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MEDICAL NEWS **TIP HABERİ**

ACUTE STROKE MANAGEMENT IN TURKEY: CURRENT SITUATION AND FUTURE PROJECTION*

TÜRKİYE'DE AKUT İNME YÖNETİMİ: MEVCUT DURUM VE GELECEK PROJEKSİYONU*

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STROKE EPIDEMIOLOGY IN TURKEY

Turkey's population is approximately 86 million, corresponding to almost one percent of the world's population. It is appropriate to add the immigrants, mainly from Syria and Afghanistan exceeding 5 million, to this number. Three quarters of the population live in cities, and approximately 7.5% of them are 65 years or older. Average life expectancy is 75.6 years for men and 81.2 for women (1).

With the development of the welfare level in Turkey, life expectancy has been getting longer in recent years. With the contribution of this, the frequency of stroke has been increasing gradually. In Turkey, the incidence of ischemic stroke is 93.2 to 108.6 per hundred thousand, intracerebral hemorrhage is 31.5 to 39.7 and total stroke is 141.7 to 158 (2). In Turkey, there were 435.941 death in 2019. The most common cause for mortality was cardiovascular diseases (36.8%) and stroke ranks second (22.2%) after coronary syndromes in this subgroup. Stroke is the third most common cause of mortality in women and fourth in men. From 2002 to 2017, stroke mortality increased by 56% (3).

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DIRECTIVE ON HEALTH SERVICES TO BE PROVIDED TO PATIENTS WITH ACUTE STROKE: PUBLICATION AND ENTRY INTO FORCE IN TURKEY

The fact that acute stroke is treated with intravenous tissue plasminogen activator (IV tPA) and/or neurointerventional methods, which can only be applicable within a certain period of time, requires a referral and management system that should cover the majority of the country. On the basis of this reality, the "Directive on Health Services to be Provided to Patients with Acute Stroke" was published by Turkish Ministry of Health on July 18, 2019 (4). While it was expected to take effect a year later, it was postponed to March 2021 due to the pandemic. Afterwards, 57 comprehensive stroke centers (named as “Stroke Center”) and 51 primary stroke centers (named as “Stroke Unit”) were certified in the approximately 1-year period from March 2021. The distribution of centers within the country is shown in Figure 1.

ORGANIZATION OF STROKE SYSTEM OF CARE IN TURKEY

In the Annex-1 of this directive, hospitals involved in in acute stroke system of care in Turkey are organized in two categories as "stroke units" and "stroke centers".

"Stroke units" are an adaptation of "the primary stroke centers" for our country. These hospitals are generally located in small settlements where IV tPA can be administered and patients who do not need critical and advanced neurological management methods can be hospitalized. The in-patient units of these hospitals must contain a minimum of 4 dedicated beds. The hospital should be capable of performing 7/24 of computed tomography (CT) and CT angiography. Stroke units are expected to operate in coordination with the stroke center on a regional basis. Provincial health directorates usually take a position in the creation of this regional system of acute stoke care.

Stroke centers include neurology intensive care units, angiography suits where all kinds of neurointerventional procedures can be performed, as well as advanced imaging, operation, care and monitoring utilities/facilities available on 24/7 basis. Acute ischemic stroke cases with major cerebral vascular occlusion and requiring neurological intensive care, and almost all acute intracerebral and subarachnoid hemorrhages are managed in stroke centers (Table 1).

The stroke directive has also implemented several key rules that are critical to the functioning of these two types of centers. The first, all kinds of medical management procedures of acute stroke patients will be carried out under the responsibility of the neurologist appointed as the stroke unit and stroke center director. The second, neuro-interventional procedures can be performed by neurology, cardiology, radiology and neurosurgery specialists who meet defined competency requirements. Specialist physicians who will perform neurointerventions must have done at least 100 intracranial neurointerventions. At least 10 of these intracranial interventions should include mechanical thrombectomy or thromboaspiration. Specialists who will perform neurointerventions must have performed at least 20 extracranial neuroendovascular therapeutic interventions (such as Carotid stent) in the head and neck region. The list of neurointerventions is given in Table 2. It is mandatory to document the protocol number of the cases in which these neurointerventional procedures were performed, together with the angiography reports and, if requested, video recordings of the procedure. The validity of the documents is evaluated by the national scientific commission. The capacity and technical standards of the angiography suites in stroke centers are also clearly stated in the directive (Table 1). The third, stroke centers and units where interventional procedures are performed are first registered with local certification and then central certification by the national acute stroke science board. Finally, each stroke unit and center takes place in the management network or in a system linked to it, which is planned to operate at the country level (4).

