



Policy Research Paper no. 82
Analysis of Stroke Diagnosis Verification in Patients
That Died at Home

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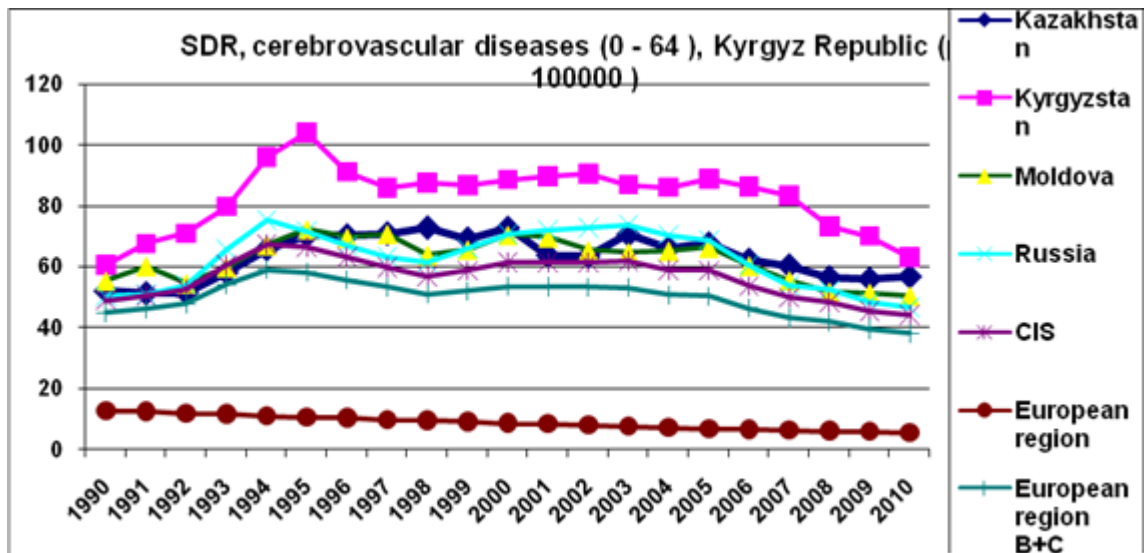
List of Acronyms

AH – Arterial Hypertension
WHO – World Health Organization
HS - Hemorrhagic Stroke
IS – Ischemic Stroke
CHD – Coronary Heart Disease
CT – Computer Tomography
KR – Kyrgyz Republic
MOH – Ministry of Health
MS – Minor Stroke
MRI – Magnetic Resonance Imaging
NRI – Neurology Research Institute
HCK – National Statistics Committee
AHE – Acute Hypertensive Encephalopathy
ACVA – Acute Cerebrovascular Accident
TIA – Transitory Ischemic Attack
PAMH – Russian Academy of Medical Sciences
RHIC – Republican Health Information Center
SDR – Standardized Death Rate
AS – Ambulance Station
TH – Territorial Hospitals
TIA – Transient Ischemic Attack
FMC – Family Medicine Center
ECG – Electrocardiography

1. Background

Kyrgyzstan has the highest mortality rate caused by cerebrovascular diseases in the European region, exceeding the figures for Kazakhstan, Russia, Moldova, CIS, EU - C and EU - A in more than 10-times.

Figure 1

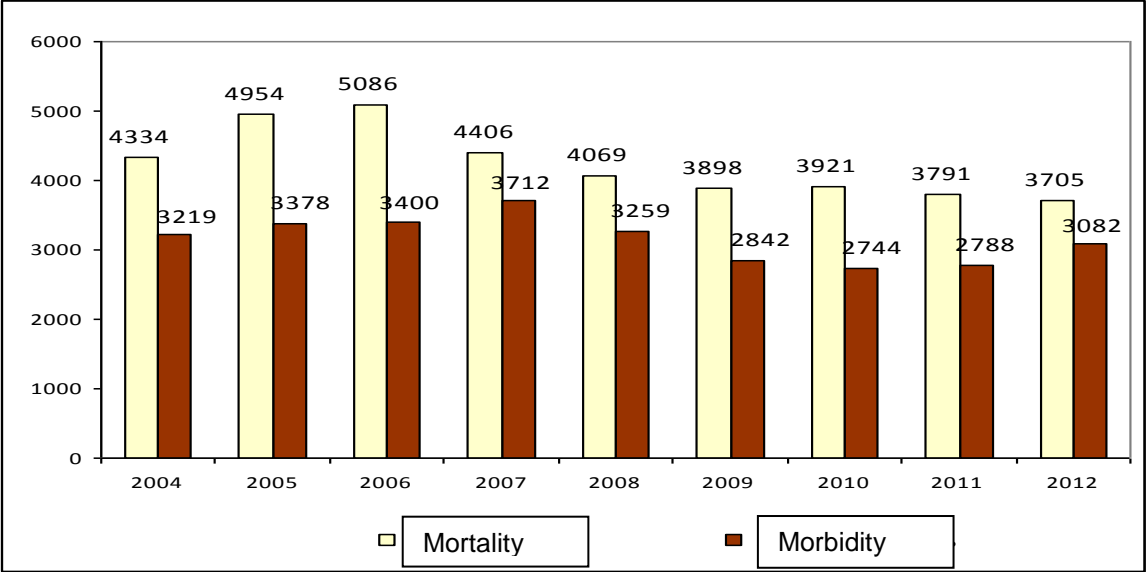


Source: Health for All, database of WHO European Regional Bureau and National Statistics Committee

Stroke is one of the major death causes that stipulate low life expectancy in the Kyrgyz Republic.

