

CRCS-5 Statistics – 2012 Report

Global Statistics of CRCS-5

Acute Treatment Statistics of CRCS-5

Outcome Statistics of CRCS-5

Selected Subgroup Statistics of CRCS-5



뇌졸중임상연구센터
Clinical Research Center For Stroke

About CRCS-5 and these statistics

Clinical Research Center for Stroke (director: Byung-Woo Yoon, Seoul National University Hospital) established in 2006 to facilitate multi-center collaborations in clinical research and to develop clinical practice guideline, with research support from the Korea Healthcare Technology R&D Project, Ministry of Health and Welfare, Republic of Korea (A102065). CRCS is consisted of six divisions, and CRCS-5 (principal investigator: Hee-Joon Bae, Seoul National University Bundang Hospital) is engaged in epidemiological researches. From the commencement of CRCS-5, stroke physicians from academic and regional centers have constructed multicenter cohort and gather prospective outcomes of acute ischemic stroke patients.

In April 2008, 9 centers (Eulji General Hospital, Eulji University Hospital, Dong-A University Hospital, Seoul National University Bundang Hospital, Seoul Medical Center, Soonchunhyang University Hospital Seoul, Yeungnam University Medical Center, Inje University Ilsan Paik Hospital, and Hallym University Sacred Heart Hospital) established a prospective registry of consecutive acute stroke patients based on web-database system (<http://www.stroke-crc.or.kr/ecrf/>). At this stage, CRCS-5 aimed to improve quality of stroke care in participating centers as well as to develop and spread e-QI system to Korean hospitals. CRCS-5 data manager collects and audits all the data registered by each participating center. In November 2009, 5 centers kicked off prospective capture of stroke outcomes including modified Rankin Scale (mRS) scores at 3 month and 1 year after stroke.

In January 2011, two stroke centers (Dongguk University Ilsan Hospital, Chonnam National University Hospital) were introduced to CRCS-5, expanding

CRCS-5's regional coverage to southwestern part of South Korea. Also in this year, all the participating centers started prospective outcome capture system, and its collecting information was expanded to occurrence of early neurological deterioration (END), NIHSS scores and mRS scores at 3 month and 1 year after stroke, and medication adherence with patients' self-knowledge. Jeju National University Hospital, at the southernmost island of Korea, joined CRCS-5 in October 2011. As current of January 2012, 12 stroke centers consist of CRCS-5, and the number of registered stroke cases reached 16,459.

