

# THE STATE OF STROKE MEDICINE IN UKRAINE BEFORE THE REFORM OF SPECIALIZED CARE

TONCHEV M.D.<sup>1</sup>, LEBEDYNETS D.V.<sup>3</sup>,  
LEBEDYNETS P.V.<sup>4</sup>, LITOVCHENKO V.E.<sup>2</sup>, NOS A.O.<sup>1</sup>

<sup>1</sup>Poltava Regional Clinical Hospital named after M.V. Sklifosovsky, Poltava, Ukraine

<sup>2</sup>Poltava State Medical University, Poltava, Ukraine

<sup>3</sup>Stroke Center, Feofaniya Clinical Hospital, Kyiv, Ukraine

<sup>4</sup>Stroke Unit Medical Home Odrex, Odesa, Ukraine

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**Objective** – to study the approaches to providing medical care to patients with acute ischemic stroke in Ukraine before the reform and to identify the necessary changes for further improvement of this care.

**Materials and methods.** The study analyzed the stroke care system in Ukraine. Data collection was carried out through a survey of 408 healthcare institutions, resulting in 532

completed questionnaires. Additionally, a review of regulatory documentation, medical university curricula, and scientific publications was conducted.

**Results.** The survey of 408 healthcare institutions and the analysis of 532 questionnaires revealed significant disparities in stroke care delivery. A total of 13,965 beds were reported for stroke patients, but these were not confined to dedicated stroke units and included beds in intensive care, neurology, and neurosurgery departments. Only 235 institutions had specialized intensive care units. Workforce analysis showed a sufficient number of neurologists, neurosurgeons, and anesthesiologists; however, the lack of standardized treatment approaches led to inconsistency in care quality. A significant shortage of nursing staff was identified, with one nurse caring for up to 15 patients per shift — far exceeding the recommended staffing norms of European stroke centers (Intercollegiate Stroke Working Party, 2023). Equipment availability also remains a challenge: only 103 MRI and 199 CT scanners were reported across the studied facilities, limiting access to timely diagnosis and modern treatment (Poltava Regional Military Administration, 2023). The availability of thrombolytic therapy remains significantly below European standards, with only 100 clinics reporting experience with its use (European Stroke Organisation, 2021). These findings emphasize the urgent need for investment in infrastructure, human resources, and the implementation of evidence-based clinical stroke treatment protocols.

**Conclusions.** Before the reform of specialized care, patients with acute ischemic stroke in Ukraine received varying levels of treatment depending on infrastructure and staff readiness to implement reperfusion therapy. Gradual implementation of European Stroke Organisation standards and the establishment of a national stroke registry are critical steps toward improving quality control and optimizing stroke care delivery.

**Key words:** acute ischemic stroke; reform; medical personnel; infrastructure.

Acute stroke is a non-communicable disease that has a significant impact on the state, both socio-economically and at the population level [1]. Treatment methods for acute stroke have rapidly evolved over the past 30 years. As a separate nosological entity, stroke was described as early as 460–370 BC by Hippocrates; however, for almost 2000 years, its treatment strategy remained unchanged, and for a long time, the disease was considered unpromising. According to the analysis «Global, regional, and national burden of stroke, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016», Ukraine is classified among countries with a high incidence of stroke [2]. Every year, approximately

120,000 patients with acute stroke are hospitalized in Ukraine. According to the literature, stroke ranks second in mortality, surpassed only by cardiovascular diseases, and holds first place in terms of patient disability [3]. However, the full impact of acute stroke on the population in Ukraine has not been thoroughly studied.

**Objective:** to study the approaches to providing medical care to patients with acute ischemic stroke in Ukraine before the reform and to identify the necessary changes for further improvement of this care.

### Materials and methods

Given the limited set of available statistical data, we chose a survey of healthcare facility departments as the research method. The selection criterion for participation in the survey was the number of treated patients in the department over the previous calendar year — no fewer than 50.

Additionally, we conducted an analysis of the existing regulatory documentation, medical university curricula, and publications in professional journals in Ukraine

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ТОНЧЕВ Михайло Дмитрович  
к. мед. н., нейрохірург, комунальне підприємство  
«Полтавська обласна клінічна лікарня  
ім. М.В. Скліфосовського Полтавської обласної  
ради», завідувач відділення нейрохірургії та  
інтервенційної радіології з ангіографічним  
рентгеноопераційним блоком  
Адреса: Україна, 36, м. Полтава, вул. Шевченка, 23  
Тел: +38 (0532) 56-12-79  
e-mail: info@okl.poltava.ua  
ORCID ID: 0000-0002-1994-4613

from 1991 to 2019.

