Report on situational analysis results of acute stroke care in Ukraine
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Abstract
Stroke care remains a critical health care priority in Ukraine, with an estimated annual incidence of 130,000 stroke cases and higher mortality rates compared with the average within the WHO European Region. This updated report extends the previous situation report on stroke care in Ukraine (2019–2021) by incorporating recent developments and expanding the analysis to monitor the trends. Leveraging data extracted from the electronic health information system, policy materials review and an assessment of stroke services’ performance, this report benchmarks Ukraine against other countries in the WHO European Region.

In line with the European Union–Ukraine integration process, the Stroke Action Plan for Europe key performance indicators (KPIs) were utilized to align with European health care standards. Analysis of these KPIs revealed Ukraine’s varying performance.

Findings and stakeholder discussions held in November 2023 concluded in proposals aimed at fortifying stroke prevention strategies and addressing the underutilization of effective treatments and rehabilitation services.

This report reflects on the situation post COVID-19 pandemic and the beginning of the full-scale invasion of Ukraine by the Russian Federation in February 2022. It aims to contribute to ongoing health system recovery and reform in Ukraine.

Keywords
STROKE — PREVENTION AND CONTROL
DELIVERY OF HEALTH CARE — METHODS
HEALTH SERVICES
UKRAINE

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<td>AIS</td>
<td>acute ischaemic stroke</td>
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<tr>
<td>CT</td>
<td>computed tomography</td>
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<td>CVD</td>
<td>cardiovascular diseases</td>
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<td>ECG</td>
<td>electrocardiogram</td>
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<td>ESO</td>
<td>European Stroke Organization</td>
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<td>IVT</td>
<td>intravenous thrombolysis</td>
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<td>KPI</td>
<td>key performance indicator</td>
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<td>MRI</td>
<td>magnetic resonance imaging</td>
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<td>NCD</td>
<td>noncommunicable disease</td>
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<td>NHSU</td>
<td>National Health Service of Ukraine</td>
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<td>PMG</td>
<td>Program of Medical Guarantees</td>
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<td>RES-Q</td>
<td>Registry of Stroke Care Quality</td>
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<td>SAP-E</td>
<td>Stroke Action Plan for Europe</td>
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<td>SDG</td>
<td>Sustainable Development Goals</td>
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<td>SSO</td>
<td>stroke support organization</td>
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<tr>
<td>TTE</td>
<td>transthoracic echocardiogram</td>
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<td>TOE</td>
<td>trans-oesophageal echocardiogram</td>
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Executive summary

Stroke presents a significant health challenge in Ukraine, causing high rates of mortality and disability and imposing substantial costs on individuals, families, communities and the country. Failure to prioritize action on stroke is impeding the achievement of the Sustainable Development Goals (SDGs), which are a universal call to action to end poverty, protect the planet and improve the lives of all. While some action has been taken to prevent stroke and to improve care, despite the challenges imposed by the COVID-19 pandemic and the ongoing full-scale military invasion of the country by the Russian Federation that started in February 2022, it falls short of what is required. Nevertheless, there are some encouraging initiatives on which to build. Given the urgency for action, this report reviews Ukraine’s progress and capacities against international recommendations and standards as described by WHO and within the Stroke Action Plan for Europe (SAP-E) and benchmarks its performance against other countries in WHO European Region. This report is built on the comparative analysis of data extrapolated from electronic health records (e-health), a public electronic medical data management system and review of policy materials.

Key findings show a rise in diagnosed acute stroke cases in 2022, primarily acute ischaemic strokes (AIS), with nearly equal admissions among men and women. Most stroke patients were admitted to hospitals contracted by the National Health Service of Ukraine to provide stroke-specific health services, however some patients were admitted to hospitals without stroke-specific contracts. According to the data, women appear to have strokes at later ages compared to men in Ukraine. The mean age of patients admitted with acute stroke in Ukraine appears to be younger than elsewhere in the WHO European Region. Effective treatments for AIS such as intravenous thrombolysis (IVT) and/or mechanical thrombectomy appear to be underutilized, as do rehabilitation services. Stroke mortality is not improving over time and may be worse for women. Not all stroke cases are specified by stroke type.

Assessment against SAP-E’s 12 key performance indicators (KPIs) indicates Ukraine’s moderate performance on most indicators, with strengths in two KPIs (3 and 8) and shortcomings in three (4, 6 and 12), placing the country mid-tier among countries in the WHO European region. The finding that Ukraine is underperforming in crucial metrics for acute and long-term stroke (e.g. national and regional level systems for assessing and accrediting stroke clinical services, access to stroke unit care and follow-up at 3–6 months after a stroke) should inform future actions and strategies aimed at enhancing acute stroke care, the implementation of specific educational interventions for providers and policy-makers and stroke campaigns aimed at the general population.

There is a significant preventable mortality and disability in Ukraine, which has costs for individual, family, communities and the country. Pragmatic measurable and impactful interventions are available and may be implemented along the whole continuum of care, with short-, medium- and long-term gains.

The outlined “Way Forward” segment proposes strategic actions for advancing stroke care in Ukraine, based on the benchmarking exercise and a situation report, as well as a technical meeting with stakeholders held in November 2023.

- **Primary and secondary stroke prevention**: implement communication campaigns, update clinical protocols and enhance health care professional competencies in hypertension management.
● **Acute stroke care delivery and rehabilitation:** develop integrated services, expand rehabilitation packages and avoid fragmented infrastructure investments.

● **Surveillance and quality improvement:** update national guidelines, establish measurable care standards and create a legislative framework for stroke care quality monitoring.

These measures collectively aim to fortify stroke care capacities in Ukraine, ensuring a comprehensive approach spanning policy development, preventive strategies, acute care, rehabilitation and ongoing quality enhancement.
1. Introduction

**Stroke is a major cause of death and disability in Ukraine.** It is among the group of countries with the highest stroke incidence and mortality in the world (1). It is estimated that up to 130 000 people suffer from stroke in Ukraine each year (2), with one in five dying before discharge and two fifths dying within one month of onset. Globally, stroke is the leading cause of neurological disability (3).

**The war in Ukraine has disrupted health services while the affected population suffers from an increasingly high burden of non communicable diseases (NCDs).** Since the military invasion of the Russian Federation to Ukraine on 24 February 2022, the health system has been struggling to cope with a grade three emergency. Response activities have been implemented since then, but regular access to health services, including rehabilitation, cannot be ensured in areas with active hostilities. The demand for NCD services and the prevalence of uncontrolled hypertension and cardiovascular diseases (CVD) are high in emergency response areas (4). This emergency has and will have immediate and long-term consequences for population health.