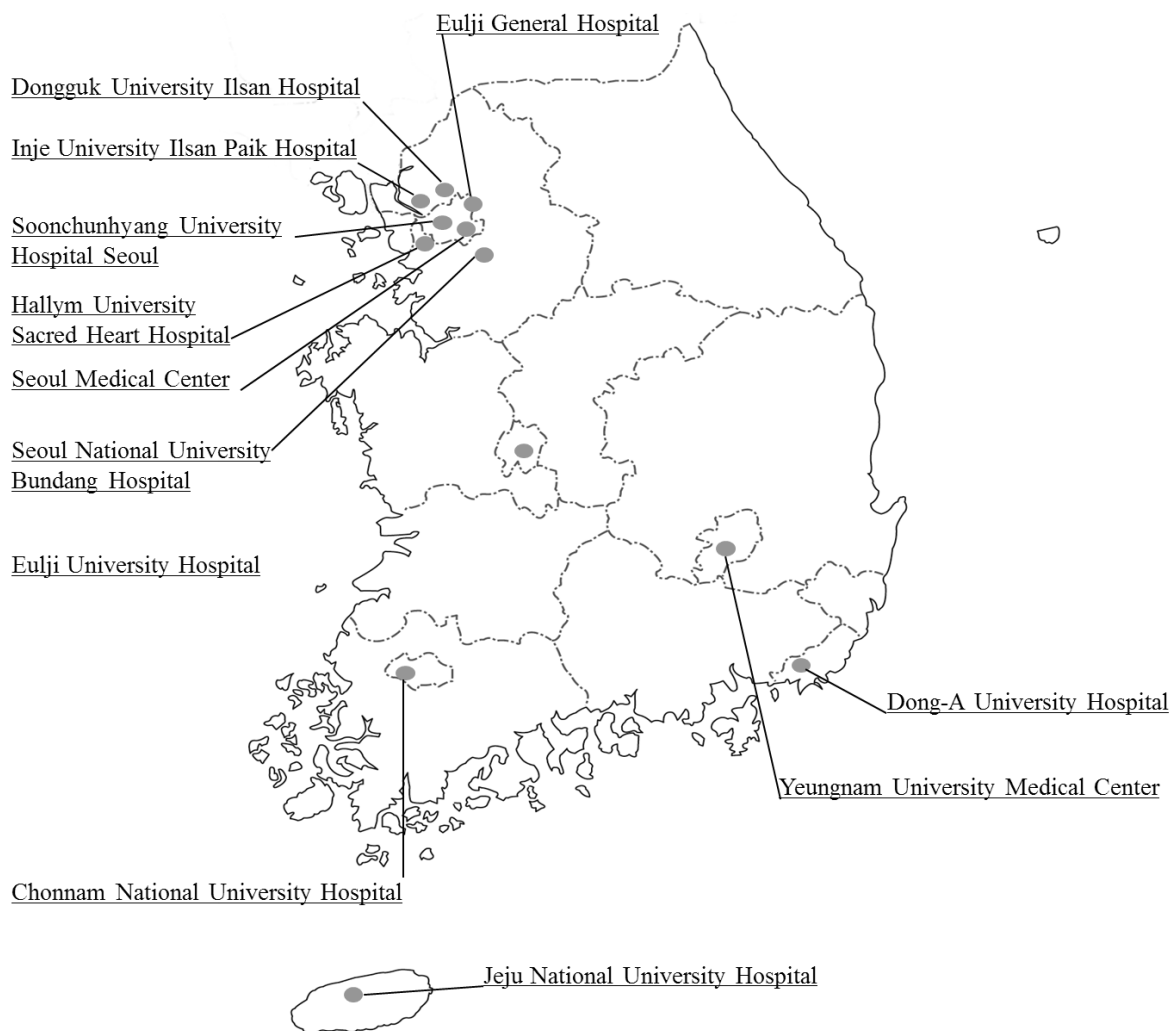


Figure 1 Participating centers and their geographic location

Participating stroke centers and site investigators

- Seoul National University Bundang Hospital: Hee-Joon Bae (director), Moon-Ku Han, Beom Joon Kim, Jihoon Kang, Min Uk Jang, Jeong Ho Hong
- Eulji General Hospital: Jong-Moo Park, Kyusik Kang
- Eulji University Hospital: Soo Joo Lee, Youngchai Ko
- Dong-A University Hospital: Jae-Kwan Cha
- Seoul Medical Center: Tai Hwan Park, Sang-Soon Park
- Soonchunhyang University Hospital Seoul: Kyung Bok Lee
- Yeungnam University Medical Center: Jun Lee
- Inje University Ilsan Paik Hospital: Keun-Sik Hong, Yong-Jin Cho
- Hallym University Sacred Heart Hospital: Mi-Sun Oh, Kyung-Ho Yu, Byung-Chul Lee
- Dongguk University Ilsan Hospital: Dong-Eog Kim
- Chonnam National University Hospital: Joon-Tae Kim, Ki-Hyun Cho
- Jeju National University Hospital: Jay Chol Choi

Statistical advisors

- JiSung Lee, Juneyoung Lee. Department of Biostatistics, Korea University College of Medicine

cf. List of sites and investigators is as of October 2012.

List of Tables and Figures

Table 1 Number of registered acute stroke patients

Table 2 Number of acute ischemic stroke patients stratified by sex and age group

Table 3 Fractions of TOAST classification components in CRCS-5

Table 4 Arterial territory of ischemic stroke (multiple choices permitted)

Table 5 Anatomical location of ischemic stroke (multiple choices permitted)

Table 6 Angiographic location of steno-occluded arteries (multiple choices permitted)

Table 7 History of vascular events in CRCS-5 registered strokes

Table 8 Major modifiable vascular risk factors

Table 9 Frequencies of potential cardioembolic sources (risk stratification according to the TOAST classification scheme)

Table 10 Frequency of etiological work-ups

Table 11 Profile of laboratory tests

Table 12 Profile of hyperacute treatment for ischemic strokes

Table 13 Profile of acute stroke medications (multiple choices permitted)

Table 14 Profile of secondary preventive medications at discharge (multiple choices permitted)

Table 15 Profile of surgical interventions during acute period of stroke (multiple choices permitted)

Table 16 Major vascular risk factors and their management before index strokes

Table 17 Distribution of premorbid mRS score in the included stroke cases

Table 18 Modality of revascularization treatment for acute ischemic stroke

Table 19 Discrepancy in onset (last normal time) to arrival time according to the treatment modality

Table 20 Categorized onset-to-arrival time

Table 21 Door-to-treatment time according to treatment modality

Table 22 Door-to-endovascular time according to treatment modality

Table 23 Discrepancy of revascularization modality among stroke centers

Table 24 Onset-to-arrival times and NIHSS scores between stroke centers

Table 25 Distribution of mRS score at 3 month and 1 year after stroke

Table 26 mRS score matrix of 3 months and 1 year after stroke.

Table 27 Frequencies of early neurological deteriorations (END) occurred within 3 weeks after stroke

Table 28 Type of recurrent strokes within 3 weeks from onset or during hospitalization

Table 29 Later vascular events until 3 month after stroke (excluding END period)

Table 30 Later vascular events between 3 month and 1 year after stroke (excluding events before 3 month)

Table 31 Subgroup statistics according to sex

Table 32 Subgroup statistics to age

Figure 1 Participating centers and their geographic location

Figure 2 Number of acute stroke patients since April 2008

Figure 3 Number of registered acute stroke patients from each center

Figure 4 Distribution of acute ischemic strokes according to sex or age-group

Figure 5 TOAST classification

Figure 6 Arterial territories of ischemic strokes (multiple choices permitted)

Figure 7 Anatomical locations of ischemic strokes (multiple choices permitted)

Figure 8 Angiographic locations of steno-occluded arteries (multiple choices permitted)

Figure 9 Distribution of NIHSS score at hospital arrival

Figure 10 Onset (last normal time) to hospital arrival time

Figure 11 NIHSS score at discharge (missing in 91 cases)

Figure 12 mRS score at discharge (missing in 23 cases)

Figure 13 Percentages of major modifiable vascular risk factors in CRCS-5 database

Figure 14 Composition of hyperacute revascularization treatment modalities

Figure 15 Percentages of acute stroke medications (multiple choices permitted)

Figure 16 Percentages of secondary preventive medications at discharge

(multiple choices permitted)

Figure 17 Percentages of surgical interventions during acute period of stroke

(multiple choices permitted)

Figure 18 Percentages of regular treatment for vascular risk factors

Figure 19 Percentages of undocumented vascular risk factors

Figure 20 Difference of NIHSS score over arrival and day #1 post-revascularization (available in 966 strokes)

Figure 21 Volume of acute revascularization treatment for each stroke center

Figure 22 Discrepancy of revascularization modality among stroke centers

Figure 23 Frequencies of post-stroke events

Figure 24 Frequencies of early neurological deteriorations (END) occurred within 3 weeks after stroke

Figure 25 Later vascular events until 3 month after stroke (excluding END period)

Figure 26 Later vascular events between 3 month and 1 year after stroke (excluding events before 3 month)

Figure 27 Incidence of END and vascular events after stroke (N=877 who completed 1-year follow-up)

Global Statistics of CRCS-5

Recruitment of acute stroke patients

- A total of 16,459 acute strokes were registered in the CRCS-5 database until January 2012 (Figure 2 Number of acute stroke patients since April 2008).
- Number of monthly recruitment was 358 ± 79 cases on average. In year 2011, number of registered cases per month was 460 ± 52 .
- Recruitment profiles of participating hospitals differ according to the volume of acute stroke patients and the time of joining CRCS-5. Seoul National University Bundang Hospital topped on the list as registered 3019 cases until January 2012 and 66 ± 10 subjects per month on average (Table 1 Number of registered acute stroke patients). However, Cheonnam National University Hospital has been most rapidly recruiting acute stroke patients, as 89 ± 8 cases per month on average (Figure 3 Number of registered acute stroke patients from each center).

Demographic profile of acute ischemic stroke

- Number of acute ischemic strokes in CRCS-5 was 14,792 (90%).
cf. Hemorrhagic stroke patients are customarily admitted to neurosurgical department in usual Korean stroke centers. So that above statistics should not be interpreted as 90% of acute stroke patients are ischemic stroke in Korea.
- Number of male was 8601 (58%) and female was 6191 (42%).
- Average age at onset was 68 ± 13 and median 69 [interquartile range, 60 – 77] years old with minimum 12 and maximum 105. Young-age stroke patients (age of

onset < 45 year-old) were 721 (5%), and oldest olds (age ≥85 year-old) were 966 (7%).