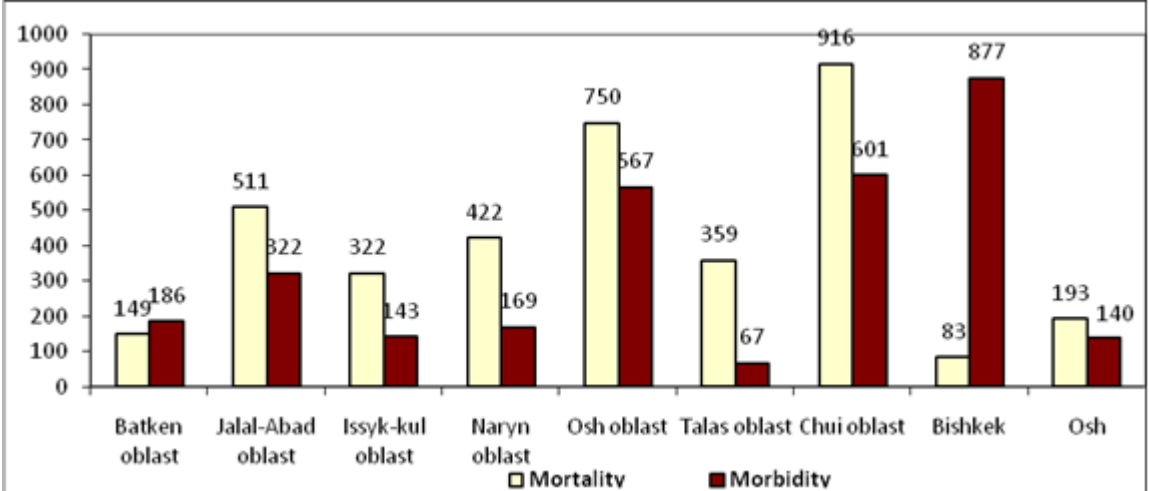
Analysis of RHIC statistical data indicates that stroke-related mortality exceeds morbidity rates (Figure 2).

Figure. 2 Stroke-related morbidity and mortality (in absolute numbers)



These rates have different trends region-wise. In this vein, mortality rates are higher than morbidity rates only in Batken oblast (province) and in Bishkek. (Figure 3).

Figure 3 Stroke-related mortality and morbidity (in absolute numbers), 2012



It should be noted that Bishkek has the lowest stroke-related mortality rate (83 cases for 2012 or 9,3 per 100000 people). It has more to do with the fact that Bishkek maintains Stroke Registry since 1997 on a regular basis. This work involves stroke diagnosis only on the basis of a thorough check of all information sources (patient medical records, reports of health care organizations at the primary and hospital level, of ambulance, Civil Registry Office, and if necessary, additional check-up of a patient and interview of a patient’s family members). Availability of clearly outlined stroke diagnostics criteria allows to maintain more accurate registration of stroke-related morbidity, mortality and lethality. Stroke Registry is implemented only in Bishkek; other regions do not have it.

In addition, health organizations in Bishkek have better developed infrastructure with modern equipment and trained personnel, which enables them to provide better services to stroke patients. Thuswise, a number of stroke patients treated in hospital setting have been annually increasing (2011 – 70,6%; 2012 – 79,9%). And the Stroke Registry physician examines the major part of patients with such a diagnosis (2011 – 86,8%; 2012 – 94,1%).

Currently, there is no appropriate stroke diagnostics (computer tomography and/or magnetic resonance imaging (CT/MRI)), so according to the study HPAU 2007¹ the share of patients that had CT/MRI in regions was 16% and it include only patients treated in Bishkek. Therefore, stroke diagnostics is currently mainly based on methods of clinical examination of patients and doctor's personal experience. In this connection, diagnosis of stroke cases and stroke-related mortality in the regions requires a thorough analysis and assessment.

In addition, population of the country is unevenly distributed, with the presence of small towns and cities, which have feldsher-midwife stations as the single health services providers; country has sparsely populated mountainous areas of up to 200-300 km, where in case of an emergency condition or sudden death, there is a lack of qualified diagnostics, especially in cases of death in non-hospital settings. Experience has proven that stroke is diagnosed more frequently in such cases, which results in an increased stroke-related mortality rates. Cerebral Stroke Registry, which had been implemented only in Bishkek, is one of the most informative methods of obtaining accurate epidemiological and clinical data. Statistic and epidemiological profile of stroke and stroke-related mortality in other regions are not sufficiently studied and there is no accurate data on stroke-related epidemiology, morbidity structure and mortality.

In this regard, this study shall be aimed at verification of stroke diagnosis in persons that died at home, in other words, in outpatient setting on the basis of clinical documentation analysis.

2. The Goal and Objectives of the Study

The goal: To analyze verification of stroke diagnosis in persons that died at home.

Objectives:

1. Review of Cerebral Stroke Registry performance in Bishkek;

¹*Quality of CVD Treatment and Prevention in the Kyrgyz Republic*, Policy Research Paper 45, HPAU, 2007.

2. Review of medical records to verify stroke diagnosis in persons that died in outpatient settings.
3. Development of recommendations for improvement of completeness and quality of stroke-related death registration in the Kyrgyz Republic.

3. Assessment Methodology

3.1. Review of Cerebral Stroke registry performance in Bishkek

- 1) Assessment of morbidity, mortality and lethality trends on the basis of reports for 2007-2011 developed by Cerebral Stroke Registry personnel.
- 2) Performance assessment (strength and weaknesses).

3.2. Assessment of stroke diagnosis verification in persons that died at home

For this purpose, a tool (assessment form for stroke registration validity) was developed.

The assessment tool for stroke diagnosis accuracy was developed after discussion with leading experts in neurology and piloted in two primary health care facilities.

The main criteria of this tool were based on verification of stroke diagnosis in died patients by ruling-out all other diseases that can lead to death of a patient.

This tool included two-phased assessment:

1. Rule-out/non-confirmation of stroke diagnosis on the basis of the developed rule-out criteria.

Rule-out criteria, included into assessment tool:

- short time period (less than 2 hours) between the beginning of stroke episode and death;
- lack of clinical data on health status of a patient prior to death and autopsy data;
- lack of clinical records confirming stroke.

2. Rule-out/non-confirmation of stroke on the basis of objective medical examination and clinical data available in medical records.