**Failure to prioritize action on stroke is impeding the achievement of the Sustainable Development Goals (SDGs) in Ukraine.** Achievement of SDG target 3.1 to reduce premature mortality (30–70 years) from major NCDs by a third requires concerted action within the next 6 years to prevent heart attacks and strokes, prevent mortality from heart attacks and strokes and prevent recurrence.

**While some action has been taken to prevent stroke and improve care, it falls short of what is required.** WHO has identified a set of cost-effective and effective interventions for the prevention and control of stroke, yet these are not being implemented to scale within Ukraine (5). In May 2021 the Ministry of Health of Ukraine signed the Declaration for the Stroke Action Plan for Europe as an act of the country’s commitment to the battle against stroke, but this has not been followed through by an endorsed and implemented stroke action plan. In 2020 financing of specialized health care was transferred to the National Health Service of Ukraine (NHSU), the newly established national purchaser of health services. With this change, a stroke-specific service package was developed and introduced as a priority package within the Program of Medical Guarantees (PMG) (6). However, gaps in stroke care service provision persist. Medicines and inpatient care remain the main drivers of catastrophic health expenditures overall (7). The recently adopted Ministry of Health Order 1091 (8) outlines the parameters of the organizational design for stroke care services in Ukraine, but an efficient system has not yet been established. Coordination and standardization of services across providers require further strengthening. A system of monitoring, audits, feedback to providers and continuing professional development requires further development to improve the quality of care, save patients’ lives and support health (9).

**There are some encouraging initiatives on which to build.** In addition to wider health system recovery and reform efforts, several attempts to harmonize and standardize stroke clinical pathways are underway, with reference to organizational models of stroke care in other WHO European Region Member States. Despite the challenges imposed by health reform ongoing...
from 2017, the 2020 COVID-19 pandemic and the ongoing war, Ukraine actively participates in some European projects promoted by European scientific societies such as the European Stroke Organization (ESO). Both the Ministry of Health and NHSU took strong communication and coordination action in the summer of 2023 to address the issue of stroke care effectiveness and, in cooperation with WHO, held several technical meetings with regional health authorities to discuss stroke data, gaps in service provision and population health outcomes. These meetings served as an additional incentive for service providers and managers to further system improvement and ensure better service quality. Further regulatory work is envisioned in 2023 and 2024 to strengthen the system.

**Given the urgency for action, this report reviews the current situation** and brings up to date WHO’s previous 2021 analysis (10). It reviews Ukraine’s progress and capacities against international recommendations and standards as described by WHO and within the Stroke Action Plan for Europe (SAP-E), and benchmarks the country’s performance against that of other WHO European Region Member States. This report is intended for policy-makers, health-care facility managers, and acute and long-term care providers, as well as other health-care professionals engaged in stroke care delivery.
2. Methodology

A group of WHO experts collected and reviewed relevant policies and available data to assess the current situation for acute stroke care in Ukraine. This assessment aimed to benchmark the country’s achievements against international standards and recommendations, with a focus on comparison with other WHO European Region Member States.

The assessment drew from two primary sources of international recommendations and standards.

- **WHO’s updated set of recommendations on effective and cost-effective interventions for stroke care and secondary prevention** (11), namely:
  - treatment of acute ischaemic stroke (AIS) with intravenous thrombolytic therapy;
  - treatment of AIS with mechanical thrombectomy within an experienced facility;
  - low-dose acetylsalicylic acid within 24 to 48 hours for secondary prevention of ischaemic stroke;
  - comprehensive care of acute stroke patients in stroke units; and
  - drug therapy (treatment with an anti-hypertensive and statin) to control CVD risk using a total risk approach and counselling to individuals who have had a heart attack or stroke and to people at high risk (≥ 20%) of a fatal or non-fatal cardiovascular event within the next 10 years using the updated WHO CVD risk charts.

- **The 12 key performance indicators (KPIs) within SAP-E.** SAP-E was launched in 2018 by the ESO (12) and set targets for the implementation of evidence-informed preventive actions and stroke services until 2030 (13). Its aims are to: (i) reduce the absolute number of strokes in the WHO European Region by 10%; (ii) treat 90% of all patients with stroke in the Region in a stroke unit as the first level of care; (iii) establish pan-European national plans for stroke encompassing the entire chain of care; and (iv) fully implement national strategies for multisectoral public health interventions to reduce the risk of stroke (14). SAP-E activities include the pan-European Stroke Service Tracker, which functions as an annual registry of national KPIs along the pathway of stroke care in the WHO European Region (15). The 12 KPIs were established by the SAP-E Implementation Committee to analyse and monitor the current state across the entire chain of stroke care and to observe progress over the coming years, based on the main targets in all seven domains of SAP-E (16).

WHO experts assessed Ukraine’s performance against each of the KPIs for the year 2021. An independent colour-coding system was used to assess each KPI’s capacity to demonstrate its level of development. The following describes the colour coding for each level of advancement or scoring.

- **Red** denotes limited capacity, meaning that attributes of the capacity are in the development stage (implementation may have started, with some attributes commenced).
- **Amber** denotes developed capacity, meaning that most of the attributes of a capacity are in place; however, sustainability has not been ensured.
- **Green** denotes sustainable capacity, meaning that all attributes are both functional and sustainable.
Ukraine’s performance was also benchmarked against other WHO European Region Member States for these same KPIs, drawing on data held within the pan-European Stroke Service Tracker, to which 38 countries submitted data. This allowed identification of patterns and common issues in the Region, as well as highlighting the country’s successes and good examples.

A separate aggregate set of data was received from e-health records. The e-health data contained information from health care providers contracted by the NHSU for any service package, including stroke-specific. E-health data for 2021 and 2022 were aggregated and analysed to inform the Stroke Service Tracker on such indicators as median age, stroke prevalence, mortality and coverage by relevant stroke interventions. Calculating rates and performing statistical analysis was beyond the scope of this report.

The main findings of the situation analysis were presented and discussed with national stakeholders at a technical meeting on stroke held on 13 November 2023, aiming to validate the results and collaboratively develop pragmatic solutions and actions to reduce the burden of stroke in Ukraine through the implementation of improved strategies for acute stroke care delivery.

Some key terminology used in this report is explained in Box 1.

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**Box 1. Terminology**

**Types of stroke:** several types of stroke exist. The most common is an ischaemic stroke, which can occur when blood flow to the brain is blocked. Another type is a haemorrhagic stroke (or acute inter-cerebral haemorrhage), caused by sudden bleeding in the brain. Both ischaemic and haemorrhagic strokes are preventable, and one of the major risk factors is hypertension. Stroke is a medical emergency that can cause lasting brain damage, long-term disability or even death. Signs of a stroke can range from mild weakness to paralysis or numbness on one side of the face or body. Other signs may include a sudden and severe headache, sudden weakness, trouble seeing and trouble speaking or understanding speech.