- Female stroke patients exceeded male counterpart in a group of more than 75 year-old (Table 2 Number of acute ischemic stroke patients stratified by sex and age group).
- Among male stroke patients, the largest age-group was 65-74 year-old (32%). However, female patients were most frequent in 75-84 year-old group (34%) (Figure 4 Distribution of acute ischemic strokes according to sex or age-group).

Characteristics of Acute Ischemic Strokes

- Among a total of 14,792 acute ischemic strokes, large artery atherosclerosis (LAA) accounted for 38%, small vessel occlusion (SVO) for 20%, and cardioembolism (CE) for 21%. Ischemic strokes due to other specified etiology (ODE) were 2% (Table 3 Fractions of TOAST classification components in CRCS-5 and Figure 5 TOAST classification).
- Undetermined etiology (UDE) was 18%; two or more etiologies for 4%, negative etiology (cryptogenic stroke) for 8%, and incomplete work-ups for 6%.
- Fifty-seven percent of ischemic strokes were located in middle cerebral artery (MCA) territories. As for anatomical territories, 46% located at cerebral cortex, 30% at corona radiata or adjacent white matters, and 33% at deep structures including putamen, internal capsule or thalamus. Thirty percent of strokes have infratentorial lesions (Table 4 Arterial territory of ischemic stroke (multiple choices permitted), Table 5 Anatomical location of ischemic stroke (multiple choices permitted) and Table 6 Angiographic location of steno-occluded arteries (multiple choices permitted)).
- Regarding steno-occluded arteries, MCA accounted for 31% and extracranial internal carotid artery (ICA) for 13% (Figure 6 Arterial territories of ischemic strokes (multiple choices permitted), Figure 7 Anatomical locations of ischemic strokes (multiple choices permitted)).

permitted) and Figure 8 Angiographic locations of steno-occluded arteries (multiple choices permitted)).

- NIHSS score at hospital arrival was 6.1 ± 6.3 on average and median 4 [interquartile range, 2 – 8] points, with range between 0 and 40. NIHSS score ≤ 4 was documented in 47%, NIHSS score of 5 – 8 in 25%, and NIHSS score ≥ 25 in 2% of acute ischemic stroke patients (Figure 9 Distribution of NIHSS score at hospital arrival).
- Onset (last normal time) to hospital arrival time was 33.3 ± 48.0 hour on average and median 13.8 [interquartile range, 3.9 – 41.8] hour, for whose time-related record is available. Twenty-seven percent of patients arrived within 3 hours and 40% within 6 hours. Sixty-five percent of ischemic strokes admitted within 24 hours after onset (Figure 10 Onset (last normal time) to hospital arrival time).
- At the time of discharge, NIHSS score was 5.3 ± 7.8 on average and median 2 [interquartile range, 1 – 6]; mRS score is 2.3 ± 1.7 on average and median 2 [interquartile range, 1 – 4]. Missing cases were 91 and 23, respectively. In-hospital mortality was 452 (3%) (Figure 11 NIHSS score at discharge (missing in 91 cases) and Figure 12 mRS score at discharge (missing in 23 cases)).
- Twenty-two percent of stroke cases (3213 subjects) had experienced stroke events before, and 80% was ischemic. Frequencies of other vascular events before index stroke were less than 5 percent.
- Frequencies of major vascular risk factors were as follows; 10,062 (68%) hypertension, 4914 (33%) diabetes mellitus, 4637 (31%) dyslipidemia, 5792 (39%) habitual smoking, and 2852 (19%) atrial fibrillation (Table 7 History of vascular events in CRCS-5 registered strokes, Table 8 Major modifiable vascular risk factors and Figure 13 Percentages of major modifiable vascular risk factors in CRCS-5 database).
- Potential sources of cardioembolic stroke are detected in 2888 (20%) for high risk sources and in 1179 (8%) for medium risk sources. Atrial fibrillation was the most common high risk source (80%); patent foramen ovale (33%) and congestive heart failure (25%) were leading sources of medium risk cardioembolism (Table 9 Frequencies of potential cardioembolic sources (risk stratification according to the TOAST classification scheme)).

- Magnetic resonance images (MRI) including diffusion-weighted image (DWI) or gradient-echo contrast image (GRE) were performed in more than 90% of registered strokes. Most common cardiac evaluation was transthoracic echocardiography (76%), followed by transesophageal echocardiography (13%), 24-hour electrocardiogram monitoring (30%), and 24-hour blood pressure monitoring (3%). Only 30% had carotid Doppler, but MR angiography was done in nearly 90% of strokes (Table 10 Frequency of etiological work-ups and Table 11 Profile of laboratory tests).
- Hyperacute revascularization treatments were performed in 1736 (12%) cases. Combined intravenous and intraarterial thrombolysis comprised 19% of hyperacute revascularization. Regarding pharmacological modality of thrombolysis, recombinant tissue plasminogen activator was the most frequently utilized medication (86%) (Table 12 Profile of hyperacute treatment for ischemic strokes and Figure 14 Composition of hyperacute revascularization treatment modalities).
- Regarding acute stroke medications, aspirin (82%) and clopidogrel (33%) were the two most frequently prescribed drugs (Table 13 Profile of acute stroke medications (multiple choices permitted) and Figure 15 Percentages of acute stroke medications (multiple choices permitted)).
- As with acute stroke medications, aspirin (69%) and clopidogrel (38%) were the two most frequently utilized medications for secondary prevention of stroke at discharge (Table 14 Profile of secondary preventive medications at discharge (multiple choices permitted) and Figure 16 Percentages of secondary preventive medications at discharge (multiple choices permitted)).
- Surgical or radiological interventions were not frequently performed (n=395; 3%) in CRCS-5 registered stroke cases (Table 15 Profile of surgical interventions during acute period of stroke (multiple choices permitted) and Figure 17 Percentages of surgical interventions during acute period of stroke (multiple choices permitted)).
- Duration of hospitalization was 11.9 ± 18.2 days on average and median 8.1 [interquartile range, 5.4 – 13.0].