Assessment was carried out with the help of analysis of use of specialized diagnostic measures (CT, MRI, lumbar puncture) and clinical data (cerebral symptoms, paralysis of limbs, speech disorders, lesion of cerebral-cranial nerves presence meningeal signs, pathological symptoms, etc.)

3.3. Sampling

Sampling for the study was done on the basis of operational data. With this purpose, the Republican Health Information Center collected stroke-related mortality data for 2013 per oblasts and districts. Bishkek was originally excluded from the study, since Cerebral Stroke Registry is introduced in Bishkek.

According to obtained data, the study includes regions with highest stroke-related mortality rates for 2013 (extensive indicators).

Based on the discussion, it was decided to include per 2 regions into the study from the northern and southern parts of Kyrgyzstan.

According to operative data, Chui and Naryn oblasts, and the southern region (Osh and Jalal-Abad oblasts) had the highest rates of stroke-related mortality in 2013.

3.4. Selection of Cases

It was based on retrospective analysis of outpatient medical treatment records of those patients, whose death was registered at home with the stroke diagnoses (in outpatient setting) for the period of 2013.

Inclusion criteria:

1. Reviewed case should meet diagnostic criteria of stroke
2. Reviewed patient should live (prior to his/her death) in the region (district) covered by the study
3. Reviewed patient should be examined by a doctor in the period from several hours to 7 days prior to his/her death.

On the basis of MOH decree, all outpatient treatment records of died stroke patients in 2013 were collected. 200 outpatient records that met assessment inclusion criteria were randomly sampled.

A certain part of selected outpatient treatment records did not meet necessary criteria in the data analysis process, and these cases were excluded from the study. As a result, 783 outpatient treatment records were reviewed, including:

- 196 – from Chui oblast;
- 193 – from Naryn oblast;
- 196 – from Osh oblast;
- 198 – from Jalal-Abad oblast.

3.5. Information Sources

- 1) Bishkek Cerebral Stroke Registry database for 2007-2011.
- 2) FMC Logbooks for Death Registration
- 3) Medical treatment records of died patients that meet assessment inclusion criteria

4. Assessment findings

4.1. Analysis of Cerebral Stroke Registry Performance in Bishkek for 2007-2011

Registry method is an evidence-based and the most accurate assessment method of epidemiological situation in the region, which allows to identify stroke-related mortality, morbidity and lethality rates. It is based on demographic indicators and territorial principle, enables to assess medical and socio-economic consequences of stroke, to identify effectiveness of health care delivery system and estimate needs in rehabilitation interventions in this region, detect leading risk factors for the disease and to develop the ways of correction of its impact.

City Angioneurology Unit was established in Bishkek in 1997, and the Cerebral Stroke Registry unit has been functioning by it. Work of the City Registry is organized according to recommendations of WHO and Neurology Research Institute of the Russian Academy of Medical Sciences and Stroke Research Center of the Ministry of Health of the Russian Federation.

Introduction of the Cerebral Stroke Registry in Bishkek resulted in a significant stroke-related mortality reduction in recent years (83 cases for 2012, or 9,3 per 100000).

Epidemiological data analysis for 5 years (from 2007 – to 2011) was carried out based on the Cerebral Stroke Registry data. Main indicators were estimated, including: morbidity, mortality and lethality from stroke. Data related to sex and age structure of the studied population, obtained from the recent Census were used in order to determine stroke incidence. Difference of average values was estimated with the help of Student test, supported by software package 'Statistika 6.0 for Windows 98', the result considered to be significant with probability criterion $p < 0,05$.

Cerebral Stroke registry covered 567 218 people (above 18 years) for this time period. In total, 7379 new cases of acute cerebrovascular accidents (ACVA) were registered in Bishkek for the period of 2007 - 2011. Stroke prevalence was 2,82 per 1000 people, mortality – 1,18, and lethality – 41,8%. 57,4% of patients were admitted to hospitals,

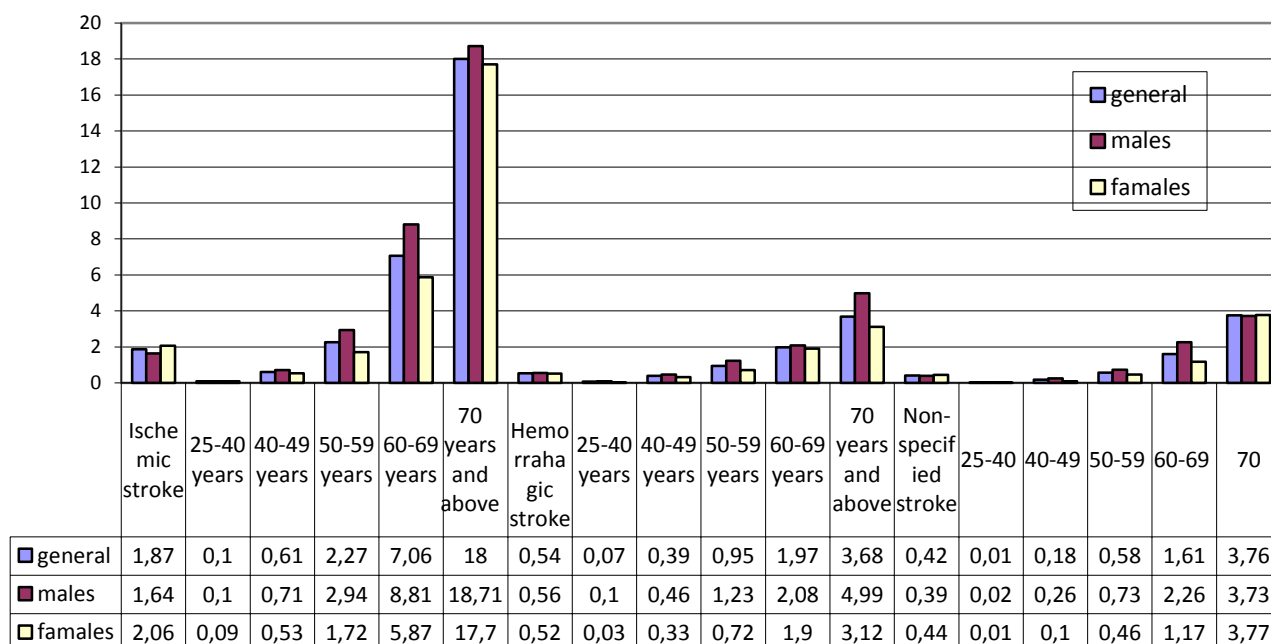
and lethality in this case was - 25,7%, while lethality among patients treated at home was 53,6%.