**Stroke unit:** a specialized ward designated for acute stroke patients with dedicated beds, offering continuous monitoring, multidisciplinary and multiprofessional dedicated stroke teams providing acute treatment as well as early rehabilitation and secondary prevention. Admission to a stroke unit significantly reduces mortality due to stroke, regardless of patients’ age, sex, comorbidities or stroke severity. However, the definition of a stroke unit encompasses different models of care.

**Acute stroke units accept patients acutely** but discharge early. These fall into two broad subcategories:

- **stroke unit (first level stroke unit or spoke stroke unit):** a dedicated, clearly defined area or ward in a hospital to which stroke patients are admitted and cared for by a multiprofessional team (medical, nursing staff and rehabilitation professionals) who have specialist knowledge of cerebral function, training and
skills in stroke care with well-defined individual tasks, regular interaction with other disciplines and stroke leadership. This team coordinates care through regular, multidisciplinary meetings; and

- **stroke centre (second level stroke unit or stroke hub):** a hospital infrastructure with related processes of care that provide the full pathway of stroke unit care. Moreover, a stroke centre is the coordinating body of the entire chain of care. This covers pre-hospital care, ongoing rehabilitation during acute and subacute rehabilitation phases, and secondary prevention and access to neurosurgical, endovascular (such as mechanical thrombectomy and intracerebral aneurysm coiling) and vascular intervention. The **stroke unit is the most important component of a stroke centre.** The stroke centre provides stroke unit services for the population of its own catchment area and serves as a referral centre for peripheral hospitals with first-level stroke units in case their patients need services that are not available locally.

**Comprehensive/integrated stroke units** (that is, a unit that combines delivery of rehabilitation services across both the acute and subacute rehabilitation phases). These units admit patients in the acute phase of stroke but can also provide a subacute rehabilitation service; for several weeks if necessary.

**Specialized rehabilitation stroke units** accept patients after a delay, usually of seven days or more, and focus on rehabilitation services during the subacute rehabilitation phase. Both the specialized rehabilitation and comprehensive unit models offer prolonged periods of rehabilitation during the subacute rehabilitation phase.

**Thrombolysis in AIS:** a treatment to dissolve dangerous clots in blood vessels, improve blood flow and prevent damage to tissues and organs, using the drug Alteplase. The drug must be administered by specialized trained physicians (generally vascular neurologists) within 4.5 hours of stroke onset. This treatment window may be extended to 9 hours only in patients selected with advanced neuroimaging techniques such as Angio computed tomography (CT) brain perfusion or magnetic resonance imaging (MRI) perfusion. Thrombolysis reduces significantly long-term disability and improves overall clinical outcome. However, the earlier it is performed, the better are the chances of recovery.

**Thrombectomy:** thrombectomy or mechanical thrombectomy is a relatively new endovascular procedure used to treat some ischaemic stroke patients. Mechanical thrombectomy involves using a specially designed clot removal device inserted through a catheter to pull or suck out the clot to restore blood flow. When used with other medical treatments on a specialist unit, evidence shows that mechanical thrombectomy can significantly reduce the severity of disability due to stroke. As thrombolysis, it is also a time-sensitive treatment. Mechanical thrombectomy should
be performed within 6 hours of stroke onset, but beyond this time, patients selected with advanced neuroimaging could be eligible to treatment for up to 24 hours.

**Stroke network model:** this model consists of three level of care settings that correspond to the three main phases corresponding to the stroke clinical care process (Fig. 1).

**Fig. 1. The stroke network model**

- **Setting 1**
  - Emergency-urgent care system
  - Pre-hospital phase

- **Setting 2**
  - Hospital network
  - Hospital phase

- **Setting 3**
  - Long-term care
  - Post-hospital phase
3. Results

3.1 Analysis of e-health data on acute stroke: 2021 and 2022

An increased number of acute stroke cases were diagnosed in 2022 compared with 2021. In 2022 acute stroke was diagnosed in almost 5000 more cases than in 2021 (123,116 and 118,477, respectively).

The most common type of stroke admitted to hospital is the AIS: of all strokes, 84% in 2021 and 85% in 2022 are of this type. This pattern is similar to that found elsewhere in the WHO European Region (80% AIS) (17). Differences were observed between years in the distribution of type of stroke:

- AIS cases appeared to have increased from 2021 to 2022. In 2022 105,161 cases were diagnosed with AIS compared with 99,862 in 2021; and
- haemorrhagic strokes appeared to have decreased slightly from 2021 to 2022. In 2021, 15,877 (13.5%) of admissions with stroke were diagnosed as haemorrhagic compared with 15,956 (13.2%) admissions in 2022.

The proportions of men and women admitted to hospital with acute strokes were almost equal: of the total number of patients diagnosed with stroke were admitted to hospitals in 2021 and 2022; 51% were men and 49% women, respectively.

Up to 10% of patients with acute strokes might not have been admitted to NHSU-contracted hospitals. The annual number of strokes in Ukraine was estimated to be around 130,000 (18), but during the period 2021–2022, recorded hospital admissions were lower. It may follow that a significant number of patients (up to 10,000) with acute stroke were not admitted to NHSU-contracted hospitals, and thus not recorded – at the least, for these particular types.

Most stroke patients are admitted to hospitals contracted by the NHSU for the stroke-specific health services package: almost 85% \((n = 101,865)\) in 2021 and 90% \((n = 111,083)\) in 2022. This is a very encouraging number, especially when considering that the stroke-specific care package was only introduced in 2020. However, it does not reflect the extent to which improvements are attributable to admission patterns, as the number of stroke-contracted hospitals increased by 16 facilities from 2021 to 2022 according to NHSU records (239 hospitals were contracted in 2021 and 255 in 2022).

Thrombolysis in patients with AIS is apparently available in both settings, despite being specific to stroke treatment: 4482 patients (5.2% of all AIS admissions) were treated in stroke-package-contracted hospitals and 155 (1.2% of AIS admissions) in non-contracted hospitals in 2021; in 2022, 6177 (6.4% of total AIS admissions) thrombolysis’ were delivered in stroke-contracted hospitals and 185 (2.0% of all AIS admissions) in non-contracted. The rate of systemic thrombolysis in AIS in 2021 and 2022 was 4.6% and 6.1%, respectively. Endovascular procedures for eligible AIS patients were delivered in only a few NHSU-contracted centres: only 0.3% of all AIS patients were treated in 2021 and 0.6% in 2022. Accordingly, the application of thrombolysis requires further attention from health authorities, as it is unclear how this highly technological service was provided beyond the scope of the PMG, or who paid for it.
Women appear to suffer strokes at a later age than men in Ukraine. Admitted male stroke patients are younger (median age 65) than women (median age 72) no matter the setting, and this figure does not change when comparing 2021 and 2022. The age of stroke onset varies according to type: the median age of females with ischaemic stroke (72–73 years) or intra-cerebral haemorrhage (66–68 years) has been observed at 4 to 7 years later than that for males (65–66 and 62–63 years, respectively) both in 2021 and 2022. This figure is in line with other evidence (19,20) from WHO European Region Member States.