In 2019, a survey was conducted in the departments of all healthcare facilities, regardless of ownership, that provided medical care to patients with acute stroke. We aimed to assess hospital bed capacity, staffing, and diagnostic capabilities to determine indicators that could be used for evaluating healthcare facilities or stimulating the development of the stroke care system. A total of 532 questionnaires were collected from 408 healthcare facilities. The total number of declared beds in departments providing care to patients with acute ischemic stroke was 13,965. However, this bed capacity was not exclusively used for stroke patients. The list included not only stroke unit beds but also beds from intensive care units, general neurology departments, neurosurgery departments, and neurological beds in therapeutic departments. The number of departments with an intensive care unit was 235.

### Results and Discussion

Regarding medical staffing, the survey revealed the presence of 1190.75 neurologist positions, of which 1128.5 were occupied; 245.75 neurosurgeon positions, with 225.5 occupied; and 1474.5 anesthesiologist positions, with 1357.5 occupied. This indicates a relatively large number of medical personnel involved in stroke care. However, these staffing levels, combined with the lack of control over adherence to a unified doctrine (established in 2012), have led to significant discrepancies and inequality in the scope and quality of care provided to patients.

Regarding the number of nursing staff (5,169 positions, of which 4,801 were occupied), the survey indicated no changes in the healthcare system — the number of personnel still aligned with the staffing schedule of the now obsolete Ministry of Health of Ukraine Order No. 33 from February 23, 2000. At the same time, the workload per nurse per shift was 15 patients, making it impossible to provide quality care according to modern standards. For comparison, in the United Kingdom, in stroke units providing revascularization treatment within the first 24 hours of stroke onset, there are 2.9 nurses per shift per

stroke bed. In acute stroke units treating patients in the early period (days 1–7), the recommended staffing ratio is 1.35 nurses per stroke bed per shift [5].

The total number of junior nurses was 3,779 positions, with 3,576 occupied.

Other Members of the Multidisciplinary Team in 408 Healthcare Facilities.

The distribution of other members of the multidisciplinary team across 408 healthcare facilities is as follows (Table 1).

Table 1

#### Distribution of Multidisciplinary Team Members

Specialty	Number of Positions	Occupied Positions
Physicians of Physical and Rehabilitation Medicine	123	115.5
Therapeutic Exercise Instructors	238.5	227.0
Speech Therapists	42.5	40.0
Psychologists	47.75	41.0

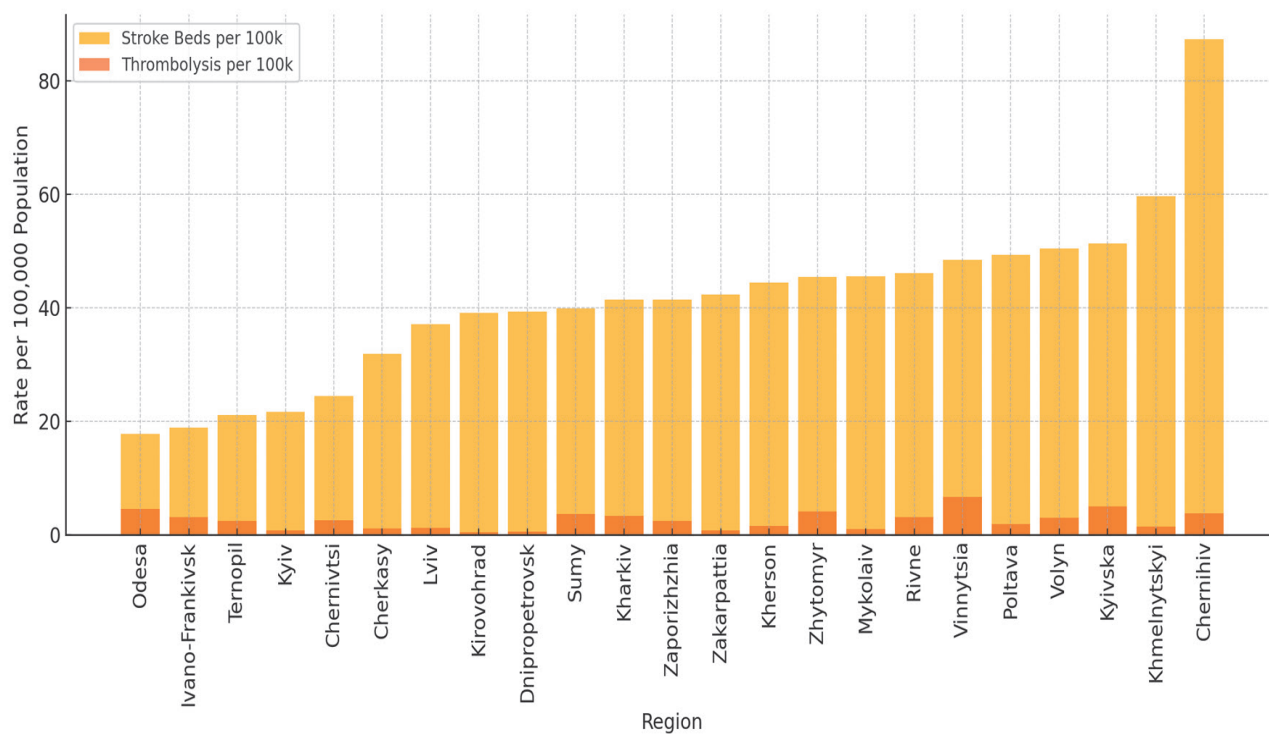
Thus, based on the data presented in the table, we can conclude that there is a lack of a multidisciplinary approach in the treatment of acute stroke and an absence of a rehabilitation component in most departments treating patients with acute ischemic stroke.