Table1. Cerebral Stroke Prevalence in Bishkek in 2007-2011 (according to the Cerebral Stroke registry data)

Class of a disease	Cerebrovascular diseases		Ischemic stroke		Hemorrhagic stroke		Non-specified stroke		Total no of stroke cases	
	Abs.	/1000 people	Abs.	/1000 people	Abs.	/1000 people	Abs.	/1000 people	Abs.	/1000 people
2007	11601	15,7	1070	0,94	332	0,17	151	0,26	1553	1,37
2008	16905	30,3	1090	1,37	344	0,32	142	0,23	1576	1,85
2009	16089	29,5	968	1,43	319	0,36	109	0,17	1396	1,96
2010	19294	35,3	999	1,38	374	0,27	62	0,20	1435	1,85
2011	19564	34,5	1015	1,46	336	0,31	108	0,22	1459	1,99

Data analysis showed that stroke frequency increased in every age group in 2-3 times: at age of 25 - 40 years – 0,18, from 40 to 49 years – 1,2, from 50 to 59 years – 3,8, from 60 to 69 years – 10,6, and 70 years and above– 25,4 per 1000 people of correspondent age (average values). In general, relative weight of persons of working age (25-59 years) that had cerebral stroke had 26,3%.

Figure 4 Type-Based Stroke Prevalence with Gender/Age Breakdown per 1000 people a year.

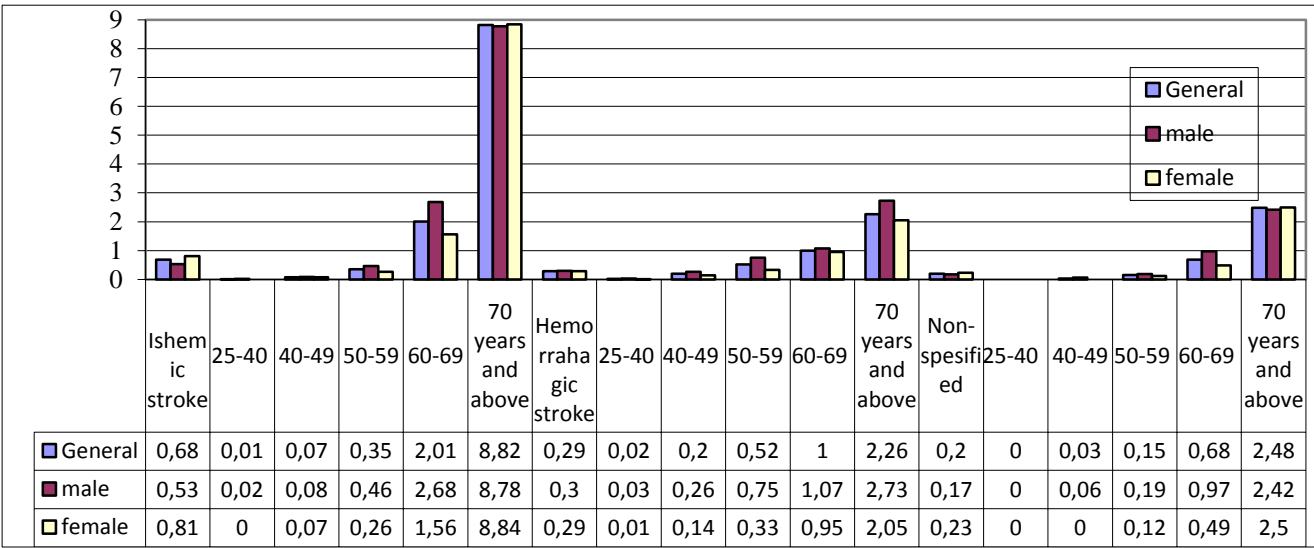


Overall mortality from stroke in 2007-2011 was in average 1.18 per 1000 people (in men - 1.01, in women - 1.33, the difference is significant ($p < 0,001$)), which is comparable to

country indicators for Russia in 2001 (in average - 1, 28/1000 people (in men - 1.15/1,000 people, in women - 1.38/1,000 people) and significantly higher than in developed countries (0.37-0.47 / 1000 people.).

As can be seen from the diagram (Fig. 5), ischemic stroke-related mortality is 2-3 times higher than in other forms of stroke and makes 0.68 per 1000 people (0.53 in men, 0.81 – in women, the difference is significant (p <0,0001)), 0.29 in hemorrhagic stroke (0.3 in men, 0.29 in women), in non-specified stroke - 0.2 (0.17 and 0.23, respectively).

Figure 5. Mortality per types of stroke in sex/age breakdown per 1000 people a year