Patients admitted with acute stroke in Ukraine appear to be younger than elsewhere in the WHO European Region. In comparison to the median ages reported for Ukraine, the median and mean age of patients at stroke onset varies in Member States: in population-based studies that reported data on overall stroke, mean ages ranged from 71.6 to 75.6 years, and median age from 77.1 to 80.1 (21). This is one of the crucial factors to be highlighted and addressed by a more comprehensive stroke care system, including stroke prevention and risk factor pillars.

Effective treatment for AIS appears to be underutilized. Only 127 (0.13%) incidences of AIS were treated with intravenous thrombolysis (IVT) followed by mechanical thrombectomy in 2021, compared with 260 (0.25%) in 2022.

- **IVT:** in 2021 4637 (4.6%) AIS were treated with IVT, whereas in 2022 this treatment was given in 6360 (6.0%) cases. According to the latest survey conducted in the Region, in 2020, the rate of IVT was 16.59% (95%, CI: 12.062–21.16) of the annual incident ischaemic strokes, while the highest country rate was 62.44% (22).

- **Mechanical thrombectomy:** in 2021 311 (0.3%) AIS were treated with mechanical thrombectomy, whereas in 2022 the treatment was given in 661 (0.6%) cases. In 2020 in the WHO European Region the estimated mean number of mechanical thrombectomies of annual AIS incidents was 7.09% (95% CI: 5.31–8.87), with the highest country rate being 19.54%.

If the intravenous thrombolysis rate of 15% recommended by SAP-E had been achieved, thrombolysis would have been offered to 14 979 patients with AIS in 2021 and 15 178 in 2022. **If the mechanical thrombectomy rate of 5% recommended by SAP-E had been achieved, there would have been 4993 and 5059 endovascular interventions performed in 2021 and 2022, respectively. This is another area requiring urgent attention and improvement by the stroke care system.** Reaching the full capacity for mechanical thrombectomy would ensure a better health outcome for the population, as outlined in the WHO best buys for AIS treatment (11).

Rehabilitation across all rehabilitation phases appears to be underutilized: the target audience for delivery of subacute rehabilitation services (in-patient settings) includes patients with moderate-to-severe neurological deficits (motor, sensory, visual, cognitive and communication abilities can be affected) and good chances of recovery or a reduction in long-term functional disorders, leading to disability; this constitutes about half of the stroke population in most settings (the target for subacute inpatient rehabilitation in most settings is 40–45%, as 10–15% of stroke victims die in hospital and 40–45% are directly discharged to their homes).

In Ukraine, subacute inpatient rehabilitation was provided for only 5727 (4.8%) of stroke patients in 2021 and only 7661 (6.2%) in 2022. In addition, subacute rehabilitation outside the in-patient setting after discharge was provided for just 1682 (1.4%) acute stroke cases in 2021 and 2574 (2.1%) in 2022.
Stroke mortality among hospitalized cases is not improving over time. 30-day stroke mortality, an integral measure of acute care, was around 25% in Ukraine, which is 8–10% higher than in many other Member States.

Overall acute stroke mortality at discharge did not change in 2022 compared with 2021 (17.3% vs. 17.5%). In 2021 overall stroke mortality at discharge was 17.8% in hospitals contracted for the NHSU stroke care package and 15.9% in the non-contracted, whereas in 2022 it was 17.4% and 16.2%, respectively. In 2021 mortality at discharge for AIS was 14.6% and 11.5%, and in 2022 14.4% and 12.4% for contracted and non-contracted hospitals, respectively. Mortality at discharge for haemorrhagic stroke victims was higher, which is to be expected. In 2021 this was 37.3% and 39.7%; and in 2022 was 37.9 and 36.4% for contracted and non-contracted hospitals, respectively.

In addition, mortality at discharge was higher in females than in males with AIS in both 2021 and 2022; female mortality was higher by 3.4 percentage points than in males (15.9% vs. 12.5%, respectively).

Strokes are not always specified by type. In hospitals with stroke package contracts, 802 (0.8%) of stroke cases were reported as acute without being specified as either haemorrhage or infarction in 2021, and an additional 445 (0.4%) cases with an unspecified acute stroke type were reported in 2022. Mortality at discharge in these cases was 58.7% and 56.6%, respectively. The rate of acute strokes not specified as haemorrhage or infarction in hospitals without the stroke package contract was much greater (9.9% and 10.5%) in both 2021 and 2022.

3.2 SAP-E KPI capacities in Ukraine and the WHO European Region

The results of benchmarking Ukraine’s capacities against other Member States in the WHO European Region based on the SAP-E KPIs are shown in Annex 1. The organization of acute stroke care delivery development was assessed using the SAP-E KPI descriptions and colours were used to assess each KPI capacity and demonstrate the level of its development in the country, as described in the methodology. The summary of results per KPI is as follows.

- **KPIs 3 and 8 were allocated a green rating.** A national strategy for multisectoral public health interventions promoting and facilitating a healthy lifestyle and risk factor control has been implemented in the country as well as access to CT/MRI, vascular imaging, electrocardiograms (ECGs), long-term ECG-monitoring, trans-oesophageal (TOE) and transthoracic (TTE) ECGs, dysphagia screening and blood tests during stroke unit admission.

- **Amber was attributed to six KPIs (1, 2, 5, 7, 9, 10 and 11).** A national stroke plan, as well as stroke network and stroke clinical pathways at the district, regional and national levels are in development but not in place or fully functional. Stroke support organizations (SSOs) and/or professional organization members are involved in stroke policies development occasionally and the participation is not granted by a national/regional rule. Quality auditing policies for stroke services are not yet in place; nevertheless, some providers have been participating in international registries, such as the Registry of Stroke Care Quality (RES-Q), on a voluntary basis, carrying out evaluation of their practice against international quality indicators. Through its national coordinator, Ukraine is providing data to SAP-E according to the Stroke Service Tracker dataset protocol. Reliable registered data in the e-health system concerning access to early stroke unit rehabilitation (including early supported discharge) are
only partially available, as well as information on the individual rehabilitation plan which is currently being implemented. Data on recanalization treatment for AIS, however, are available and recorded in the stroke service tracker. The rate of IVT is increasing, reaching almost 10% in 2022, and the growth trend seems stable despite the war. In contrast the percentage for thrombectomy is static at around 1%. Data on secondary prevention drugs, such as antithrombotics, antihypertensives and statins to reduce the risk of stroke recurrence are not available, but the “affordable medicines” programme which includes these, is certainly active.