- NIHSS score at discharge was 5.3 ± 7.8 points on average and median 2 [interquartile range, 1 – 6]. Modified Rankin Scale (mRS) score at discharge was 2.3 ± 1.7 points on average and median 2 [interquartile range, 1 – 4]. Functional independence at discharge (mRS score 0 or 1) was achieved in 5720 (39%) cases, and catastrophic consequences at discharge (mRS score 5 or 6) was documented in 1854 (13%) cases.
- In-hospital mortality was occurred in 452 (3%) subjects, after 10.3 ± 13.0 days after stroke on average and median 6 [interquartile range, 3 – 11] days. Among the mortality cases, 297 (66%) were directly related to stroke; 140 (31%) were from complications related to stroke; 14 (3%) were from other causes unrelated to stroke. Cause of death was not recorded in 1 case.
- Regarding major vascular risk factors, hypertension and diabetes were fairly well documented before stroke (89% and 79%, respectively) and on regular management (78% and 74%, respectively). However, detection rates of dyslipidemia and atrial fibrillation were below expectation (45% and 52%, respectively) and regular treatment for these risk factors was less than adequate (39% and 38%) (Table 16 Major vascular risk factors and their management before index strokes, Figure 18 Percentages of regular treatment for vascular risk factors and Figure 19 Percentages of undocumented vascular risk factors).
- Habitual smoking was reported from 5792 (39%) and 30% of them were ex-smokers. Mean smoking doses were 33.5 ± 18.9 pack-years.
- Before index stroke, 88% of stroke cases (13,055 subjects) maintained independent living, mRS score of 0 or 1 (Table 17 Distribution of premorbid mRS score in the included stroke cases).

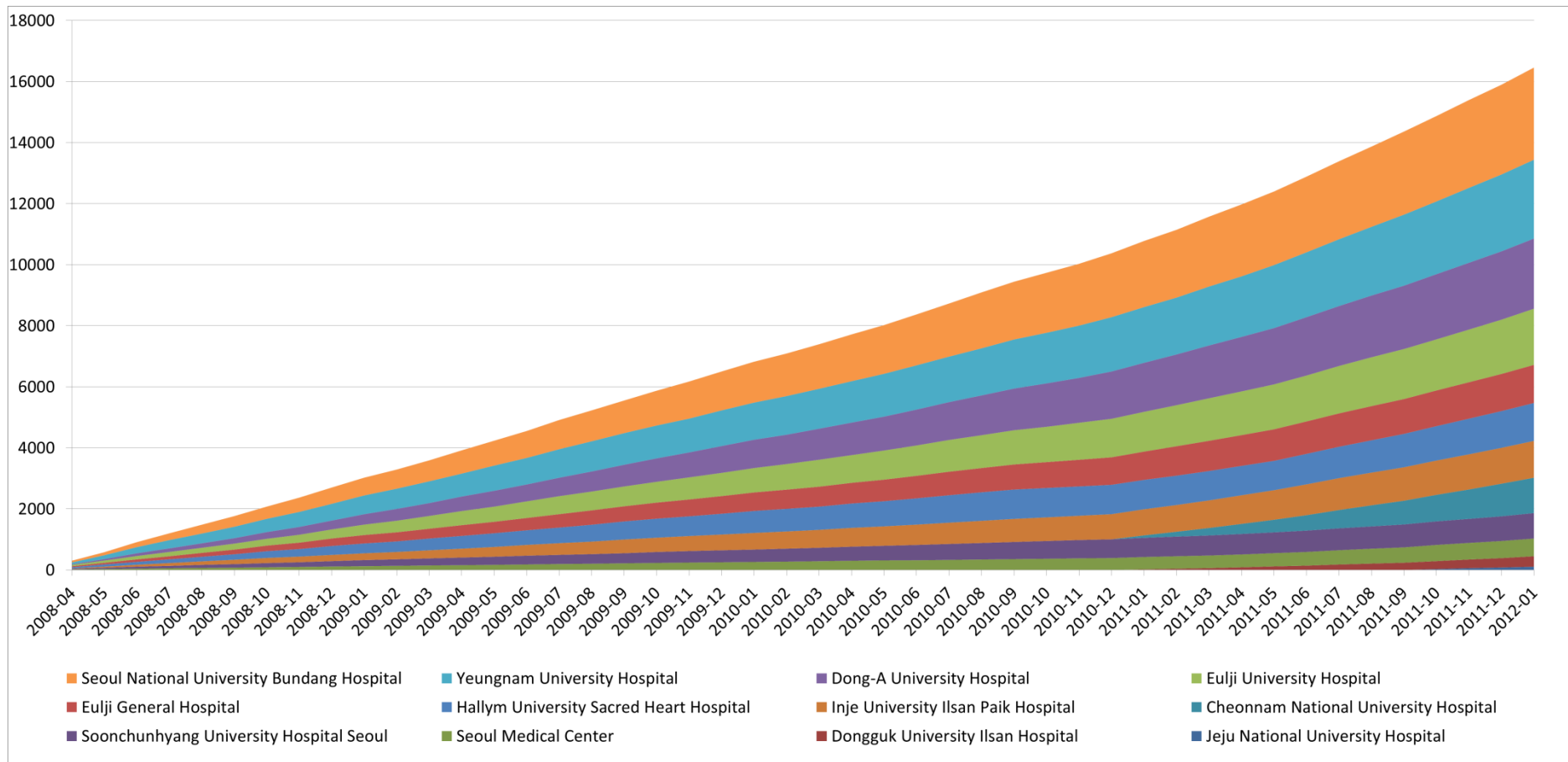


Figure 2 Number of acute stroke patients since April 2008

Table 1 Number of registered acute stroke patients

Participating center	'08 2Q	'08 3Q	'08 4Q	'09 1Q	'09 2Q	'09 3Q	'09 4Q	'10 1Q	'10 2Q	'10 3Q	'10 4Q	'11 1Q	'11 2Q	'11 3Q	'11 4Q	'12 Jan	Sum
Jeju National University Hospital															81	26	107
Dongguk University Ilsan Hospital												60	81	96	69	36	342
Seoul Medical Center	43	32	38	34	33	38	34	34	31	37	35	23	37	54	58	18	579
Soonchunhyang University Hospital Seoul	65	51	60	56	55	43	62	49	61	61	52	43	41	52	58	26	835
Cheonnam National University Hospital												245	260	272	292	89	1158
Inje University Ilsan Paik Hospital	62	81	60	62	88	96	67	71	79	89	68	81	106	86	79	32	1207
Hallym University Sacred Heart Hospital	94	85	114	92	94	114	88	79	101	101	0	0	37	95	109	39	1242
Eulji General Hospital	82	71	92	76	82	93	83	75	84	84	79	89	72	79	76	32	1249
Eulji University Hospital	110	86	101	122	125	105	111	123	111	127	141	131	111	135	139	62	1840
Dong-A University Hospital	90	88	113	130	133	157	168	137	160	189	185	180	182	163	164	59	2298
Yeungnam University Hospital	201	174	173	165	157	166	132	140	142	158	171	151	195	202	190	66	2583
Seoul National University Bundang Hospital	163	185	186	153	195	187	206	184	209	225	200	196	190	243	220	77	3019
Sum	910	853	937	890	962	999	951	892	978	1071	931	1199	1312	1477	1535	562	16459