In the process leading up to the stroke directive, “the national Stroke clinical protocol" (5) and "Stroke diagnosis and treatment guideline" (6) were published by the Turkish Ministry of Health with high degree academic cooperation of Turkish Cerebrovascular Diseases Society and Turkish Neurology Society. In addition, these two societies supported the directive by publishing guidelines and algorithms such as "Use of IV tPA in acute stroke" (7,8), "Nursing care and hospital processes in stroke" (9), "Non-vitamin-K oral anticoagulant (NOAC) use" (10), "Cerebral edema and treatment

Figure 1. Distribution of stroke centers and units.
Footnote: Distribution of stroke centers (top) and stroke units (bottom) in Turkey. According to the provincial population-based analysis, stroke units covered 60.3% of Turkey's population (84.7 million as of 13.03.2022), and stroke centers 70.5%. The total population of the provinces without stroke units and centers is around 13 million, which corresponds to 15.4%.

Table 1. Stroke units/centers minimum requirements.

	Stroke units	Stroke centers
Specialist	Neurologist (Director, in the unit during office hours) Neurologist (out of working hours, full-time at the health facility, easily accessible on 7/24 basis) Radiologist (able to report on 7/24 basis)	At least one specialist* who can perform neurovascular procedures Neurosurgeon* Anesthesiology and reanimation specialist* Cardiologist*
Bed number	At least 4	At least 6 (Some of them can be arranged within the adult intensive care unit)
Medical unit and equipment	Computed tomography (with 7/24 service, angiography capacity) Emergency biochemistry laboratory (24/7 service) At least second level adult intensive care service (in the health facility) At least second level emergency service Monitor (one per bed) Emergency sets (one per unit at minimum)	Magnetic resonance imaging** Cerebral angiography with DSA and road-map** MR angiography** Color Doppler ultrasonography** Cardiovascular surgery clinic where all kinds of cardiovascular surgery can be performed Neuro-Intensive care service Neurosurgery clinic, able to perform all kinds of brain surgery Third level emergency room (preferably) Third level adult intensive care service

* Full-time at the health facility, easily accessible on 7/24 basis (out of working hours); ** in the health facility, serving on 24/7 basis.

Table 2. List of neurointerventional processes.

Intracranial neurointerventions	Extracranial neurointerventions
1. Thromboaspiration or mechanical thrombectomy with modern devices in acute ischemic stroke	1. Carotid stent and angioplasty
2. Cerebral aneurysm treatment	2. Head and neck tumor embolism
3. Cerebral arteriovenous malformation treatment	3. Vertebral artery proximal stent and angioplasty
4. Dural arteriovenous fistula treatment	4. Subclavian stenting and angioplasty
5. Stenting or angioplasty for intracranial atherosclerotic disease	5. Extracranial carotid balloon angioplasty test
6. Stenting for intracranial dissection	
7. Intracranial parental artery occlusion	
8. Intracerebral tumor embolization	

in acute stroke" (11), "Guidelines for the treatment of acute stroke in the COVID pandemic" (12).

IV TPA AND NEUROINTERVENTIONAL TREATMENT IN TURKEY: A SHORT STORY AND CURRENT SITUATION

Intravenous tissue plasminogen activator (IV tPA) was approved by the Ministry of Health of the Republic of Turkey in March 2006, approximately 10 years after Europe (13). The drug is covered in full reimbursement. Estimated utilization rate in acute stroke patients is about 3%. A national database does not exist. The use of tPA in stroke meets contemporary quality criteria, as demonstrated in the Turkish National Intravenous Thrombolysis Registry (14) and a meta-analysis compiling published local case series (15). In the latter, an analysis of 2349 cases in 21 publications documented that the mean age was 65 years, the mean symptom-to-needle time was 111 minutes; pre-tPA National Institutes of Health Stroke Scale (NIHSS) score was 13.8, mean good prognosis at 3 months (Modified Rankin's score-mRS≤2] 59.6%, mortality 16.5%, and symptomatic IV tPA-related intracerebral hemorrhage 5.6% (15). In the recently published Turkish Endovascular Stroke Registry, where 975 patients were analyzed, the mean age was 65 years, the mean NIHSS 16, the good prognosis at 3 months (mRS≤2) was 43%, the mortality was 24%, and symptomatic bleeding was 13.6% (16).