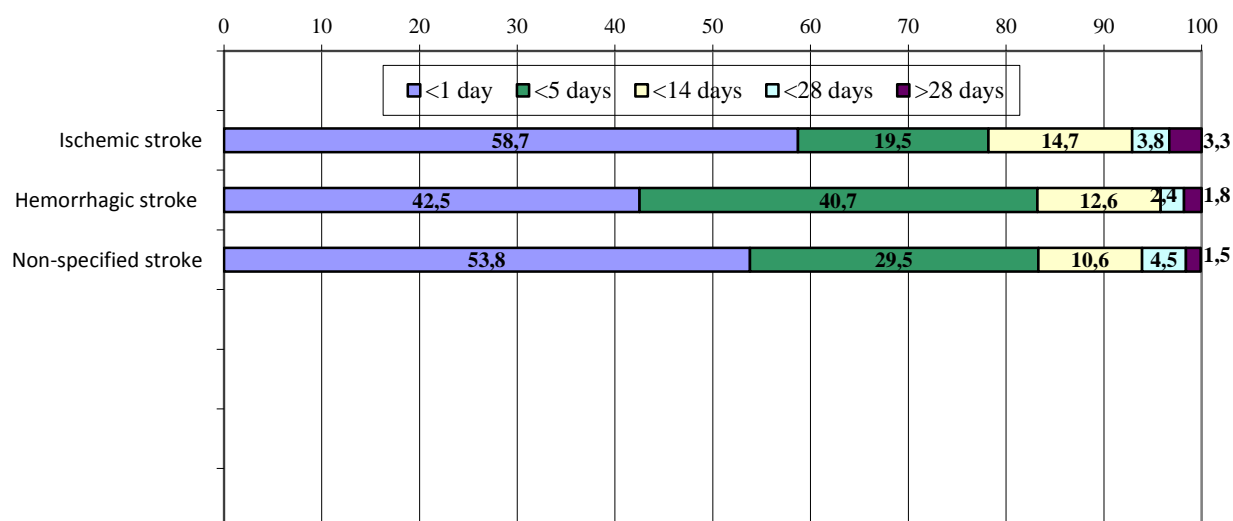


Mortality, as well as morbidity tends to increase with age from 0.04 at the age of 25-40 years to 13.55 in the 70 years and above (average values from 2007-2011), and there are spontaneous fluctuations of this indicator in the older age group, and this require to maintain registry for a number of years in order to obtain reliable data.

Overall stroke lethality rate was 41.8% (38.8% males, 43.9% of women) in 2007-2011. This rate is significantly higher for hemorrhagic stroke - 54.4% (54.1% in men, 54.9% women) and for non-specified stoke - 49.8% (44.8% in men, 53.6% women) than with cerebral infarction - 36.5% (32.4% in men, 39.3% women).

Analysis of death time in different stroke types(Figure6) indicates that in 2/3 cases it happens within first 24 hours of the disease or during its most acute period (up to 5 days), which means it is conditioned by availability and nature of diagnostic and treatment interventions in acute stage of the disease.

Figure 6. Time of Death in Different Types of Stroke



Analysis of hospital admission frequency of patients in acute condition was carried out in order to identify factors that determine time of death onset of stroke patients. During the period of angioneurology service monitoring the share of hospitalized patients increased from 39,9% to 44,8%. 1355 patients were treated in hospital for two years (2010-2011rr.), including 780 patients (58,1%) that were delivered by ambulance; and other patients were referred by FMC physicians or were self-referred.

According to the analysis results (Table 2), lethality rate in patients with stroke treated in hospital is generally lower in 2-times (25.7% and 53.6%, respectively): in hemorrhagic stroke – in 1.5 times, in ischemic stroke - in 2, 5 times, in non-specified stroke - in 4 times.

Table 2. Frequency of lethal outcome (%) in different types of stroke and different age groups, hospitalized and treated at home (according to the registry data for 2007-2011)

Age group	Ischemic stroke		Hemorrhagic stroke		Non-specified stroke		Total no of stroke cases	
	Hospital.	Non-hospital.	Hospital.	Non-hospital.	Hospital.	Non-hospital.	Hospital.	Non-hospital.
Under 40	11,9	40,0	16,0	75,0	-	100,0	12,3	64,3
40-49	6,3	25,6	34,5	82,1	12,1	33,3	16,1	47,9
50-59	9,0	27,1	49,4	68,6	13,0	46,7	20,7	38,9
60-69	21,5	34,1	43,9	61,1	16,3	62,9	26,1	42,4
70 and above	29,8	55,2	58,5	63,1	25,5	76,7	35,6	59,6
TOTAL	19,2	47,5*	45,7	65,8*	16,8	69,8*	25,7	53,6*

NOTE: * -- significant differences (p<0,05).

Comparison of lethal outcome frequency among young people of working age (23-29 years) indicates that every fifth patient 18,2% die among those that have been treated in hospital (583 cases/106 died), while nearly every second patient dies among non-hospitalized patients -- 42,9% (259 cases/111 died). In relation to patients older than 60, this ratio is 31,3% and 55,4%, which means that chances to survive after the therapy in hospital are twice higher even for patients in old age.

Analysis of the disease risk factors is important. Based on the data of the Cerebral Stroke Registry, a prevalence assessment of the 10 most significant risk factors that have objective evidence was carried out. (Tab. 5).

Arterial hypertension (AH) is one of the most common risk factors (in more than 83% of cases), and coronary heart disease (CHD) (over 22%). Comparison of these risk factors by sex, showed that the female population is dominated by hypertension and atrial fibrillation, rheumatism and diabetes are more common in several times, and men often have alcohol addiction. The obtained preliminary findings require further, more thorough scientific data analysis, under the condition that the Registry continues to be operational.

Table 3. Prevalence of cerebral stroke risk factors in patients of different sex, %).

Risk factors	Men (n=652)	Women (n=838)
Arterial hypertension	83,4±1,5	87,9±1,1*
Coronary heart disease	22,2±1,6	24,2±1,5
History of myocardial infarction	7,7±1,0	5,8±0,8
Atrial fibrillation	10,1±1,2	13,7±1,2*
Rheumatism	0,3±0,2	1,3±0,4*
Diabetes mellitus	5,1±0,7	11,1±1,1*
Repeated cerebral strokes	18,9±1,5	19,9±1,4
Transient attacks in history	2,6±0,6	3,1±0,6
Alcohol addiction	12,7±1,3*	1,6±0,4
Oncological diseases	1,5±0,5	1,9±0,5

Note: * -- significant differences (p<0,05).

Therefore, the review findings of Bishkek Cerebral Stroke Registry for 2007 – 2011 indicated that introduction of this registry resulted in significant decrease in a number of non-specified stroke diagnosis, improved continuity of care between primary health care level (FMC) and tertiary levels (specialized departments of the National Hospital), improved quality of treatment and counseling (for patients that receive treatment at home).

