

Awareness of Ischemic Stroke among Physicians in Primary Care and Emergency Departments

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ABSTRACT

Objective: In particular, ischemic stroke is the primary cause of disability and loss of work force. With intravenous thrombolytic therapy and/or mechanical thrombectomy, stroke is a curable disease. In this study, we evaluated the ischemic stroke awareness of physicians who had first contact with stroke patients.

Material and Methods: An online questionnaire of 20 items was applied to collect data. Participation was voluntary, resulting in 66 family physicians and 87 general practitioners.

Results: 92.4% of family physicians and 90.8% of general practitioners responded correctly to the item that deals with ischemic stroke symptoms. In the item related to the duration of thrombolytic therapy, the rate of correct response of general practitioners was significantly higher than that of family physicians ($p < 0.05$). Physicians who worked in the profession for less than 5 years had a significantly higher rate of correct answers than those who worked in the profession for more than 5 years.

Conclusion: Today, awareness of family physicians working in primary care and physicians working in emergency services who are in first contact with paralyzed patients should be increased. In addition, patient diagnosis and referral should be focused on. For this purpose, primary care physicians' knowledge on ischemic stroke should be increased. Training should be expanded to raise the awareness of physicians about new developments in stroke prevention, diagnosis and treatment.

Keywords: Stroke, Thrombolysis, Awareness, Family physicians, General practitioners

INTRODUCTION

Ischemic stroke is defined as the sudden onset of focal neurological symptoms due to vascular events such as decreased or stopped blood flow to a certain region of the brain. After cardiovascular diseases, cerebrovascular diseases (CVDs) are the leading cause of death in the world in the population older than 60 years. Ischemic stroke in particular is the primary cause of disability and workforce loss (1). In 2019, approximately 12.2 million new cases of stroke were reported worldwide, along with 101 million existing cases and 6.55 million stroke-related deaths (2).

Approximately 80% of strokes are ischemic, whereas the other 20% are hemorrhagic (3). In either case, controlling cardiovascular risk factors lowers the lifetime risk of stroke (4). The primary modifiable risk factors for stroke are smoking, hypertension, diabetes, excessive alcohol consumption, lack of physical exercise, psychosocial factors (e.g., stress and depression), high waist-to-hip ratio, malnutrition, dyslipidemia, and heart disease, including atrial fibrillation (5).

Stroke is a treatable disease, provided intravenous thrombolytic therapy followed by the combined or separate application of mechanical thrombectomy. Recanalization and reperfusion are the primary goals of treatment for acute ischemic stroke, and, with those treatments, the infarct area is reduced, and the neurological deficit becomes reversible. However, such successes also depend upon time-dependent therapies (6). Following the first study on thrombolytic treatment, published in 1995, and subsequent trials and meta-analyses on the topic, the thrombolytic treatment window for acute ischemic stroke has been extended to 4.5 hours in certain patients (7, 8).

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In the American Heart Association's 2015 treatment guidelines (9), the time of application for mechanical thrombectomy therapy, which is recommended to be applied with class 1A evidence, has been extended to 6–24 hours from the onset of stroke with the updated guideline (10).

Against that background, by collecting data on risk factors of stroke, stroke diagnosis, patient referrals, and acute stroke treatments, in our study we evaluated the awareness of ischemic stroke among physicians working in primary care and emergency departments and who thus make first contact with patients with stroke.

MATERIAL and METHODS

After being approved by the Ethics Committee of Harran University's Faculty of Medicine (HRU/21.23.10), our study was conducted from January 15 to March 15, 2022, with family physicians in primary care working in the city center and general practitioners working in the emergency departments of education and research hospitals located therein.

Participation was voluntary, and 66 family physicians and 87 general practitioners ultimately participated. To collect data, we administered an online questionnaire consisting of 20 items, prepared by reviewing the literature on the symptoms, diagnosis, first intervention, referral information, and treatment approaches among patients with stroke was used. The questionnaire was sent to 400 physicians, and 153 responses were received. All items were answered by the participants for a 100% response rate.

The first four items on the questionnaire addressed the non-personal demographic data of the participants (i.e., age, gender, branch, and years in the profession). Item 5 examined the physicians' previous training on stroke; Items 6–10 and 12 addressed patients' symptoms, risk factors, and approaches to stroke; Item 11 addressed the referral method of patients with stroke; and Items 13–20 addressed thrombolytic treatment and thrombectomy.