In order to increase the use of IV tPA by neurologists in acute ischemic stroke, 19 certified courses were held in 17 provinces in three years between 2017 and 2019 in cooperation with the Turkish Neurology Society and the Turkish Cerebrovascular Diseases Society. Nearly 500 neurologists completed this training program where more than 50 trainers took a role. In addition, 16 neurologists received short-term IV tPA scholarship for comprehensive stroke centers in 2017-2018 with a program managed by the Turkish Neurological Society. In this context, the Turkish Neurological Society published the first edition of the Acute Stroke IV tPA user manual in 2017 and its second edition in 2019. The society-endorsed informed consent forms of IV tPA usage and drip-and-ship procedures are also included in this handbook.

The results of the MR CLEAN study (17), which opened a new era in acute ischemic stroke, were announced at the ninth World Stroke Congress held in İstanbul on October 25, 2014 (18). Following this event which had taken place in our country, a high-degree neurointerventional training campaign sparkled among neurologists in Turkey. By the end of 2021, almost 50 neurologists had completed neurointerventional training under the structural program that was certified by Turkish Neurological Society and Turkish Cerebrovascular Disease Society and started working in stroke centers. What is pleasing is that almost all of these centers are newly introduced centers. In 2021, neurologists directly performed more than half of acute stroke thrombectomies in the country. Turkish interventional Neurology training campaign was conducted by Prof. A. Özcan Özdemir working in Eskisehir Osmangazi University Stroke Center. In the following years, neuroendovascular training centers were opened in Gaziantep and Istanbul.

"inme.org.tr" CAMPAIGN AND POPULATION-LEVEL AWARENESS

The Turkish Cerebrovascular Diseases Society run a nation-wide campaign to overcome the obstacles preventing acute stroke patients from reaching treatment, and work in a non-stop manner to raise social awareness about acute stroke to the higher level (19). Starting from 29 October 2020, the World Stroke Day, in the 2020-2021 pandemic period, this effort has been carried

to a further dimension with introduction of website named as "www.inme.org.tr". The motto of this campaign is "stroke cure=early intervention" (Figure 2 and 3). In this campaign, informative announcements and news were made on radio and television programs (Figure 4), on our websites and on other social media facilities without any interruption (Figure 5). News and information about stroke were published in the newspapers. Educational posters were placed on billboards in the subways, buses, common areas, municipal facilities, parks and squares in the cities (Figure 6, 7 and 8). Our banners took place at the national football league matches (Figure 9). Stroke patient handbooks, t-shirts, masks, name badges and badges were prepared for clinics and distributed free of charge (Figure 10 and 11). "Are you aware?" The short film competition was an important stage of this campaign (Figure 12). In these activities, it is always aimed to inform the population with short and clear messages and to change the lifestyle (Figure 13 and14).

Figure 2. The opening announcement of the stroke campaign.
Foot note: "İnme.org.tr" campaign was carried out under the consultancy of Assoc. Dr. Serhat Serter and Dr. Instructor Serdar Yıldız, both are members of Eskişehir Anadolu University Faculty of Communication Faculty. Two mottos of the campaign are "CALL 112 WITHOUT HESITATION ("ÇEKİNMEDEN ARAYIN 112" in Turkish)" and "SOLUTION TO STROKE=EARLY INTERVENTION" (INMEDE ÇARE ERKEN MÜDAHALE in Turkish)".

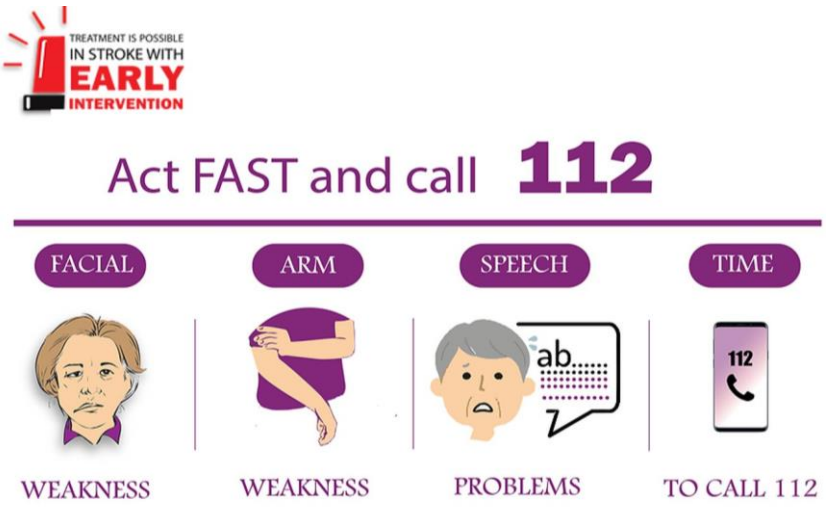

Figure 3. English version of one of the posters used in the campaign.
Foot Note: A useful acronym combining "Facial paresis", "Arm weakness" and "Speech problems" could not be produced in Turkish. Therefore, it was mottoed with a longer sentence as " YÜZDE KAYMA-KOLDA KUVVETSİZLİK-KONUŞMA BOZUKLUĞU-BİRİ Mİ VAR? HEMEN 112 ARA!".