- **Red was attributed to KPIs 4, 6 and 12.** In Ukraine there is no definition of a stroke unit, and national and/or regional-level policies for assessing and accrediting stroke clinical services are limited to NHSU criteria for the contracting hospital to deliver revascularization procedures. Comprehensive quality improvement strategies are lacking, as well as accreditation of certification procedures for stroke services. Generally, a system of quality assurance is not yet in place, major components of the clinical stroke care pathways are lacking and there are no structured stroke care outcomes monitoring activity in Ukraine.
4. Discussion

This report may be the first of its kind, providing situational analysis of acute stroke care in Ukraine based on a comprehensive e-health dataset analysis, review of available publications and benchmarking of Ukraine against the entire WHO European Region using the 12 SAP-E KPIs. It shows high numbers of stroke admissions and stroke deaths, along with low rates of efficient treatment interventions and rehabilitation.

Admission to a dedicated specialized treating environment (stroke care unit) as well as revascularization procedures, both pharmacological (thrombolysis) and mechanical (thrombectomy), are WHO-recommended effective interventions for the treatment of stroke to reduce stroke mortality and disability (11). These two interventions, particularly mechanical thrombectomy, have been significantly underused in Ukraine recently. Although both the absolute numbers and rates of mechanical thrombectomy and combined revascularization procedures doubled in 2022 compared with 2021, they remained low when compared with the Regional average, with rates of patients treated with IVT at about a third of the SAP-E recommended level, and the rate of patients treated with mechanical thrombectomy at less than a tenth of the recommended level.

Hospitals contracted by NHSU to provide stroke care are performing a growing number of revascularization procedures and this is likely to reflect a correct dispatch of potential stroke patients, as the number of patients with AIS who received revascularization procedures in hospitals without the stroke care services package contract was negligible in both 2021 and 2022. Overall, the underuse of the revascularization procedure for AIS can be explained by various organizational issues, as follows.

● Contracting requirements are specified by the NHSU and include specifications for two levels of care: basic (no interventions) and advanced (IVT and/or mechanical thrombectomy) with different reimbursement fees. Service providers are reimbursed for each case treated according to the level of care provided (basic or advanced).

● Service providers are not incentivized to refer admitted patients: once a patient is admitted to the hospital, it then receives funding for the treatment provided. Therefore, if a patient is eligible for thrombectomy, the facility would have an incentive to retain the patient, rather than referring them onwards to an advanced-level care facility with endovascular procedure capability such as a stroke centre (see Box 1). This issue leads to fragmented services and suboptimal success to appropriate care, and requires strengthening of governance and care models.

● There is an insufficient number of hub stroke centres where endovascular procedures for AIS are available. This had already been observed, both infrastructure and expertise are not sufficient to cover the current need in the country.

2 The stroke network should be embedded to the emergency network to optimize resources and establish a synergic professional environment. Hence, the first-level stroke unit (or spoke stroke unit) should be in a hospital with a first-level emergency department, with a catchment area of between 150 000 and 300 000 inhabitants; and a second-level stroke unit (or stroke centre or hub) should be located in a second-level emergency department with a catchment area of between 600 000 and 1 200 000 inhabitants, corresponding to about 1 bed per 19 000 inhabitants. These figures could change according to national/regional stroke epidemiology, geographical characteristics and pre-existing emergency hospital network organization.
Overall, acute stroke mortality at discharge did not change over time and stroke mortality at discharge from hospitals contracted with NHSU to provide stroke, appeared to be 1–1.5% higher than in hospitals without the contract both in 2021 and 2022: further investigation is needed to understand the reason behind.

Moreover, mortality at discharge in AIS in Ukraine appears to be 5–8% higher than in many other WHO European Region Member States. Mortality at discharge in patients with intracerebral haemorrhages in Ukraine both in 2021 and 2022 was high (37–38%). It was shown that stroke unit care is associated with reduced mortality in all strokes, including intracerebral haemorrhages (23); this is another WHO-recommended intervention. A comprehensive stroke care network needs to be established, as evidence shows that care in stroke units reduces mortality and disability (23).

The analysis highlighted differences between the sexes in incidence, treatment and outcome that have implications for findings, prevention and management.

- Given that women are having strokes at later ages than men, they are in turn more likely to be widowed or living alone, and to have a higher degree of disability affecting their daily activities than men at the time of stroke.

- Women appear to have poorer outcomes. Mortality at discharge for patients with AIS is higher for females than males. While it is noted that the median age of females with acute stroke is higher than that for males, age alone may not explain this difference in mortality.

- Relevant sex differences exist in key stroke risk factors (24) and prevention strategies and awareness campaigns would most likely benefit from a gender perspective planning. Considering sex-specific risk factors, including reproductive health variables associated with stroke risk, would empower stroke prevention and lead to significant reduction of stroke burden.

The analysis also highlighted issues relating to classification of stroke and use of neuroimaging. Failure to record or specify the type of stroke appeared to be substantially worse in hospitals not contracted with the stroke care package compared with the contracted hospitals. This indicates that neuroimaging was not performed in one in 10 cases in hospitals without the stroke care package. It also highlights the need for monitoring stroke care quality and further on-site educational activities for all sites.

Furthermore, the results illustrate how Ukraine compares to other WHO European Region Member States in terms of the 12 SAP-E KPIs used for benchmarking. Overall, Ukraine achieved two green (KPIs 3 and 8), three red (KPIs 4, 6 and 12) and seven amber marks which, puts the country in the middle in the Regional ratings. The finding that Ukraine is underperforming in some crucial metrics for acute and long-term strokes such as national and regional level systems for assessing and accrediting stroke clinical services, access to stroke unit care and follow-up at 3–6 months after the stroke should inform future strategies aimed at enhancing acute stroke care, the implementation of specific educational interventions for providers and policy-makers, and stroke campaigns aimed at the general population. Moreover, the specific actions taken by national professional organizations should also consider this information when setting priorities, both at the educational level for health-care professionals and in interventions directed at stakeholders.

Underuse of evidence-informed strategies with proven benefits is not unique to Ukraine. The latest United Nations report on the SDGs notes that target 3.4 “to reduce by one third premature mortality from noncommunicable diseases” is far from being met (25). Premature mortality rates...
for NCDs are driven by CVDs including stroke and require a concerted effort to reduce mortality from heart attacks and stroke in the next 6 years: sustainable development demands brain health (26).