Statistical Analysis

Statistical analysis was performed in the Statistical Package for the Social Sciences for Windows version 20.0. After the data of the patients were recorded, the distribution of the data was evaluated with the Kolmogorov–Smirnov and Shapiro–Wilk tests of normality. Whereas the Mann–Whitney U test was used for non-normally distributed variables, the independent sample t test was used for normally distributed ones. The frequency analysis of the variables was performed using cross-tabulation and frequency tests. In all tests, p values less than .05 indicated statistical significance.

RESULTS

Of the 153 participating physicians, 107 (70.6%) were men, and 45 (29.4%) were women. Whereas 66 (43.1%) were family physicians, 87 (56.9%) were general practitioners. The mean age of all physicians was 31.25 ± 25 years. Overall, 98 (64.1%) had been working as physicians for less than 5 years and 55 (35.9%) for more than 5 years.

Only 10.5% of the participating physicians were able to identify the two primary types of stroke. While 68.6% of the physicians reported informing patients about their risk factors

of stroke, 58.2% reported following up on those factors in patients who had previously had a stroke. When asked about the most common risk factors of ischemic stroke, 81% identified cardiac diseases (e.g., atrial fibrillation, heart failure, and valve diseases), 71.2% identified hypertension, 49% identified hypercoagulation, 46.6% identified diabetes, 28.1% identified hyperlipidemia, and 18.3% identified obesity.

As shown in **Table 1**, 92.4% of family physicians and 90.8% of general practitioners correctly responded to the item addressing symptoms of ischemic stroke, with the answer options of muscle weakness, facial asymmetry, and disordered speech. Regarding the means of referral of patients with stroke, 93.5% of the physicians reported preferring referral by ambulance.

Regarding the item addressing the duration of thrombolytic therapy, the rate of correct responses among general practitioners was significantly higher than that among family physicians ($p = .037$), as shown in **Table 2**. The rate of correct responses was significantly higher among physicians who had worked in the profession for less than 5 years than it was among ones who had worked in the profession for more than 5 years ($p = .005$), as shown in **Table 3**. Concerning the item of what range of blood sugar level warrants treatment with thrombolytic therapy, the rate of correct responses among general practitioners was significantly higher than that among family physicians ($p = .024$). Beyond that, no statistically significant difference between the two types of physicians emerged in the responses to the other items.

As shown in **Table 2**, 20.9% of the participants attended training on stroke and its treatment. The item that evaluated absolute contraindications for thrombolytic therapy was answered correctly by 62.5% of physicians who participated in stroke education, compared to 38% of those who did not participate. This difference was statistically significant ($p=0.013$).

Added to that, 37.5% of physicians who participated in stroke education correctly indicated how long thrombectomy can be performed in cases of acute stroke, compared with 20.7% of physicians who did not participate, for a difference that was also significant ($p = .049$). However, no other statistically significant difference arose in other responses given by physicians according to their participation in stroke education.

Table 1: Comparison of questions according to their professional status

| | | General Practitioner | Family Physician | p |
|--|---------|----------------------|------------------|--------------|
| Item 6. Types of stroke | Correct | 76 (%87,4) | 56 (%84,9) | 0,632 |
| | Wrong | 11 (%12,6) | 10 (%15,1) | |
| Item 8. The most common risk factors of ischemic stroke | Correct | 67 (%77) | 55 (%83,3) | 0,337 |
| | Wrong | 20 (%23) | 11 (%16,7) | |
| Item 10. Symptoms of ischemic stroke | Correct | 79 (%90,8) | 61 (%92,4) | 0,723 |
| | Wrong | 8 (%9,2) | 5 (%7,6) | |
| Item 11. Transport routes of stroke patient to hospital | Correct | 84 (%96,6) | 60 (%90,6) | 0,143 |
| | Wrong | 3 (%3,4) | 6 (%9,1) | |
| Item 12. The first questions to be asked in the anamnesis in acute stroke | Correct | 76 (%87,4) | 50 (%75,8) | 0,063 |
| | Wrong | 11 (%12,6) | 16 (%24,2) | |
| Item 15. Thrombolytic treatment window | Correct | 17 (%19,5) | 5 (%7,6) | 0,037 |
| | Wrong | 70 (%80,5) | 61 (%92,4) | |
| Item 16. Thrombolytic therapy contraindications | Correct | 39 (%44,8) | 27 (%40,9) | 0,629 |
| | Wrong | 48 (%55,2) | 39 (%59,1) | |
| Item 17. Blood pressure value of the patient who will apply thrombolytic therapy | Correct | 37 (%42,5) | 24 (%36,4) | 0,442 |
| | Wrong | 50 (%57,5) | 42 (%63,6) | |
| Item 18 What range of blood sugar level warrants treatment with thrombolytic therapy | Correct | 53 (%60,9) | 28 (%42,4) | 0,024 |
| | Wrong | 34 (%39,1) | 38 (%57,6) | |
| Item 19. Major complications of thrombolytic therapy | Correct | 75 (%86,2) | 56 (%84,8) | 0,813 |
| | Wrong | 12 (%13,8) | 10 (%15,2) | |
| Item 20. Thrombectomy treatment window | Correct | 24 (%27,6) | 13 (%19,7) | 0,261 |
| | Wrong | 63 (%72,4) | 53 (%80,3) | |