However, the work of the Cerebral Stroke Registry demonstrates that diagnostics of the cerebral stroke or its type remains to be a difficult task even for specialty care providers

(FMC and ambulance neurologists), since its clinical signs (level of consciousness, presence of meningeal signs) have significant polymorphism in patients of different groups with somatic comorbidity. Differentiated treatment in hospital and follow-up treatment at home is not possible without appropriate medical examination (brain imaging, cerebral spinal fluid test). Besides, people have a low level of stroke awareness in comparison with cardiac pathology, in regard to their health status. Family physician often visits a patient after the “therapeutic window”, and it is difficult for the physician to make a correct diagnosis and prescribe differentiated therapy without necessary examination (ECG, lab tests). This share of patients (which are more often of old age group) is treated at home from non-specified stroke diagnosis, and therefore, the mortality rate is as high in this group of patients as in patients with hemorrhagic stroke.

Registry data require revision of cerebral stroke patients management tactics and bear the evidence of the need of emergency angioneurologic care in a specialized hospital, and inadmissibility of delayed hospitalization or home-based inpatient care in acute stage of the disease.

4.2. Review Findings of Medical Records of Died Stroke Patients, Registered at Outpatient Level

Study for assessment of registration validity of cerebral stroke-related mortality covered 4 oblasts, 16 districts and 2 cities. Overall 783 assessment forms for cerebral stroke registration validity were collected.

Table 4. Distribution of reviewed cases per oblasts (n=783)

№	Oblast	Number of cases (N)
1.	Chui	196
2.	Naryn	193
3.	Osh	196
4.	Jalal-Abad	198

According to the filled assessment forms for stroke registration validity, the average age of patients died from stroke was 72,32 years.

The number of deceased patients in terms of gender is as follows: 403 cases of men and 380 women.

The largest number of deceased patients (on the basis of age category) was in age group of 61 and above, which made more than 55% of the surveyed cases.

According to the reviewed medical records, the stroke-related mortality trends are practically the same among men and women. It should be noted that about 5% of stroke-induced deaths have been reported in patients under 40 (Table 5).

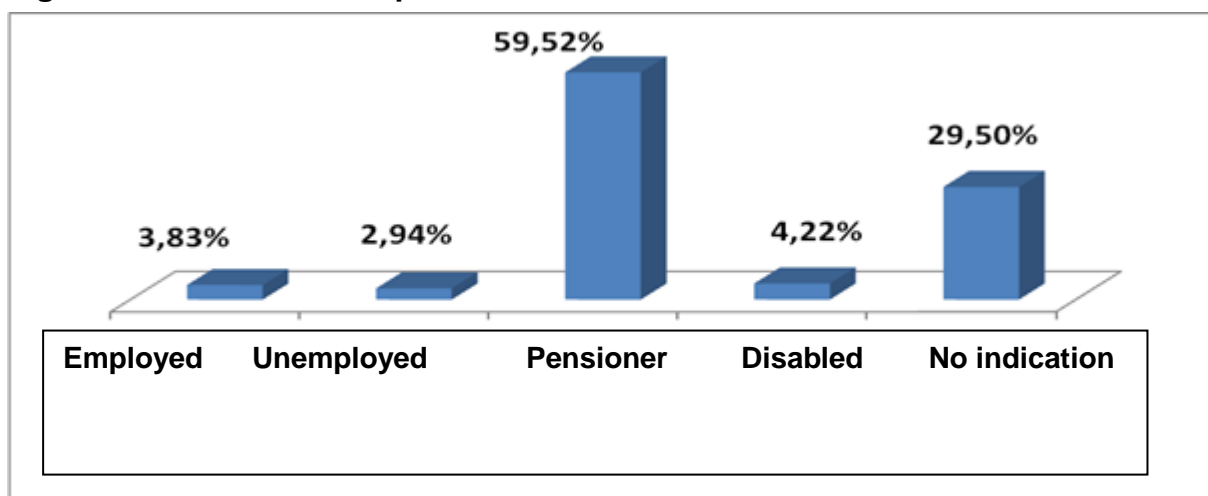
Aggregate Data

Table 5. Sex/age distribution of died patients (n=783)

No	Sex	18-30 years old (n=4)	31-40 (n=34)	41-50 (n=149)	51-60 (n=163)	61-70 (n=210)	Above 70 (n=223)
1.	Men (n=403)	2	16	75	97	101	112
2.	Women (n=380)	2	18	74	66	109	111

According to information of the medical treatment records, 3,83% of patients were employed, 2,94% - were unemployed, 59,52% - were pensioners, 4,22% - disable, and 29,5% of patients didn't have any indication of their social status in their medical treatment record (Figure 7).

Figure 7. Social status of patients indicated in their medical records



Information on the Disease

Date, onset of stroke, date and time of establishing stroke diagnosis and intervals between them, as well as timeliness of hospitalization and start of its specialized treatment impact the potential for patients survival. It should be noted that the reviewed medical treatment records practically don't have any indication of the accurate time, they have mainly indications of dates related to stroke onset, establishing the diagnosis

and death. It should be noted that 23% of reviewed medical records didn't have any information about dates of stroke onset, establishing the diagnosis and death.

Therefore, these parameters were analyzed in the context of daily intervals. Following data were obtained: in more than half of the patients (58.24%), the diagnosis of "stroke" was established in the first day, i.e. the time between stroke onset and the date of diagnosis was less than 1 day for almost a third of patients (29.63%), the time between the date of the stroke onset and the date of establishing diagnosis ranged from 1-3 days.

According to the reviewed medical records the interval between the date of the stroke onset and the date of death was less than 1 day in 32.7% of cases, more than 1-3 days - in 24.1% of cases and more than 10 days in 12.4% of cases.