Previous studies have demonstrated inequalities in the provision and quality of acute stroke care among countries, particularly concerning the three main components (stroke unit care, intravenous thrombolysis and endovascular treatment) (27–29). For many Member States, particularly those with lower income, the number of stroke units and rates of both revascularization procedures are far below what was achieved in others within the Region (22). Alongside other SAP-E activities, the KPIs and Stroke Service Tracker platform maintained by the SAP-E implementation committee can facilitate monitoring of the KPIs and provide an incentive for national authorities to improve data collection, collaborate with national and international stroke experts including WHO and promote high-quality stroke care delivery.

Limitations to the methodology are recognized. E-health data on stroke were only available for 2021 and 2022, and thus longer-term trends could not be ascertained. With only 2 years of data and without statistical analysis, it was also problematic to interpret the statistical significance of differences between years. In addition, data may be biased due to inaccurate input, coding and similar issues.

Furthermore, context can make some findings difficult to interpret. The years 2021–2022 formed part of a tumultuous period for Ukraine, with the COVID-19 pandemic in 2020 followed directly by the full-scale military invasion of the Russian Federation to Ukraine from 24 February 2022. Some examples of these limitations and issues are as follows.

- Given the fact that 6 to 8 million people fled Ukraine in 2022, the reasons for an apparent increase in the number of stroke cases from 2021 to 2022 are not entirely clear. Plausible explanations include the following:
  - people who moved abroad were predominantly young or middle-aged, as the median age of stroke did not change significantly;
  - stroke incidence increased in people who stayed in the country because of stress, poor adherence to preventive medications, and risk factor management; or
  - improved recording of diagnoses: many educational activities on stroke are ongoing and have been carried forward in recent years by Ukrainian professional stroke associations, and the stroke community has remained active despite the beginning of the conflict.

- The reason for the slightly lower proportion of haemorrhagic strokes over time is less clear, as a higher proportion of haemorrhagic strokes would be expected at a time of war due to increased stress and decreased hypertension control.

In 2021, WHO conducted a different type of situation analysis on stroke in Ukraine (10). Comparing the findings, it is notable that stroke mortality has not changed over time: this reflects a need for action. The number of interventions (thrombolysis and thrombectomy) for AIS increased, although the number of hospitals contracted with NHSU to provide acute stroke care did not significantly increase. Unfortunately, a national definition of a stroke unit has not been adopted and stroke unit certification criteria and defined processes have not been implemented. This is also true for the national stroke strategy and system for quality-of-care monitoring. To evaluate the (expected) effect of these treatment implementations, it is necessary to collect data relating to disabilities 3–6 months after stroke, both in patients treated with thrombolysis and/or thrombectomy and in untreated stroke patients.
The number of hospitals contracted with NHSU to provide stroke care has increased by 6%, from 239 to 255, and the criteria to receive the contract to provide stroke care were modified including timely rehabilitation during the acute rehabilitation phase and a defined mandatory set of clinical and diagnostic procedures.

The rehabilitation pathway for patients with stroke is under development, as are the requirements for rehabilitation service packages. Since 2020, the NHSU began contracting healthcare facilities to provide rehabilitation services for neurological conditions, including stroke. In 2023, separate packages were introduced for inpatient and outpatient rehabilitation settings. To enable the availability of rehabilitation services in a capable hospital network, hospitals have begun to establish nonspecialized inpatient rehabilitation departments. Electronic records systems are being implemented to record rehabilitation functions in e-health.
5. Conclusions

This report examines the challenges of acute stroke care in Ukraine given the concerning nature of the latest statistics regarding reported cases of acute stroke, mortality rates and the devastating impact on the population, underscoring the urgent need for action. Stroke is a preventable condition and most stroke cases could be avoided by controlling modifiable risk factors and empowering healthy lifestyle habits in the population.

The ongoing war in Ukraine, preceded by the COVID-19 pandemic, has had a severe impact on the health sector. While access to health services has been disrupted by hostilities, the high burden of NCDs presents immediate health challenges, with potential long-term repercussions for population health. The repercussions of this emergency demand both immediate responses and long-term strategies to mitigate their effects.

Failure to prioritize stroke care undermines Ukraine’s progress towards achieving the SDGs, particularly in terms of reducing premature mortality from major NCDs. Despite the actions taken thus far, the gap between implemented actions and the necessary scale of intervention remains substantial.

The relative underutilization of effective treatments and rehabilitation means that significant preventable mortality and disability persists in Ukraine. This has impact on individuals, their families, needs and goals, and society at large. Nevertheless, the increasing trend in the usage of effective procedures such as IVT is very positive and demonstrates the possibility for rapid improvements, despite multiple barriers.

A national strategy for the prevention and control of NCDs has been approved and is under implementation; whereas a comprehensive national stroke plan, although discussed and drafted, has not yet been approved. Civil society is directly involved in stroke prevention and care policy development, and there is growing positive collaboration between institutions and the third sector, as demonstrated by the participation of SSOs in ministerial working groups. National accreditation, quality monitoring, clinical and organizational audit systems are not sufficiently implemented as yet, but their strengthening could lead to significant improvement of the efficiency of stroke services.

Country progress in the SAP-E KPIs places Ukraine mid-tier in the WHO European Region. The potential directions to improve progress in terms of the KPIs include further development of stroke network systems and stroke unit care, expanding access to revascularization procedures, implementing comprehensive quality improvement strategies and standardizing clinical care pathways.

Since WHO’s report in 2021, there have been promising developments in stroke care and prevention, and the wider health system that facilitates it. There is an urgent need to identify key elements of the chain of care for patients with stroke that can be improved with maximum benefits (30).
6. Way forward

Considerations for the way forward are outlined in this section, based on the situation report findings and the consultation with the national stakeholders during the technical meeting in November 2023. The first set of enabling actions is tailored to strengthen the capacities of Ukraine in line with SAP-E KPIs and the second set reflects the suggestions proposed during the technical meeting on stroke and may have a broader scope.

6.1 Enabling actions for further progress in SAP-E KPIs

**National stroke action plan development**

Compile a comprehensive national stroke plan involving scientific societies, guiding policies from national to regional levels across the stroke care continuum. Focus on policy cascading rather than a predefined financial budget.

**Hypertension control programme scale-up**

Hypertension is a primary risk factor for stroke, with proven benefits to hypertension control in terms of interventions of scale. Improved blood pressure control in the population is a meaningful goal.

**Integrated population-based stroke prevention programs**

Implement integrated population-based stroke prevention programs, focusing on lifestyle modifications and collecting and registering patient data for NCD risk factors in electronic health records.

**National accreditation system development**

The national accreditation system and accreditation criteria for stroke network require development to reflect international best practices. Independent agencies could be considered a temporary solution for stroke quality assessments in the short term.
Stroke network development

Establish a comprehensive national stroke network, with evidence-informed, international definitions for stroke units, centres and levels of care aligned with NHSU packages and a concrete monitoring system. Establish and encourage shared management systems for stakeholders involved in the acute phase of stroke care.