Table 2: Comparison of the questions according to their participation in the training

| | | Attend training (Yes) | Attend training (No) | p |
|--|---------|-----------------------|----------------------|--------------|
| Item 6. Types of stroke | Correct | 27 (%84,4) | 105 (%86,8) | 0,741 |
| | Wrong | 5 (%15,6) | 16 (%13,2) | |
| Item 8. The most common risk factors of ischemic stroke | Correct | 26 (%81,2) | 96 (%79,3) | 0,812 |
| | Wrong | 6 (%18,8) | 25 (%20,7) | |
| Item 10. Symptoms of ischemic stroke | Correct | 29 (%90,6) | 111 (%91,7) | 0,842 |
| | Wrong | 3 (%9,4) | 10 (%8,3) | |
| Item 11. Transport routes of stroke patient to hospital | Correct | 28 (%87,5) | 116 (%95,9) | 0,075 |
| | Wrong | 4 (%12,5) | 5 (%4,1) | |
| Item 12. The first questions to be asked in the anamnesis in acute stroke | Correct | 26 (%81,2) | 100 (%82,6) | 0,854 |
| | Wrong | 6 (%18,8) | 21 (%17,4) | |
| Item 15. Thrombolytic treatment window | Correct | 5 (%15,6) | 17 (%14) | 0,822 |
| | Wrong | 27 (%84,4) | 104 (%86) | |
| Item 16. Thrombolytic therapy contraindications | Correct | 20 (%62,5) | 46 (%38) | 0,013 |
| | Wrong | 12 (%37,5) | 75 (%62) | |
| Item 17. Blood pressure value of the patient who will apply thrombolytic therapy | Correct | 17 (%53,1) | 44 (%36,4) | 0,086 |
| | Wrong | 15 (%46,9) | 77 (%63,6) | |
| Item 18 What range of blood sugar level warrants treatment with thrombolytic therapy | Correct | 18 (%56,2) | 63 (%52,1) | 0,674 |
| | Wrong | 14 (%43,8) | 58 (%47,9) | |
| Item 19. Major complications of thrombolytic therapy | Correct | 28 (%87,5) | 103 (%85,1) | 0,734 |
| | Wrong | 4 (%12,5) | 18 (%14,9) | |
| Item 20. Thrombectomy treatment window | Correct | 12 (%37,5) | 25 (%20,7) | 0,049 |
| | Wrong | 20 (%62,5) | 96 (%79,3) | |

Table 3: Comparison of questions according to the time spent in the profession

| | | Worked in the profession ≤5 years | Worked in the profession >5 years | p |
|---|---------|--------------------------------------|--------------------------------------|--------------|
| Item 6. Types of stroke | Correct | 85 (%86,7) | 47 (%85,5) | 0,794 |
| | Wrong | 13 (%13,3) | 8 (%14,5) | |
| Item 8. The most common risk factors of ischemic stroke | Correct | 75 (%76,5) | 47 (%85,5) | 0,189 |
| | Wrong | 23 (%23,5) | 8 (%14,5) | |
| Item 10. Symptoms of ischemic stroke | Correct | 88 (%89,8) | 52 (%94,5) | 0,314 |
| | Wrong | 10 (%10,2) | 3 (%5,5) | |
| Item 11. Transport routes of stroke patient to hospital | Correct | 94 (%95,9) | 50 (%90,9) | 0,208 |
| | Wrong | 4 (%4,1) | 5 (%9,1) | |
| Item 12. The first questions to be asked in the anamnesis in acute stroke | Correct | 86 (%87,8) | 40 (%72,7) | 0,020 |
| | Wrong | 12 (%12,2) | 15 (%27,3) | |
| Item 15. Thrombolytic treatment window | Correct | 20 (%20,4) | 2 (%3,6) | 0,005 |
| | Wrong | 78 (%79,4) | 53 (%96,4) | |
| Item 16. Thrombolytic therapy contraindications | Correct | 43 (%43,9) | 23 (%41,8) | 0,806 |
| | Wrong | 55 (%56,1) | 32 (%58,2) | |
| Item 17. Blood pressure value of the patient who will apply thrombolytic therapy | Correct | 41 (%41,8) | 20 (%32,8) | 0,508 |
| | Wrong | 57 (%58,2) | 35 (%63,6) | |
| Item 18 What range of blood sugar level warrants treatment with thrombolytic therapy | Correct | 57 (%58,2) | 24 (%43,6) | 0,085 |
| | Wrong | 41 (%41,8) | 31 (%56,4) | |
| Item 19. Major complications of thrombolytic therapy | Correct | 83 (%84,7) | 48 (%87,3) | 0,664 |
| | Wrong | 15 (%15,3) | 7 (%12,7) | |
| Item 20. Thrombectomy treatment window | Correct | 24 (%24,5) | 13 (%23,6) | 0,906 |
| | Wrong | 74 (%75,5) | 42 (%76,4) | |