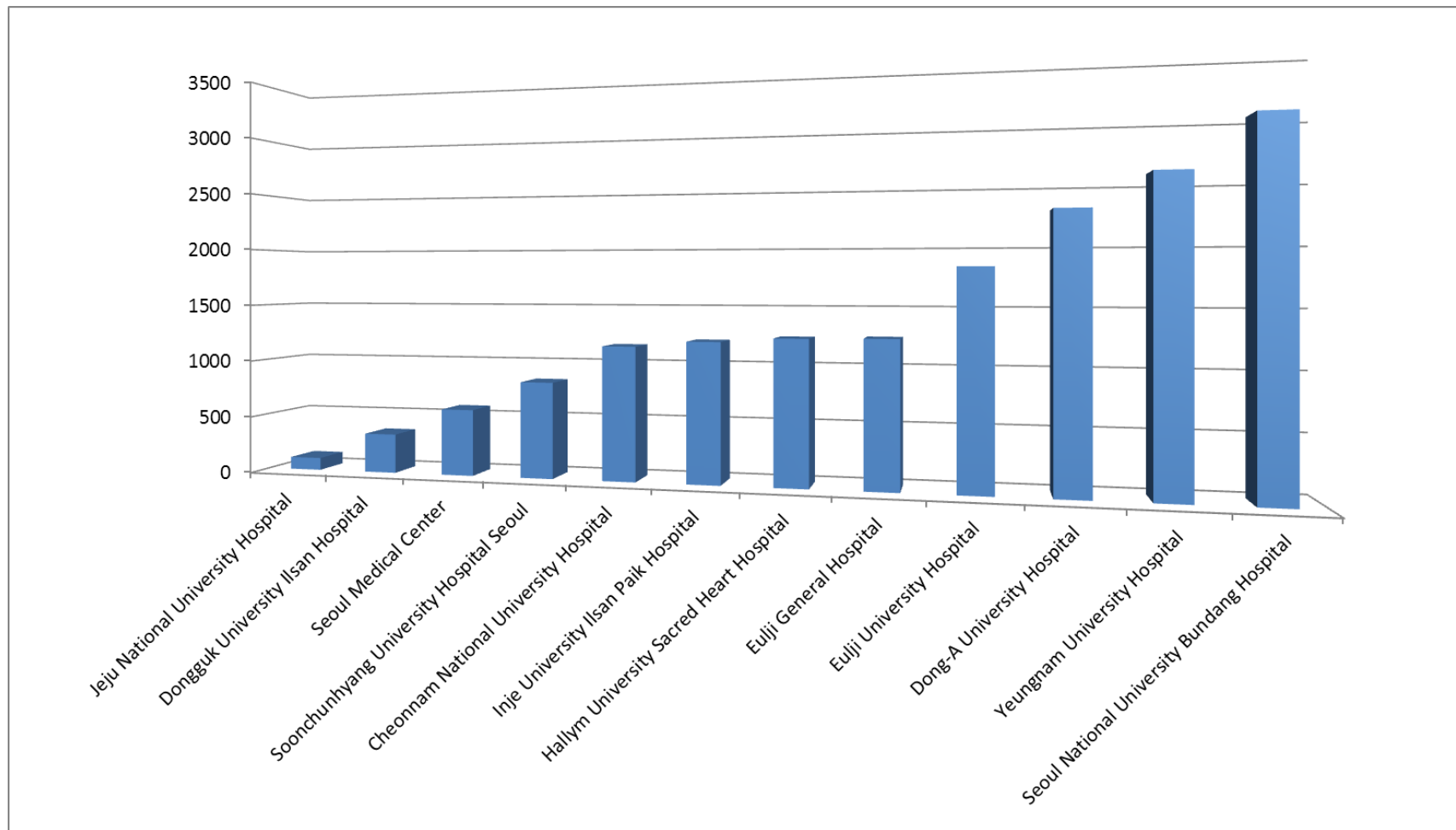


Figure 3 Number of registered acute stroke patients from each center

Table 2 Number of acute ischemic stroke patients stratified by sex and age group

Age group	Whole population		Male		Female	
< 45	721	4.9%	537	6.2%	184	3.0%
45 - 54	1705	11.5%	1271	14.8%	434	7.0%
55 - 64	2863	19.4%	2048	23.8%	816	13.2%
65 - 74	4810	32.5%	2768	32.2%	2042	33.0%
75 - 84	3725	25.2%	1631	19.0%	2095	33.8%
≥ 85	966	6.5%	346	4.0%	620	10.0%
Total	14792		8601		6191	

● Based on 14,792 ischemic stroke cases.