When analyzing the number of stroke beds per 100,000 population, we obtained the following data (Fig. 1). However, when comparing this with the administration of intravenous thrombolysis, it became evident that the availability of beds has a very weak correlation with patient access to reperfusion therapy (correlation coefficient – 0.17).

A separate analysis was conducted to assess the availability of essential medical equipment. When compiling the list of necessary material and technical resources, we relied on the European Stroke Organisation (ESO) certification requirements for stroke units in Europe, considering their objectives and responsibilities.

According to the survey data, on average across Ukraine, given the existing stroke bed capacity:

- One pulse oximeter is available for every 10.7 beds.



**Fig. 1.** Comparison of Stroke Beds and Thrombolysis Availability per 100k Population

- Monitoring of vital functions, including ECG, is available for every 15th patient.

- Oxygen supply is available for every 32nd patient.

- Neuroimaging is accessible for every 60th patient (with a total of 103 MRI machines and 199 CT scanners across 408 healthcare facilities, regardless of ownership).

Regarding stroke type verification, the survey revealed that, on average, neuroimaging is used for every 57th patient, which closely corresponds to the reported availability of neuroimaging equipment. All other cases are diagnosed clinically or through lumbar puncture, which, in our opinion, leads to diagnostic errors and, consequently, incorrect treatment strategies.

Additionally, data were collected on the use of stroke scales, surgical procedures, and other medical interventions.

The availability of cerebral vessel visualization technologies was reported as follows:

- 77 respondents confirmed the use of non-contrast MRI for vascular imaging.

- 117 respondents reported access to CT angiography.

- 59 respondents indicated the availability of cerebral subtraction angiography.

Furthermore, only 100 clinics confirmed

experience with intravenous thrombolysis in acute stroke treatment, which is significantly lower than European standards [6]. This data highlights substantial gaps in medical equipment availability and adherence to modern stroke treatment guidelines in Ukraine.

We also examined the regulatory documentation governing the treatment of acute stroke patients in Ukraine from 1991 to 2019. For a long time after the collapse of the Soviet Union, stroke treatment in Ukraine remained largely unchanged from Soviet-era practices. Until 2004, when the first intravenous thrombolysis with alteplase was performed in Kharkiv, stroke treatment in Ukraine followed two primary strategies:

1. Inpatient care.
2. Home-based treatment.

Within inpatient settings, stroke patients were divided into two major specialties:

- Ischemic strokes were treated in neurology departments.
- Hemorrhagic strokes were treated in neurosurgery departments.

Most acute stroke patients were hospitalized in neurology departments of central district and city hospitals, while neurology departments of regional hospitals primarily managed scheduled (non-emergency) patients.

Stroke treatment was predominantly

based on methodological recommendations from individual neurology departments and the clinical experience of each hospital unit.

At the national level, no unified stroke treatment standards were in place, leading to significant variations in approaches across different neurology schools. These variations were observed in:

- The selection of prescribed medications.
- The formulation of stroke diagnoses.

Since there was no centralized state policy on medication use, drug prescriptions were often determined by the personal preferences of doctors and patients.

The only official regulation was the Ministry of Health's approval of drug instructions, which legally permitted certain medications for stroke treatment.