Figure 4. Examples of short training videos prepared by stroke experts in Turkey.
Foot Note: In up-to-down order : Prof. İpek Midi (Turkish Cerebrovascular Diseases Society, member of Borad of Directors) "What is stroke?"; Prof. Mehmet Akif Topçuoğlu (Turkish Cerebrovascular Diseases Society, Vice-president) "Can you have a stroke while asleep?"; Prof. Atilla Özcan Özdemir (Turkish Cerebrovascular Diseases Society, President) "Is there a relationship between corona virus and stroke?"; Prof. Bijen Nazlıel (Turkish Cerebrovascular Diseases Society, Treasurer) "What are the symptoms of stroke?"; Prof. İpek Midi "What should we do to prevent stroke?"; Prof. Bijen Nazlıel "Is there a relationship between smoking and stroke?"; Associate Professor Erdem Gürkaş (Interventional neurologists, Stroke center director) "Why do you need to call 112 first at the time of stroke?" and Prof. Mehmet Akif Topçuoğlu "Can a stroke be fatal?".

Figure 5. Turkish Cerebrovascular Diseases Society instagram page.
Foot note: This page is managed by Çiğdem Akbaş Ilgaz, the Executive Secretary of the Turkish Cerebrovascular Diseases Society. Throughout the campaign, Society secretaries Çiğdem Akbaş Ilgaz and Yener Gök played a very active role.

Figure 6. Our motto on the Metro screens in the Stroke campaign.
Footnote: The photo was taken by Çiğdem Ilgaz.

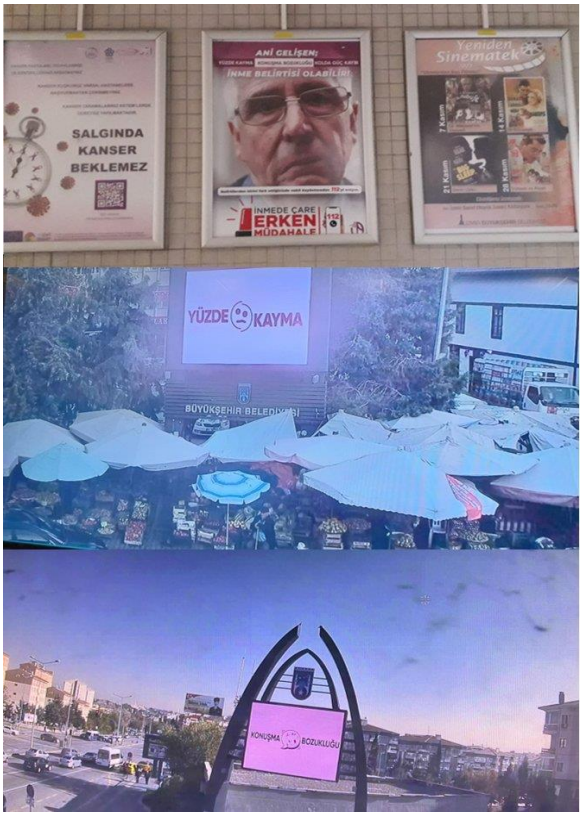

Figure 7. Stroke in the city.
Footnote: Campaign posters on billboards and screens in squares. Photos were taken by Yener Gök.

Figure 8. Campaign posters on billboards on the street in Istanbul.
Footnote: Photos were taken by Yener Gök.