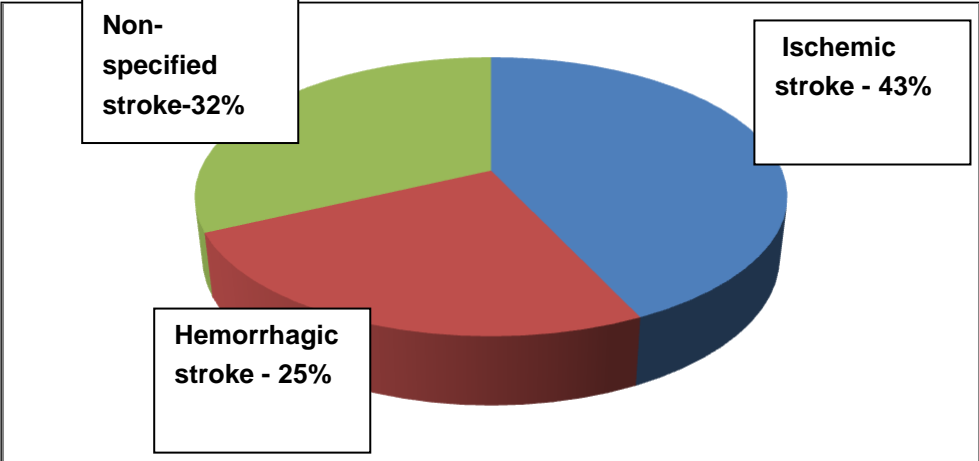
Table 6. Intervals between the dates of the stroke onset, establishing diagnosis and date of death (n=783)

	Less than 24 hours, %	From 1- to 3 days, %	From 4-10 days, %	More than 10-days, %
Interval between the date of the stroke onset and date of establishing diagnosis "stroke"	456 (58,24%)	232 (29,63%)	21 (2,68%)	18 (2,3%)
Interval between the date of the stroke onset and the date of death	256 (32,7%)	189 (24,1%)	167 (21,3)	97 (12,4%)

Established initial and postmortem diagnosis

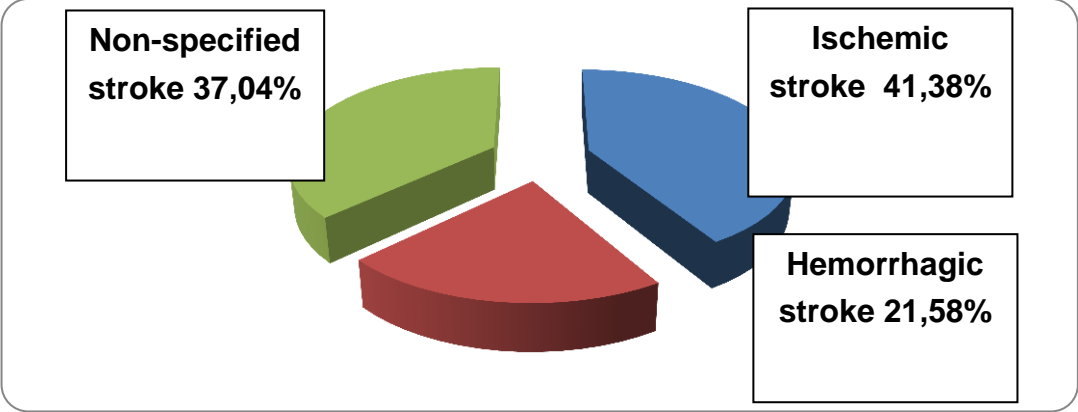
The analysis showed that initial diagnosis in medical records included ischemic stroke – in 43% cases, hemorrhagic stroke in 25% of cases, and non-specified stroke in 32% of cases (Figure 8).

Figure 8. Established initial diagnosis



Established postmortem diagnosis of the stroke type in the reviewed cases is slightly different: ischemic stroke is indicated in 41,38% of cases, hemorrhagic in 21,58% and non-specified in 37,04% of cases. Non-specified stroke type rate is 5% higher than in initial diagnosis of the stroke type. Even such a small difference may suggest that there were some doubts at establishing diagnosis “stroke”, and the number of cases of non-specified stroke type increased therefore in postmortem diagnosis.

Figure 9. Established postmortem diagnosis



Review of medical treatment records demonstrated that autopsy was performed only in 4,1% of examined cases (necroscopy), which can cause doubts regarding accuracy of stroke diagnosis in died patients.

Evaluation of Acute Brain Disorders in History

Disease history plays an important role for stroke diagnosis accuracy, in particular available data pertaining to previous brain disorders prior to this episode (within the nearest 28 days). Medical records analysis demonstrated that in 77% of cases there

were no indications to previous acute vascular abnormalities, which can cause doubts in stroke diagnosis accuracy.

Table 7. ACVA in recent history (more than 28 days prior to last stroke episode)

№	Type of ACVA	Number (n)	in %
1.	Transient ischemic attack (TIA, hypertensive cerebral crisis)	16	2%
2.	Minor stroke(cerebral stroke, acute hypertensive encephalopathy)	8	1%
3.	Stroke (IS, HS)	156	20%
4.	Non-specified	603	77%

Hospital admission records

All patients with ACVA should be admitted to a hospital as soon as possible. Golden standard for hospitalization is 1-3 hours from the onset of ACVA development (level A). Direct dependence of stroke prognosis has been clearly proven. Treatment of acute stage of stroke at home is hopeless, and usually associated with high risk (level B). Based on the study findings only 5% of patients were admitted to a hospital.

Clinical and Diagnostic Test Data

ACVA diagnostics is based in clinical, laboratory and instrumental data. Most accurate instrumental and neuroimaging rapid methodologies include computer tomography (KT) and brain magnetic resonance imaging. Reviewed medical records have indications on MRI performance in diagnostic purposes in 2,7% cases, and in 97,3% cases MRI (KT) was not carried.

Besides CT and MRI, a lumbar puncture plays an important part in ACVA diagnostics. According to the medical treatment records, diagnostic lumbar puncture was carried out in 4% of reviewed cases.

Such a low percentage of main diagnostic tests can cause doubts in the stroke diagnosis accuracy. It should be taken into account in this case that accessibility of these diagnostic methods is limited. MRI and CT is available only at the central (Bishkek) and regional levels (Osh).As far as lumbar puncture is concerned, it should be noted that many doctors at district level do not have appropriate skills for that, therefore such a reliable diagnostic method is not broadly used.