This regulatory gap allowed various stakeholders to promote different (including unethical) drugs.

As a result, in our opinion, for an extended period, stroke patients in Ukraine became «hostages» of physicians' personal treatment preferences, rather than receiving evidence-based care based on the latest clinical research and guidelines.

A major issue in Ukraine's stroke care system has been the absence of a centralized data collection system for monitoring stroke treatment quality. This made it impossible to implement effective quality control mechanisms. The assessment of medical care quality was conducted only in response to complaints from dissatisfied patients or their relatives. The main indicators that were monitored included:

- Hospital mortality rates.
- Length of hospital stay.

The first significant changes in stroke care regulations occurred on July 30, 2002, with the issuance of Ministry of Health Order No. 297 «On improving medical care for patients with cerebrovascular pathology». This order mandated the creation of 1–2 intensive care unit beds in neurology departments of hospitals, regardless of their specialization.

The standard equipment for these intensive care unit beds included:

- Oxygen concentrators.
- Adjustable functional beds with head elevation capabilities.

However, this order did not lead to the establishment of a robust stroke care network capable of providing comprehensive acute stroke treatment.

In 2008, the Ministry of Health issued Order No. 317 (June 13, 2008), which approved clinical protocols for neurosurgery (Nos. 23 and 24) covering neurosurgical stroke treatment.

In 2012, the Ministry of Health issued Order No. 602, which introduced a National Unified Clinical Protocol for Ischemic Stroke Treatment. This document mandated:

- The routine implementation of pharmacological reperfusion therapy (intravenous thrombolysis).
- A multidisciplinary approach to stroke treatment.

Despite these regulatory advancements, from 2012 to 2016, only one hospital consistently implemented reperfusion therapy, while most other healthcare facilities continued using traditional symptomatic and nootropic treatments for ischemic stroke.

This highlights the significant gap between national stroke treatment policies and their real-world implementation, emphasizing the need for systemic reforms to ensure equitable access to modern, evidence-based stroke care.

In 2012 and 2014, the Ministry of Health of Ukraine introduced a requirement for the implementation of medical standards based on evidence-based medicine (Orders No. 751 dated September 28, 2012, and No. 1422 dated December 29, 2016).

This regulatory change allowed hospitals to select modern international guidelines and, after approval as a «new clinical protocol», incorporate them into routine medical practice. This flexibility enabled the integration of the latest medical advancements into the Ukrainian healthcare system.

The only restriction was that hospitals could only adopt national treatment protocols from recognized healthcare systems, including:

- The United States;
- Canada;
- The European Union;
- Australia.

In 2018, the European Stroke Organisation, in collaboration with the Stroke

Alliance for Europe, developed the European Stroke Action Plan (ESAP) 2018–2030.

This strategic document outlined four key goals for stroke care improvement in Europe by 2030 [2]:

1. Reduce the absolute number of strokes in Europe by 10 %.
2. Ensure that  $\geq 90$  % of all stroke patients receive treatment in specialized stroke units.
3. Develop national stroke plans that cover the entire care continuum.
4. Fully implement national strategies for multisectoral health interventions.

Additionally, the plan established reperfusion therapy targets:

- Intravenous thrombolysis in at least 15% of stroke cases.
- Mechanical thrombectomy in at least 5 % of stroke cases.

Over time, these targets were revised to reflect improving stroke care standards. As of early 2025, the recommended targets are:

- 20 % of ischemic stroke patients should receive thrombolysis.
- 10 % should undergo mechanical thrombectomy.

For a long time, internationally recognized endovascular stroke treatments faced obstacles in Ukraine. A significant issue was the lack of mechanical thrombectomy in the National Unified Stroke Protocol. Although some hospitals implemented endovascular stroke treatment by approving local clinical protocols, these efforts were not supported by financial incentives. In most cases, their success depended solely on the dedication of individual specialists advocating for these advanced techniques. In 2020, the Ministry of Health of Ukraine and the National Health Service of Ukraine introduced a reform of specialized medical care, transitioning hospitals to a performance-based financing model — where healthcare facilities are reimbursed based on the services they pro-

vide. This transformation process is ongoing, aiming to enhance hospital efficiency and accountability.

As of today, Ukraine has 258 healthcare facilities providing acute stroke care under the acute stroke service package. All of these hospitals declare the availability of sufficient technical and human resources to provide appropriate stroke care. However, ensuring consistent adherence to international standards remains a key challenge for Ukraine's evolving stroke care system.