DISCUSSION

Although an important public health problem, stroke has become a treatable disease thanks to new treatment methods. Even so, the implementation of treatment depends on the rapid referral of the appropriate patients to the appropriate clinical centers (11). Therefore, knowledge about stroke and awareness among physicians who first encounter patients with stroke in the acute period and during follow-up are important. To investigate the knowledge of primary care physicians about risk factors of stroke in general and treatment for acute ischemic stroke in particular, we administered to such physicians a questionnaire prepared with reference to the literature. Among the results, general practitioners responded correctly to the items at higher rates than family physicians did.

Identifying and reducing modifiable risk factors play important roles in lowering the burden of stroke in the community (12). Indeed, the incidence of age-related stroke in the United States has dropped by 40% in the past 20 years depending on the increase in preventive methods and the reduction of risk factors (13). In our study, 68.6% of physicians had informed patients about their risk factors for stroke. Beyond that, 58.2% of them reported following up on risk factors in patients who had previously experienced stroke. The most important modifiable risk factors of stroke are hypertension, type 2 diabetes mellitus, atrial fibrillation, smoking, dyslipidemia, and obesity, treatment for which can be accessed from primary health care services (14). In Kumral's study on the risk factors for left ventricular hypertrophy, hypertension was the most prevalent (63%), followed by hypercholesterolemia (37%), diabetes (35%), ischemic heart disease (23%), atrial fibrillation (20%), and smoking (17%) (15).

Our study revealed that physicians are largely aware of the risk factors of ischemic stroke, without any statistically significant difference between general practitioners (77%) and family physicians (83%). In a recent study conducted with family physicians, the proportion of physicians who knew the risk factors of stroke and how to manage them increased after training in stroke awareness (16). Failure to take timely, effective measures to curb stroke, however, will only increase death rates and the loss of the workforce due to CVDs, which will both affect public health and impose a heavy burden on the economy. For that reason, physicians in primary health care institutions, which are the first referral centers for patients, have a significant burden in evaluating stroke-related risk factors and providing appropriate treatment early in the course of the disease.

In a 2017 study evaluating stroke awareness among the emergency room workers at a hospital with a stroke center, 79% of the emergency department staff could name the cardinal stroke symptoms (17). In another survey on stroke awareness conducted among nurses and interns in Turkey, 64.1% of the nurses responded correctly to the items about stroke symptoms, whereas interns gave correct responses at a rate of 78.6% (18). In our study, 92.4% of family physicians and 90.8% of general practitioners gave correct responses to the item concerning ischemic stroke symptoms. Those results show that primary care physicians mostly do not struggle in correctly diagnosing stroke.

When asked about background story—that is, the first question that should be asked in the anamnesis of patients with acute ischemic stroke—82.4% of the participants responded correctly by stating at the time of symptom onset.

That question is the most important one for choosing the treatment modality to be applied in patients with acute stroke and can be useful in initiating the referral chain. At that point, patients' means of transportation to clinical centers become important. In a survey study investigating pre-hospital and emergency service delay time and its causes after acute stroke, patients transported to the hospital by ambulance arrived 1.9 hours earlier than all other patients (19), a situation that has been observed in other studies as well (20-22). In our study, 93.5% of the physicians reported preferring to have patients be referred by ambulance. The use of ambulances affords the emergency department and neurologists the time to adequately prepare to treat stroke, namely by being able to skip procedures such as triage and registration before the patient arrives and by informing the hospital.