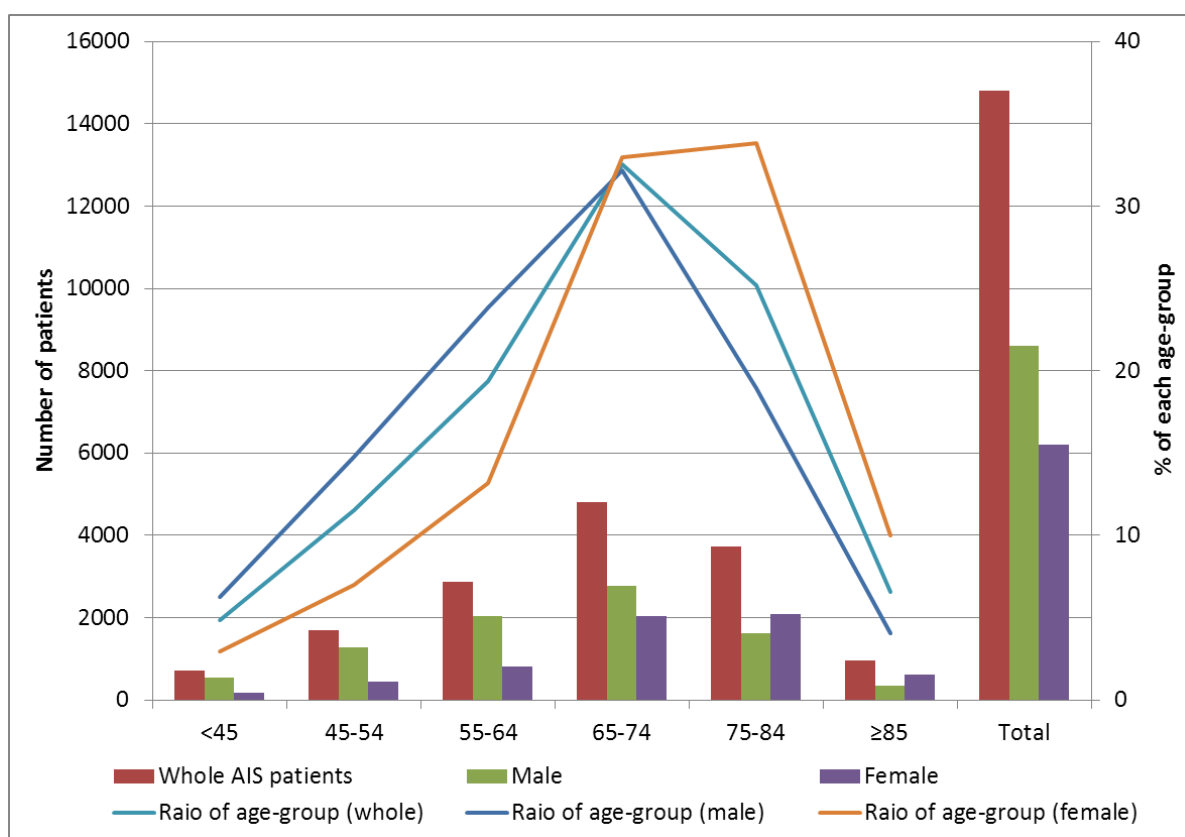


Figure 4 Distribution of acute ischemic strokes according to sex or age-group

● Based on 14,792 ischemic stroke cases.

Table 3 Fractions of TOAST classification components in CRCS-5

TOAST classification	Frequency	Percentage
Large Artery Atherosclerosis	5562	37.6
Small Vessel Occlusion	3009	20.3
Cardioembolism	3154	21.3
Other Determined Etiology	357	2.4
Undetermined Etiology - 2 or more	601	4.1
Undetermined Etiology - Negative	1225	8.3
Undetermined Etiology - Incomplete work-ups	884	6.0
Total	14792	

● Based on 14,792 ischemic stroke cases.

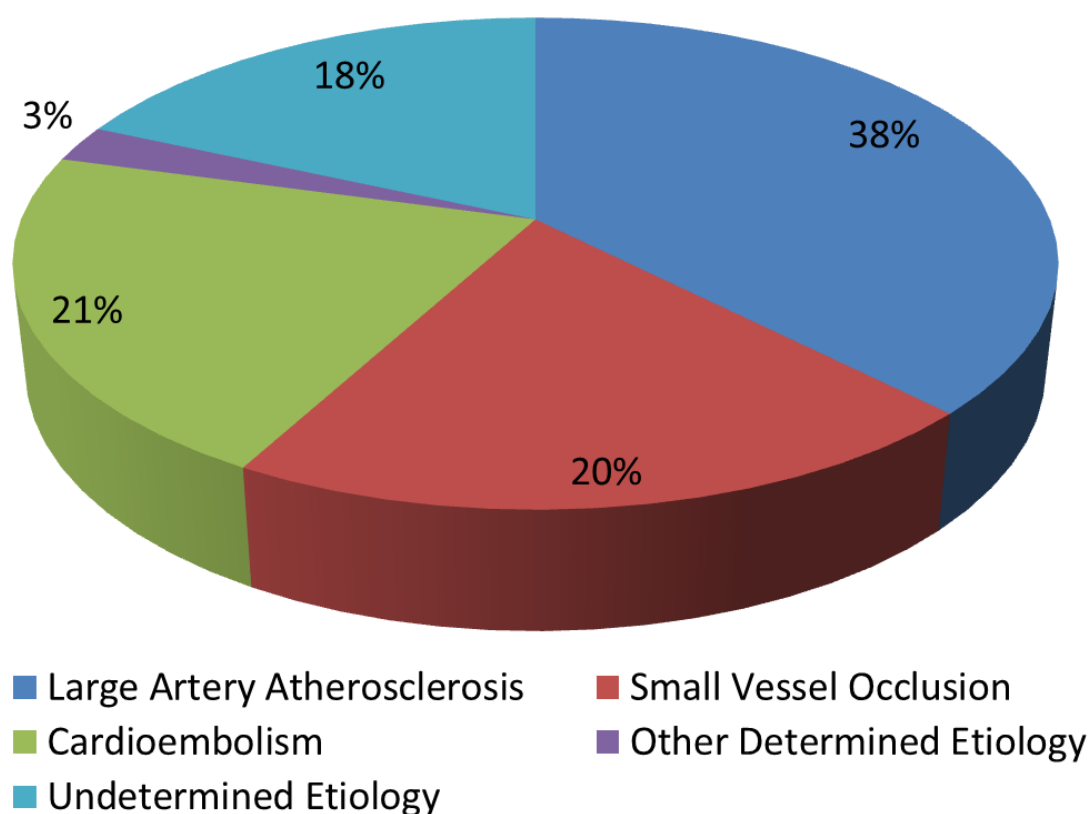


Figure 5 TOAST classification

● Based on 14,792 ischemic stroke cases.

Table 4 Arterial territory of ischemic stroke (multiple choices permitted)

Arterial Territory of Ischemic Stroke	Frequency	Percentage
Internal Carotid Artery	462	3.1
Middle Cerebral Artery	8437	57.0
Anterior Cerebral Artery	829	5.6
Posterior Cerebral Artery	2025	13.7
Basilar artery	1792	12.1
Vertebral artery	395	2.7
Superior Cerebellar Artery	463	3.1
Anterior Inferior Cerebellar Artery	179	1.2
Posterior Inferior Cerebellar Artery	1357	9.2
Borderzone	435	2.9
Total	16374	

- Based on 14,792 ischemic stroke cases.