Health-care workforce capacity-building

Evaluate the need, review and enhance the academic curricula for health-care professionals involved in stroke care along its continuum.

Increase the proportion of stroke patients admitted to hospitals with the appropriate NHSU contract

At least 95% of patients with suspected stroke should be admitted to hospitals contracted by the NHSU to provide acute stroke care. The harmonized definition of suspected stroke should be adopted and used by ambulance staff and dispatch services, which require emergency medical services to enhance their infrastructure and legal frameworks.

Conduct a similar situation analysis to assess the impact of the full-scale invasion on stroke care, mortality and disability

Though there was disruption in e-health reporting by health-care facilities in early months of the invasion, reporting resumed and was sustained through to 2023. However, the significant population movements within and outside the country mean that data should be interpreted cautiously, taking the current context into account.

Rehabilitation coverage

Synchronize efforts on implementation of stroke services into the capable hospital network with the establishment of up-to-date rehabilitation services across all phases. Develop long-term care services and community-based support mechanisms for stroke survivors with high levels of permanent functional disorders.

Integrated secondary prevention strategies

Develop secondary stroke prevention strategies for primary and specialized care, ensuring access to lifestyle advice and medicines while monitoring patient adherence to therapy and risk factor control.
Rehabilitation recordings: individual rehabilitation plan

Ensure the integration of electronic recordings of rehabilitation services delivered during the acute rehabilitation phase into the overall rehabilitation recording system. In particular, individual rehabilitation plans should be developed for each patient and updated across all rehabilitation phases. Implement monitoring via e-health rehabilitation records and periodic clinical audits.

Structured follow-up activities

Establish structured stroke patient follow-up activities with relevant engagement of primary health care. Update national clinical guiding documents to incorporate relevant clinical follow-up.

6.2 Suggested enabling actions outlined during the technical meeting on stroke 13 November 2023

Primary and secondary stroke prevention

- Communication campaigns: national-level strategic communication campaigns aimed at hypertension prevention and control.
● Regulatory framework: update, approval and implementation of the national clinical protocol on arterial hypertension

● Effective treatment: expansion of the “affordable medicines” programme to include fixed combination antihypertensive drugs.

● Capacity-building: strengthen competencies of primary health-care physicians and nurses in the prevention, diagnosis and management of hypertension; improve the knowledge and skills in measuring blood pressure; set the target and monitor for the improvement of blood pressure measurement in the target population.

**Acute stroke care delivery rehabilitation and long-term care**

● Design, plan and implement comprehensive integrated rehabilitation services, starting from the acute rehabilitation phase and extending across the sub-acute and long-term rehabilitation phases. Develop a system of long-term care services, including nursing care for stroke patients at the district and regional levels. Avoid isolated infrastructure investments in individual hospitals to reduce fragmentation of care.

● Continue implementation of PMG rehabilitation packages by facilitating infrastructure development within the framework of the hospital masterplan at regional and district levels.

**Surveillance and quality improvement**

● Update, implement and monitor implementation of national stroke guidelines or adapt international guidelines to the country’s health system.

● Develop evidence-informed measurable standards for the different components of stroke care. Collect and analyse data of standards implementation, develop a clinical and organizational strategy. A potential useful tool is the patient discharge record, where critical information should be collected such as pre-stroke modified Rankin Scale and National Institutes of Health Stroke Scale status at the admission and discharge destinations.

● Establish legislative and infrastructure framework for stroke care quality monitoring and auditing.

● Facilitate the establishment of NCD risk factor patient data collection through e-health records to ensure the ability to evaluate population groups and individuals at high risk of stroke. Implement prevention programmes, at the individual and population levels.

● Collect patient-reported outcomes and longer-term (e.g. 6 months and 1 year) outcomes, covering both hospital and community care. This is possible if information systems relating to the different care sectors are integrated.
References


Annex 1. Benchmarking Ukraine against the WHO European Region using the 12 Stroke Action Plan for Europe key performance indicators

Table A1. Benchmarking Ukraine against WHO European Region and Stroke Action Plan for Europe key performance indicators

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<tr>
<th>KPIs and definitions</th>
<th>Ukraine</th>
<th>WHO European Region</th>
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<tr>
<td>1.</td>
<td>National stroke plan defining pathways, care and support after stroke, including the pre-hospital phase, hospital stay, discharge, and transition and follow-up.</td>
<td>The Ministry of Health declared its support for SAP-E in 2019. The National Stroke Action Plan for Ukraine was drafted based on SAP-E and reviewed by a WHO mission in 2019 but was not formally approved by the Government or implemented (1). The SAP-E Declaration was officially signed by the Ministry of Health in 2021 (2). Comprehensive health care reform has been a part of the agenda since 2017. A new Cabinet of Ministers of Ukraine decree (28 February 2023) specified levels of hospital care within the capable hospital network (3). Hospital district development plans should be formulated regionally, with specification of care pathways. The stroke care network has not been completely shaped and pre-hospital care requires more clarity concerning pathways (4). According to SAP-E data for 37 WHO European Region Member States for this KPI in 2021, 11 (29%) confirmed having a national stroke plan (5). The ESO has created a National Stroke Plan template to standardize this approach and highlight the importance of covering the full chain of care (6).</td>
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<td>2.</td>
<td>At least one individual from the respective SSO (if existent) will be involved and supported, in an equal way, during the development of each country’s national stroke plan or stroke-related guideline.</td>
<td>An SSO exists as a part of the nongovernmental organization “Ukrainian Anti-Stroke Association”, a national multiprofessional body. There are several committees and working groups in Ukraine that are involved in improving stroke care, including the Working Group on Stroke under the Ministry of Health (est. 2020); the Multidisciplinary Working Group working to update and contextualize clinical guidelines on stroke (est. 2021, Ministry of Health); ESO EAST/ANGELS Ukraine Steering Committee and the SAP-E National Implementation Committee. The last of these includes an SSO representative (7). According to the SAP-E data for 37 WHO European Region Member States for this KPI in 2021, 21 (57%) countries have patient representatives involved in development of national stroke plans and guidelines. Participation/involvement are not defined – so the setting/level of involvement/commitment varies among WHO European Region Member States.</td>
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<td>KPIs and definitions</td>
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<td>3. A national strategy for multisectoral public health interventions promoting and facilitating a healthy lifestyle and risk factor control has been implemented</td>
<td>A national strategy for the prevention and control of NCDs has been approved. The Ministry of Health has to report to the Cabinet of Ministers of Ukraine on its implementation (8,9), but there has been no formal review of implementation since 2020.</td>
<td>According to SAP-E data for 36 Member States regarding this KPI: in 2021, 15 had implemented a strategy for interventions that promote a healthy lifestyle and risk factor control. For this KPI there are no specific definitions – it is possible that this information is biased by partial knowledge of the NCD policies of WHO European Region Member States.</td>
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<td>4. Establishment of national- and regional-level systems for assessing and accrediting stroke clinical services, providing peer support for quality improvement and making audit data available to the public.</td>
<td>There are general procedures for provider (hospital) accreditation in Ukraine, but no specific accreditation of certification procedures for stroke services (10). There is a draft regulation on the provisions of quality of care in Ukraine; however, a system of quality assurance is not yet in place.</td>
<td>According to SAP-E data for 36 Member States on this KPI in 2021, 13 (36%) had national or regional systems for quality improvement and assessment. There is no definition for such systems. The ESO provides a stroke unit and stroke centre certification platform: <a href="https://eso-certification.org">https://eso-certification.org</a>. On the ESO website there is also a list of certified centres.</td>
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<td>5. All stroke units and other stroke services, independent of sector, undergo quality audits; continuously or at regular time intervals.</td>
<td>There is no comparable practice in Ukraine; even so, some providers in the country are participating in RES-Q, an international registry of stroke care quality, carrying out audits of their practices against international quality indicators on a voluntary basis. Ukraine, through its national coordinator, provides data to SAP-E according to the Stroke Service Tracker dataset protocol.</td>
<td>According to SAP-E data for 36 countries on this KPI in 2021, nine countries and the autonomous community of Catalonia (25%) stated that stroke services undergo quality auditing continuously or at regular time intervals.</td>
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<td>6. Access to stroke unit care** for patients with acute stroke.</td>
<td>There is no official definition of a stroke unit and no list of stroke units in Ukraine. Inpatient care and medicines are identified as the main drivers of catastrophic health expenditure, experienced in 2021 by 17% of households – one of the highest rates in the WHO European Region (11).</td>
<td>According to SAP-E data for 36 countries on this KPI in 2021: 11 countries confirmed access to stroke unit for more than 75% of patients (5 within 24 hours after admission to hospital) (12,13). Comprehensive* care of acute stroke patients in stroke units is within the updated list of WHO’s menu of policy options and cost-effective interventions for the prevention and control of NCDs. Specific coding for stroke unit treatment is needed to document this intervention.</td>
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7. Recanalization treatment (intravenous thrombolysis and mechanical thrombectomy) rate provided for patients with ischaemic stroke.