### Conclusions

Prior to the reformation of the specialized medical care system, patients with acute ischemic stroke in Ukraine received varying levels of medical care, depending on the availability of material and technical resources and the preparedness of medical personnel to implement reperfusion therapies.

Despite the existence of a sufficient regulatory framework and relevant orders from the Ministry of Health, which have significantly expanded hospitals' capacity to provide modern stroke care since 2016, the traditional approach to stroke treatment remains prevalent in most healthcare facilities.

Therefore, we believe that gradual implementation of new requirements for stroke care is necessary. This should include:

- Establishing a national stroke patient registry to ensure quality control of medical services.
- Defining criteria for external and internal monitoring of stroke care processes.
- Standardizing stroke treatment pathways to ensure adherence to modern evidence-based practices.

These steps will contribute to the systematic improvement of stroke care in Ukraine, ensuring greater accessibility and adherence to international treatment standards.

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## СТАН ІНСУЛЬТНОЇ МЕДИЦИНИ В УКРАЇНІ ДО ПОЧАТКУ РЕФОРМИ СПЕЦІАЛІЗОВАНОЇ ДОПОМОГИ

ТОНЧЕВ М.Д.<sup>1</sup>, ЛЕБЕДИНЕЦЬ Д.В.<sup>3</sup>, ЛЕБЕДИНЕЦЬ П.В.<sup>4</sup>, ЛІТОВЧЕНКО В.Е.<sup>2</sup>, НОС А.О.<sup>1</sup>

<sup>1</sup>КП «Полтавська обласна клінічна лікарня ім. М.В. Скліфосовського ПОР» м. Полтава, Україна

<sup>2</sup>ВНЗ «Полтавський державний медичний університет», м. Полтава, Україна

<sup>3</sup>Інсультний центр, Клінічна лікарня «Феофанія», м. Київ, Україна

<sup>4</sup>Інсультне відділення, Медичний дім «Одрекс», м. Одеса, Україна

**Мета роботи** – вивчити підходи до надання медичної допомоги пацієнтам із гострим ішемічним інсультом в Україні до проведення реформи спеціалізованої допомоги та визначити необхідні зміни для вдосконалення цієї допомоги.

**Матеріали та методи.** Проаналізовано систему надання медичної допомоги пацієнтам із гострим мозковим інсультом в Україні за допомогою анкетування 408 закладів охорони здоров'я (отримано 532 анкети), а також нормативну документацію, навчальні програми вищих медичних навчальних закладів і наукові публікації з цієї проблеми.

**Результати.** Опитування виявило суттєві відмінності в рівні надання медичної допомоги при інсульті. Загальна кількість заявлених ліжок для пацієнтів з інсультом становила 13 965, але їх використовували не лише в спеціалізованих інсультних відділеннях, а й у відділеннях інтенсивної терапії, неврології та нейрохірургії. Лише 235 закладів мали спеціалізовані блоки інтенсивного лікування. Аналіз кадрового складу виявив достатню кількість лікарів-неврологів, нейрохірургів і анестезіологів, але відсутність єдиного підходу до лікування спричинила відмінності за якістю надання допомоги. Установлено недостатню кількість медичних сестер, тому навантаження на одну медичну сестру становить 15 пацієнтів за зміну, що значно перевищує рекомендовані норми європейських інсультних центрів (Intercollegiate Stroke Working Party, 2023). Також існує проблема недостатньої забезпеченості необхідним обладнанням: лише 103 магнітно-резонансних томографи та 199 комп'ютерних томографів функціонують у досліджених закладах, що обмежує доступність швидкої діагностики та сучасного лікування (Полтавська обласна військова адміністрація, 2023). Можливість проведення тромболізу значно менша за європейські стандарти, оскільки лише 100 клінік повідомили про досвід його проведення (European Stroke Organisation, 2021). Отримані дані свідчать про необхідність інвестицій в інфраструктуру, вирішення питання щодо кадрів та впровадження сучасних клінічних протоколів лікування інсульту.

**Висновки.** До реформи спеціалізованої допомоги пацієнти з гострим мозковим інсультом в Україні отримували лікування різного рівня залежно від матеріально-технічного забезпечення та готовності медичного персоналу до застосування реперфузійної терапії. Поступове впровадження нових вимог Європейської організації з вивчення інсульту та створення національного реєстру пацієнтів з інсультом дадуть змогу поліпшити контроль за якістю лікування та оптимізувати систему надання допомоги.

**Ключові слова:** гострий мозковий інсульт; реформа; персонал; матеріально-технічне забезпечення.