patients among nurses working in emergency department,  
 217 Traynelis (2012) in the United States also showed that the mean score of emergency nurses'  
 218 knowledge of evidence-based care was low in these patients(19). Harper (2007) also  
 219 reported a low level of nurses' knowledge about evidence-based care of AIS patients in  
 220 emergency departments(20).

221 The findings of the study showed that the lowest level of nurses' knowledge was regarding  
 222 the range of blood pressure and temperature requiring treatment in AIS patients. Along with  
 223 these findings, Harper (2007) also revealed that the lowest level of nurses' knowledge were



224 regarding blood pressure control and the temperature conditions requiring treatment in these  
225 patients(20) .

226 Shahjouei et al. (2017) have also reported inadequate knowledge of the clinical team of AIS  
227 guidelines, the lack of a comprehensive health care program in hospitals and the  
228 unpreparedness of treatment centers as barriers of managing AIS in Iran(21) .

229 Since even a slight increase in vital signs can lead to irreversible effects through  
230 development of the brain disease(12), the change in blood pressure is identified as one of  
231 the most important predictive hemodynamic indices in patients with acute conditions(22),  
232 which emphasizes the need for nurses' knowledge in this regard. As a new finding and  
233 despite the fact that nurses gain more knowledge and experience in working places where  
234 the rate of patient referral is higher, the findings of the study showed that the level of the  
235 knowledge of the nurses working in larger hospitals with more than 100 beds in some cases,  
236 such as the interval between the onset of stroke symptoms and receiving tPA, the reason for  
237 the prescription of labetalol before treatment with tPA, and the recommended dose of this  
238 drug in hospitalized patients was significantly less than the knowledge of nurses working in  
239 smaller hospitals with fewer than 100 beds.

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241 Also, the knowledge of nurses in the emergency departments with more than 10 beds  
242 regarding the amount of reducing blood pressure through using labetalol before treatment  
243 with tPA and the recommended dose of this drug in a patient with stroke was significantly  
244 less than that of nurses working in less than 10 beds.

245 These findings are consistent with the studies by Kermanshahi and Parvinian (2012)(23),  
246 and Khammarnia et al. (2015) (15), where the large number of beds and heavy workloads  
247 are suggested as barriers to evidence-based practice. Shahidi et al. (2015) (24)and Heydari  
248 et al. (2014) (25) also referred to shortage of nurses, high number of patients, lack of  
249 adequate time, and inadequate environmental conditions as barriers to implementation of  
250 evidence-based guidelines. According to Mellon (2015), 90% of nurses were well aware of  
251 AIS symptoms but few of them had sufficient knowledge about the timing of thrombolytic  
252 drug administration (26) that could be due to differences in clinical settings and increased  
253 clinical exposure to these patients.

254 Obviously, unpredictable overcrowding in the emergency departments of larger hospitals  
255 with more than 100 beds and continuous work pressure in such wards leads to a lack of time  
256 and a reduction in the focus of nurses on the use of professional knowledge and existing  
257 evidence in care of patients.

258 The important point in interpreting the results of this study is that, unfortunately, nurses in  
259 Iran have less autonomy in using evidence-based guidelines. Therefore, it seems that the  
260 learning process by nurses mostly is clinical and occurs when the physicians carry out  
261 treatment measures. The fact that these evidence-based guidelines are commonly used in  
262 specialized neurological emergency departments can be an important factor in remembering  
263 the relevant care principles. It indicated the fact that fewer nurses' exposure to these  
264 patients in non-specialized emergency departments (hospital more than 100 beds and  
265 emergency departments with more than 10 bed) has led to less knowledge in this regard.

266 The present study is the first study conducted in Iran on the level of nurses' knowledge about  
267 evidence-based guidelines for the care of patients with AIS, which indicates a gap in the  
268 knowledge of nurses in caring these patients. One of the constraints of the study was the  
269 possibility of counseling and exchanging information between the participants in responding  
270 to the questions of the questionnaire.

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273 **5. CONCLUSION**

274 In general, the study shows insufficient knowledge of emergency department nurses  
275 regarding evidence-based care for AIS patients. Although presence of some facilities is  
276 essential to implement some of the proposed evidence-based guidelines, but it shows the  
277 need for employing highly educated nurses by officials and educational managers. Also, in  
278 order to increase the awareness of nurses about provision of evidence-based guidelines for  
279 AIS patients in their acute phase, organizational learning programs, such as continuous AIS  
280 training courses in the acute phase, are needed.

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284 **CONSENT AND ETHICAL APPROVAL**

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286 This study was conducted after receiving the written approval of the Ethics Committee of  
287 Guilan University of Medical Sciences with ethics code No: IR.GUMS.REC.1396.335. Before  
288 starting the sampling, we explained to the participants in terms of the objectives of the  
289 research and the data collection process. Also, written informed consent was obtained from  
290 all of samples.

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293 **COMPETING INTERESTS**

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295 The authors have no conflict of interest.

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