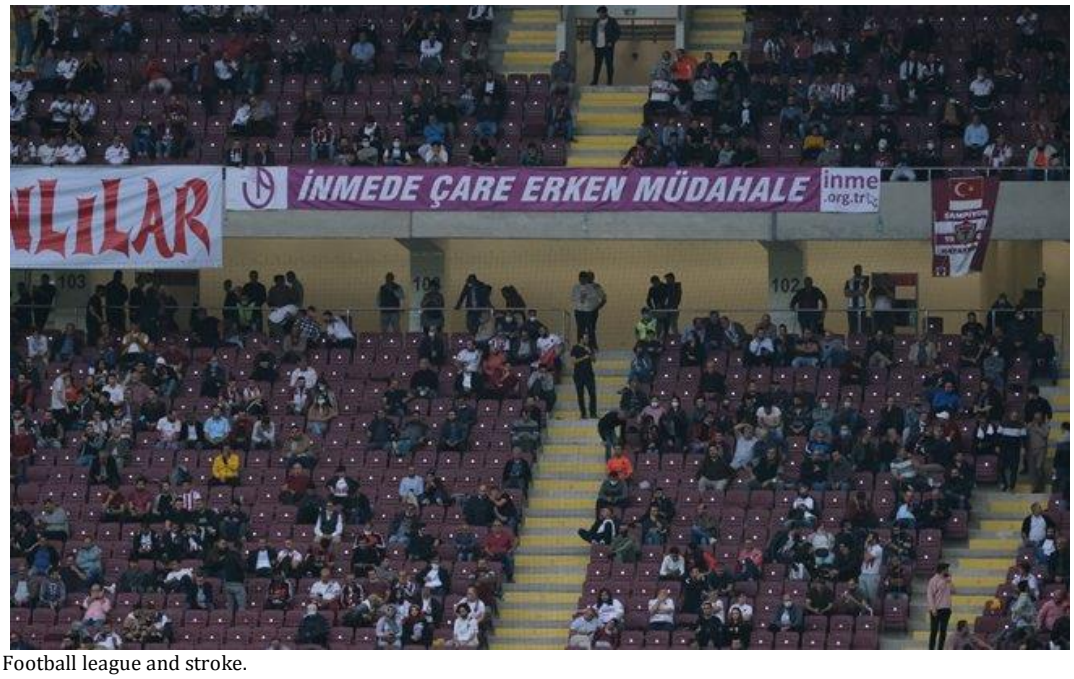

Figure 9. Football league and stroke.
Footnote: The motto stating "Remedy for Stroke = Early Intervention" in the turbine in the Turkish Super League football match. The photo was taken by Yener Gök.

Figure 10. Stroke patient handbooks.
Footnote: The stroke patient handbook was distributed to stroke clinics free of charge by TBDHD. The first draft of the book titled "Hold on to Life, Avoid Stroke" was prepared by Prof. İpek Midi, Prof. Canan Togay Işıkay and Prof. Bijen Nazlıel. The picture of the patient reading this book in the public park was taken by Yener Gök, the secretary of the Society Ankara Office, who pioneered the realization of this project.

Figure 11. Stroke teams wearing campaign t-shirts.
Footnote: Footnote: Top image. Prof. İpek Midi and her team, Marmara University Stroke Center (Istanbul), Down Prof. Vedat Ali Yürekli and his team, Süleyman Demirel University Stroke Center (Isparta).

Figure 12. "Are you aware?" short film competition.
Footnote: The jury of the short film competition titled "Are you aware?" included Prof A. Özcan Özdemir, Assoc. Dr. Serhat Serter, Director Çağrı Vila Lostuvalı, Actress Merve Dizdar, Actor Oktay Kaynarca and Journalist Şebnem Bursalı. Prof. Mehmet Akif Topçuoğlu, Lecturer Dr. Hakan Aşkan and Lecturer Dr. Meltem Cemiloğlu took place in the elimination jury. Dr. Ayşe Sönmez was the project coordinator and her assistant were Atlas Timur. The short film called as "White", directed by Uğurcan Özcan and Ayşe Nur Güney, won the first prize in the competition.

Figure 13. An example of the infographics used in the campaign.
Footnote: "Four golden rules to prevent stroke" infographic, prepared by the Turkish Cerebrovascular Disease Society, on the stroke awareness day on May 10, 2021.

Figure 14. Examples for "Stroke prevention strategy during Pandemic " "Problem and Solution"advertisements published on "Stroke org tr".
Footnote: #1 "Don't be sedentary", #2 "Review your lifestyle", #3 "Don't interrupt your treatments.", #4 "Don't waste your time during a stroke."

NEAR FUTURE EXPECTATIONS

The time has come to establish an integrative organization of stroke units and centers, a nationwide management network, and develop a quality-based acute stroke system. And, it is the time for official definion of the personal responsibilities and rights of stroke nurses, physiotherapists and language-speech therapists and other disciplines who will take part in the team headed by the neurologist directing management and care in the neurological intensive care and stroke units and angiography suits. The workforce of neurologists who can manage neurological and neurointerventional treatments to a desired level should be increased in a short time. These neurologists will adopt and implement the modern stroke system of care, drawn in the directive in our country, provide scientific stroke management uninterrupted. It is our effort and expectation that all of them will be implemented in the near future. The European Stroke Organization (ESO) and the Stroke Alliance for Europe (SAFE) will be our indispensable stakeholders in this regard.

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Ethics

Ethics Committee Approval: This article is a medical mew, there is no need an ethical approvel.

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