Data concerning number of cases by age, sex, hospital or oblast are available in the e-health database. Data of 30-day case-fatalities of treated patients should also be available. While eHealth captures more than 90% of intravenous thrombolytic therapy and more than 60% of mechanical thrombectomy cases, some public and most private hospitals did not contribute to eHealth as of 2022.

Access to thrombolysis varies significantly between countries and regions, according to the SAP-E data for 37 countries on this KPI in 2021:
- 10 countries stated intravenous thrombolysis higher than 15% (SAP-E target).
- Concerning access to mechanical thrombectomy (36 countries reporting data) 16 countries (and the autonomous Region of Catalunya) reported a mechanical thrombectomy rate higher than 5% (SAP-E target).

Thrombolysis and mechanical thrombectomy are WHO-recommended interventions.

8. Mandatory access to: CT/MRI, vascular imaging, ECG, long-term ECG-monitoring, TOE and TTE ECGs, dysphagia screening and blood tests during stroke unit admission.

Long-term ECG monitoring is not mandatory and data are not available. Further investigations are required for NHSU hospitals contracted to the stroke services package. A general progress report was undertaken, introducing a stroke care package of guaranteed services in 2021, but further developments required to understand remaining out-of-pocket spending for stroke patients and improve the financial protection for those (14).

38 countries reported on this KPI in 2021; 24 countries have mandatory access to at least six out of the following seven tests: CT/MRI, vascular imaging, ECG, long-term ECG monitoring, TOE and TTE ECGs, dysphagia screening and blood tests during stroke unit admissions (15).

9. Access to early stroke unit rehabilitation including early supported discharge.

Monitored via e-health for contracted hospitals, excepting early supported discharge. Not monitored in the hospitals that do not contribute to e-health records (16).

Access to early rehabilitation in at least 90% of stroke units is provided in a minority of countries (15 and the autonomous Region of Catalunya out of 36) and several countries (17 out of 36) are not able to provide data on provision of early rehabilitation in stroke units.
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<td>10. Access to basic secondary prevention including antithrombotics, antihypertensives and statins as well as lifestyle advice.</td>
<td>Information about drugs prescribed at discharge is not included in the e-health database. However, the ongoing “affordable medicines” programme includes anti-thrombotics, antihypertensives and statins (^{17}).</td>
<td>36 countries reported on this KPI for 2021. However, the quality of the data on which this KPI is based is low in most countries, including an expert’s estimate. Therefore, the SAP-E recommend interpreting these results with some uncertainty (^{18}). Seven countries stated that at least 90% of patients have access to basic secondary prevention; six countries stated that 75–90% of stroke patients have access to basic secondary prevention; two countries stated that 50–75% of stroke patients have access to basic secondary prevention; one country stated that less than 50% of patients have access to basic secondary prevention; 20 countries have no data on this KPI. Potential data sources in the WHO European Region: registries (not only stroke registries); and primary care database. As already mentioned, these are WHO recommended interventions.</td>
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<td>11. A binding personalized, documented rehabilitation and sector transition plan provided at the time of discharge.</td>
<td>The individual rehabilitation plan is being implemented in Ukraine and will be included in the e-health shortly (^{19}).</td>
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<td>12. Follow-up at 3–6 months after the stroke incident including a Post Stroke Checklist and a functional assessment and referral for relevant interventions.</td>
<td>There is no structured stroke follow-up activity in Ukraine.</td>
<td>36 countries answered on this KPI for 2021: 15 countries report providing a structured follow-up at 3–6 months while 21 countries do not.</td>
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*Note: CT: computed tomography; ECG: echocardiogram; ESO EAST: European Stroke Organization - Enhancing and Accelerating Stroke Treatment; KPI: key performance indicator; MRI: magnetic resonance imaging; NCD: noncommunicable disease; NHSU: National Health Service of Ukraine; RES-Q: Registry of Stroke Care Quality; SSO: stroke support organization; TOE: trans-oesophageal ECG; TTE: transthoracic ECG.*


The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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Armenia
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Belgium
Bosnia and Herzegovina
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Denmark
Estonia
Finland
France
Georgia
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Kazakhstan
Kyrgyzstan
Latvia
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North Macedonia
Norway
Poland
Portugal
Republic of Moldova
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