Table 5 Anatomical location of ischemic stroke (multiple choices permitted)

Anatomical Location of Ischemic Stroke	Frequency	Percentage
Cortex	6831	46.2
Corona Radiata	4381	29.6
Putamen - Internal capsule	3553	24.0
Thalamus	1272	8.6
Midbrain	363	2.5
Pons	1828	12.4
Medulla Oblongata	605	4.1
Cerebellum	1682	11.4
Total	20515	

- Based on 14,792 ischemic stroke cases.

Table 6 Angiographic location of steno-occluded arteries (multiple choices permitted)

Angiographic Location of Steno-Occlusion	Frequency	Percentage
Anterior Cerebral Artery	647	4.4
Middle Cerebral Artery	4572	30.9
Posterior Cerebral Artery	1288	8.7
Basilar Artery	1231	8.3
Vertebral Artery	1489	10.1
Extracranial Internal Carotid Artery	1972	13.3
Intracranial Internal Carotid Artery	1304	8.8
Common Carotid Artery	117	0.8
Aorta	23	0.2
Total	12643	

- Based on 14,792 ischemic stroke cases.

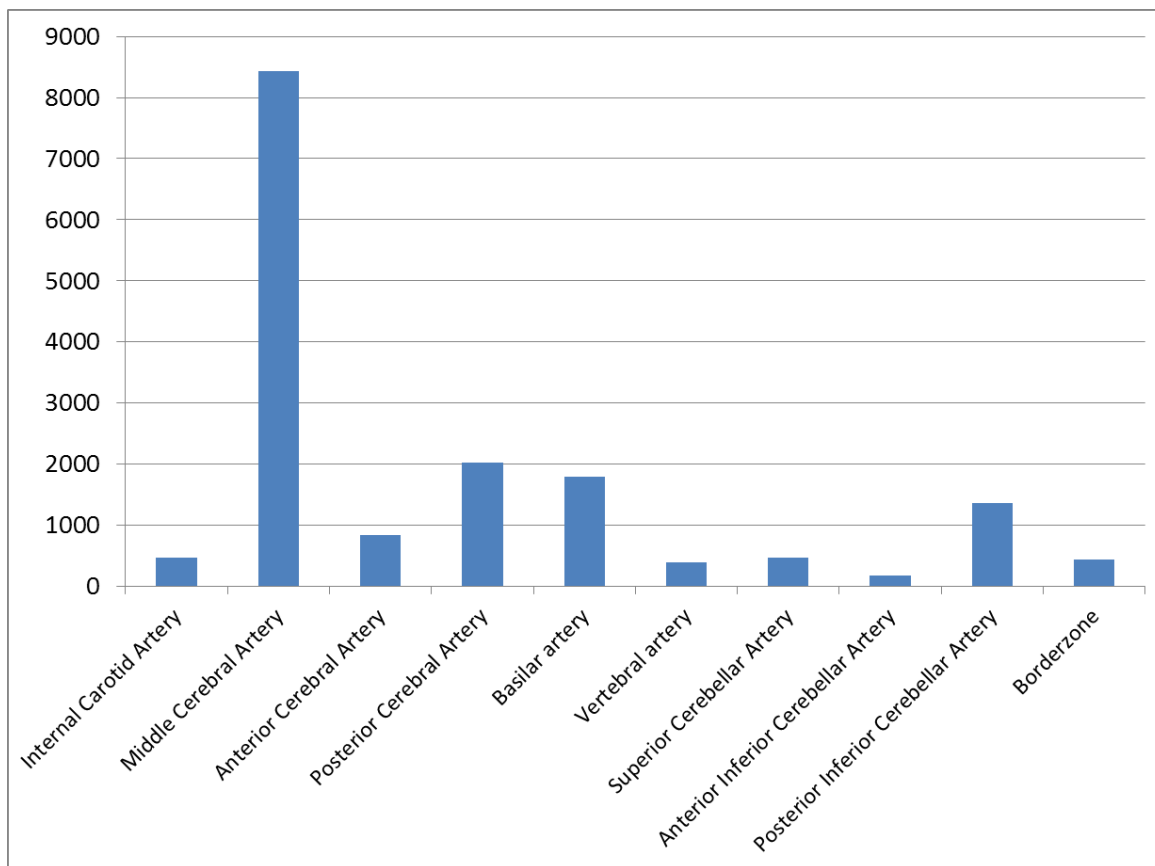


Figure 6 Arterial territories of ischemic strokes (multiple choices permitted)

- Based on 14,792 ischemic stroke cases.

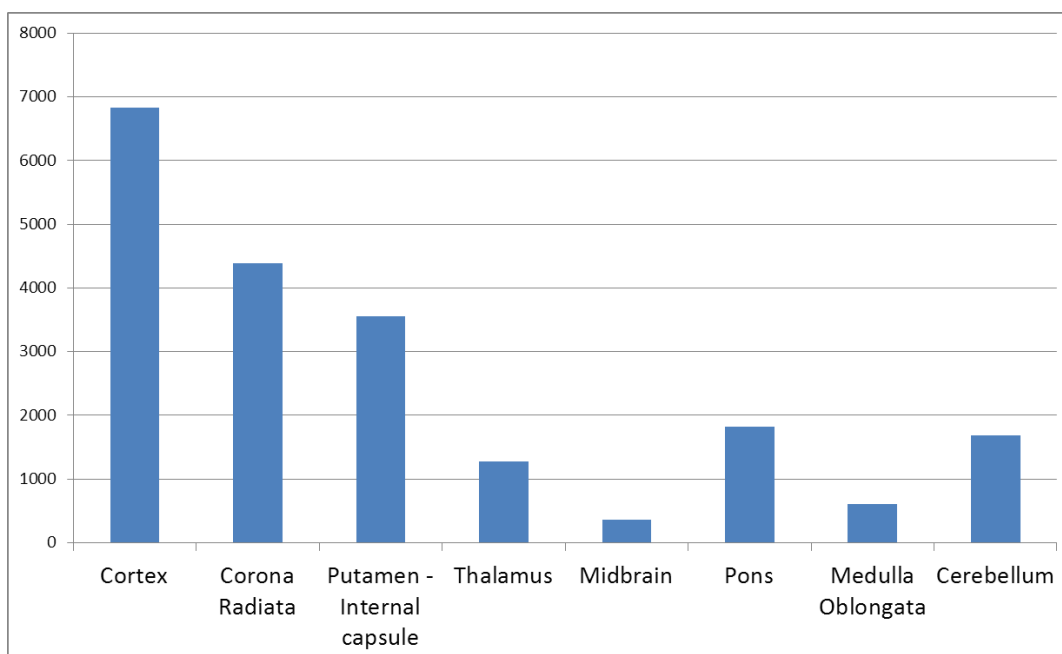


Figure 7 Anatomical locations of ischemic strokes (multiple choices permitted)

- Based on 14,792 ischemic stroke cases.