The treatment of acute stroke is intravenous thrombolytic and endovascular thrombectomy for tissue reperfusion (8). In a 2022 study investigating stroke management and the impact of education among primary care physicians, less than half (40.3%) of the participants knew the duration of thrombolytic therapy. After stroke education was provided, however, the rate increased to 61.0% (16). In a survey study conducted on knowledge, attitudes, and practices regarding acute stroke among primary care physicians, approximately 75.0% of physicians claimed to practise were aware of thrombolytic therapy, but less than 50.0% knew the duration of such therapy. When compared according to the time spent in the profession, primary care physicians with up to 10 years of clinical practice experience had the highest level of knowledge (23). In our study, general practitioners provided significantly more accurate responses than family physicians on the question related to the duration of thrombolytic therapy before a stroke occurs. However, there was no significant difference between physicians who received stroke training and those who did not. That result can be explained by the fact that the first interventions of patients with acute stroke and the treatment protocols followed are performed in emergency services and that general practitioners have more experience with and evaluate more patients with strokes than family practitioners. In addition, the rate of correct responses to that item, which evaluated the thrombolytic treatment window, was significantly higher among physicians who worked in the profession for less than 5 years than ones who worked in it for more than 5 years. That result can be explained by the relative newness of thrombolytic therapy and the more recently acquired knowledge of physicians with less time in the profession to date.

In a survey conducted in Turkey on stroke awareness among family physicians in primary care, participants gave the most correct answer to the item addressing contraindications for thrombolytic treatment (24). In another study investigating stroke awareness and knowledge about stroke symptoms before and after training, only 9% of emergency service workers knew the contraindications of intravenous thrombolysis before training compared to 70% after training (17). In the same study in which contraindications to thrombolytic therapy were evaluated, 88.2% of the physicians had the highest response rate in mentioning any type of intracranial (i.e., intracerebral, subarachnoid, and subdural) hemorrhaging upon imaging (17). Thrombocytopenia, another contraindicated condition, ranked second with a rate of

52.9%, while the response of not starting treatment within the first 4.5 hours, which was expected to be the best-known contraindication, ranked fourth (41.8%). Practitioners gave significantly more accurate responses regarding the necessary range of blood glucose levels for patients to be treated with thrombolytic therapy. The results showed that primary care physicians had superior knowledge of the contraindications of thrombolytic therapy. Knowing the contraindications of treatment can aid in identifying patients who would benefit most from the treatment and in quickly initiating the referral chain for the necessary patients. The development of techniques used in emergency endovascular thrombectomy has been a major milestone in reperfusion therapy for patients with those common major vascular occlusions (25-27). In a survey evaluating stroke awareness among family physicians in primary care in Turkey, only 27% of participants knew about the thrombectomy treatment window (24), whereas 47.3% of interns in another study had such knowledge (18). In our study, physicians who had received training on stroke were significantly better acquainted with the treatment window for thrombectomy. Those results may be because thrombectomy, which is relatively new, can be performed only in a limited number of centers by physicians specialized in the procedure, and it is not a standard treatment.

All of those results indicate the need to develop a new protocol for continuing medical education and training in terms of approaches, referrals, and new treatment modalities for patients with stroke.

Limitations: As for the limitations of our study, the scope of the questionnaire survey was limited to family physicians working in central districts in Şanlıurfa and, even then, in two training and research hospitals, and the sample size was, therefore small. Because participation in the study was voluntary, the results do not reflect the general situation in Şanlıurfa. Last, not all information regarding stroke management was evaluated in the questionnaire.

CONCLUSION

Although acute ischemic stroke is a treatable disease, and the loss of neurological function can be minimized with additional research, the greatest benefit to patients provided by clinical practitioners may be by preventing the disease in the first place. Failure to take timely, effective measures will only increase death rates and the loss of the workforce due to CVDs, which will affect public health and burden Turkey's economy heavily. For that reason, physicians in primary health care institutions, which are the first referral centers for patients, have a great burden in evaluating stroke risk factors and providing appropriate treatment early in the course of the disease. The success of treatment for acute stroke depends on rapid diagnosis, rapid referral to stroke centers and appropriate hospitals, and the ability to perform necessary imaging without the loss of time. At present, the awareness of family physicians in primary care and physicians working in emergency services, who make first contact with patients with stroke, should be increased and focus on diagnosing patients and referral-related issues. To those ends, primary care physicians' knowledge about ischemic stroke should be increased, and education and training should be expanded to raise awareness of new developments in preventing, diagnosing, and treating stroke.

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