Clinical assessment of stroke diagnosis verification, according to clinical protocol approved by the MOH KR, was carried out on the basis of assessment of the general and local neurological symptoms with the use of the following indicators: consciousness, cerebral symptoms, paraplegia, speech disorders, lesion of cranial nerves, meningeal signs and pathological symptoms.

Analysis of clinical data in medical treatment records indicated that in 71,4% of cases patients had comatose condition, in 10% - semicoma, in 11,4% of cases - semisomnus condition and clear consciousness in 7% of cases. It should be noted that such a high rate of coma impedes performance of main clinical and lab tests and can undermine verification of the stroke diagnosis.

Presence of cerebral symptoms (nausea, vomiting, dizziness) was indicated in 13% of cases.

ACVA is diagnosed at sudden (within minutes, or less often hours) emergence of local or/and cerebral and meningeal neurological symptoms in patients with high risk of vascular disease and in absence of other causes. Assessment of data availability showed that local meningeal and pathological symptoms are present only in 5% reviewed cases.

- **paraplegia**- is unilateral movement disorders in limbs in a form of paralysis and paresis, which are the most common symptoms of focal stroke. In this study, 32.18% (n = 252) of cases had indication to the presence of paresis/paralysis. They include 51.59% of left-handed paralysis cases, and 48.41% of right-sided paralysis.

- **speech impairment** was observed in 15.96% of medical records (n = 125). These cases include 95.2% of patients that did not speak (had dysarthria), 1.6% of cases – didn't understand what people told them (aphasia) and in 3.2% of cases – patients could not speak or understand other people's speech.

-**lesion of cranial nerves** was observed in 18% of patients (n = 141). These cases include 8.51% cases with indication to oculomotor nerve lesion, 63.82% - facial nerve lesion, 13.48% of patients had swallowing disorder, 8.51% of patients had tongue deviation, and 5.68% of patients had comorbid lesion of 2cranial nerves.

- **meningeal signs** were observed only in 4,2% cases.

- **abnormal neurological symptoms** (Babinski, Oppenheim, Gordon, Schaeffer) were observed only in 4.5% of the reviewed cases.

Treatment

There is available evidence that an early start of specialized/differentiated treatment impact the prognosis of stroke patients' survival.

Assessment of medical treatment record demonstrated that treatment interventions were carried out only in 42,91% (n=336) of reviewed case.

Only 7,14% of patients received specialized/differentiated treatment.

4.2. Peer Review of Stroke Diagnosis Verification in Died Patients According to Criteria

Experts used 3 rule-out criteria for the stroke diagnosis in this study:

- 1- short time period (less than 2 hours) between the onset of stroke event and death;
- 2-lack of clinical data on health status of a patient prior to death and autopsy data;
- 3- lack of clinical records, confirming stroke diagnosis.

Analysis of medical records showed that stroke diagnosis was not confirmed in more than a half of reviewed cases– **55,4%**(n=403).

They include 2,98% of died patients, which stroke diagnosis was not confirmed on the basis of one criterion, and 82,63% of died patients - on the basis of two criteria and 14,39% on all three criteria. (Table 5)

Table 5. Stroke rule-out criteria

Stroke rule-out criteria (n=403)	%
1 rule-out criteria	2,98%
2 rule-out criteria	82,63%
3 rule-out criteria	14,39%

According to peer review of medical treatment records, several underlying diseases were indicated as probable causes of death of patients with non-confirmed stroke.

]About 70% of deaths referred to as a consequence of stroke, according to clinical criteria described in the medical records were more consistent with consequences of cardiovascular disease (sudden death due to acute myocardial infarction, congestive heart failure, pulmonary embolism and chronic heart failure). About 25% of the reviewed cases, according to experts opinion, could have other causes of death, such as alcoholism, alcohol and other type of intoxication, end-stage cancer, tuberculosis and other infections, sepsis, postoperative complications after surgery for brain tumors, head injuries, consequences of cerebral palsy, epilepsy with status epilepticus, endocrine causes of death (diabetes and its complications, ketoacidosis and coma).

And experts were not able to establish the most probable cause of death in about 5% of the reviewed case histories.

Thus, this study for verification of the stroke diagnosis accuracy of patients that died at home showed that diagnosis was not confirmed in 55.4% of the reviewed cases. This indicates that national and oblast-based stroke-related mortality rates are overstated.

Recommendations:

- Given the medical and social significance of stroke and a need for monitoring of key epidemiological indicators, further implementation of the Stroke Registry Program is required in Bishkek
- To consider an opportunity to extend this experience to the country's regions (regional level) to improve reliability of the verification of the stroke diagnosis.
- To develop criteria for assessment of post-mortem diagnosis accuracy from stroke on the basis of medical history, clinical signs, including neurological and laboratory and instrumental data, on which basis, the post-mortem stroke diagnosis shall be established in healthcare facilities and training of family doctors and neurologists on developed criteria shall be carried out therefore.
- To recommend all family physicians and FMC neurologists to go through specialized training by the Kyrgyz State Medical Institute of Retraining and Qualification Upgrading in relation to preclinical health care, diagnostics and treatment of cerebral stroke.
- To consider an opportunity of regular organization of travelling seminars on the base of TH and FMC for ambulance doctors, family physicians and neurologists for introduction of CP/CPG related to preclinical health care delivery, diagnostic and treatment of cerebral stroke.
- To strengthen a neurologist's role and responsibility for every stroke-related death case at the primary care level, and to consider an opportunity to confirm death from stroke by neurologist.
- To develop a system of health care delivery in rural area (at the level of rural healthcare units (FAPs), and remote FGP with regular involvement of neurologist as consultants.
- To strengthen supervision of stroke-induced death cases in health care facilities by establishing supervisory control of the national level departments of every oblast and appointment of neurology coordinators at oblast level.
- To develop and introduce educational programs for population on stroke signs and first aid (through mass media, information leaflets, etc.).