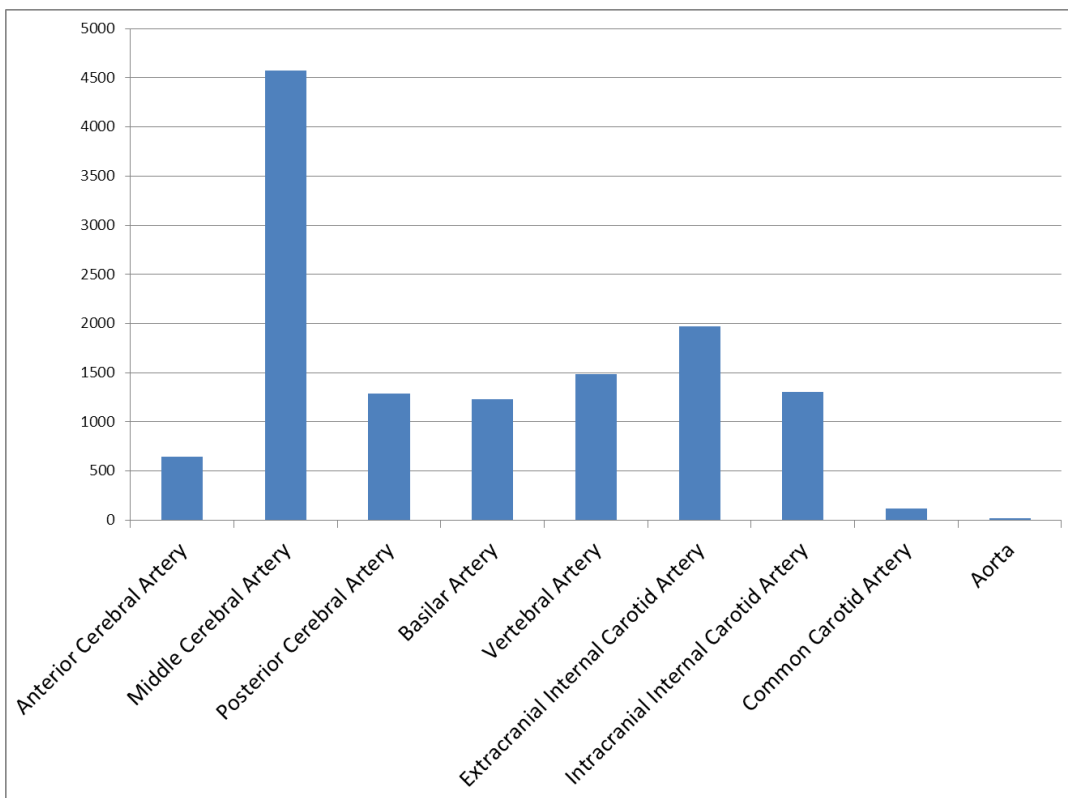


Figure 8 Angiographic locations of steno-occluded arteries (multiple choices permitted)

- Based on 14,792 ischemic stroke cases.

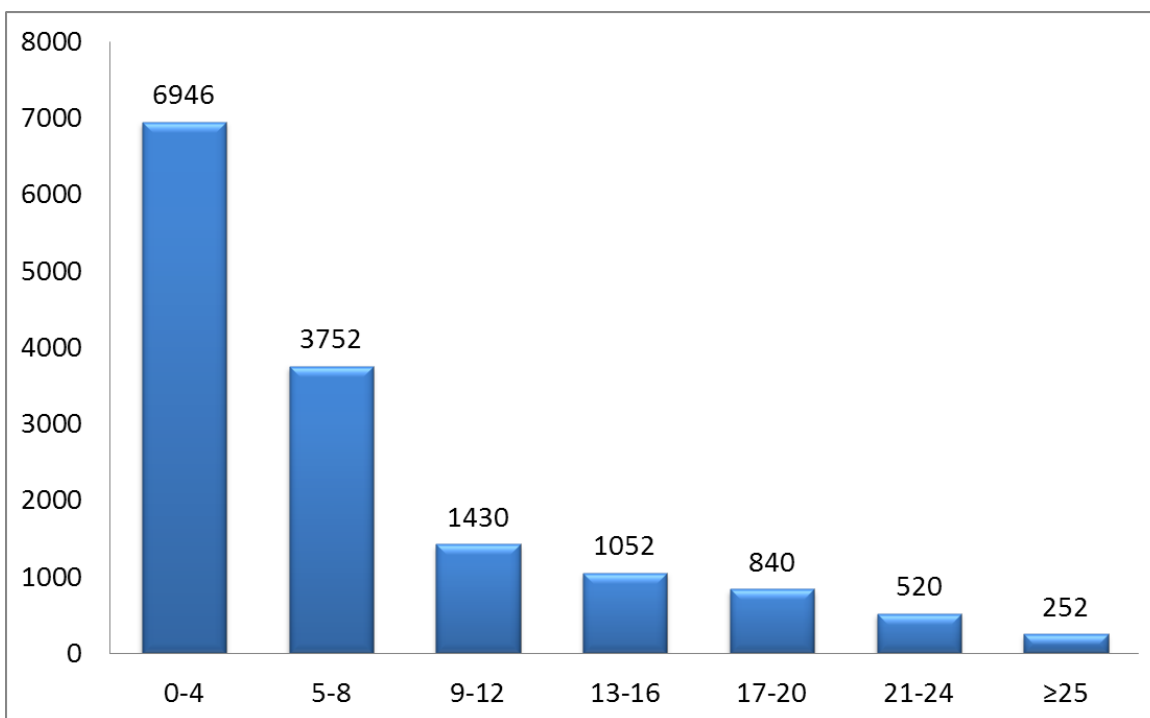


Figure 9 Distribution of NIHSS score at hospital arrival

- Based on 14,792 ischemic stroke cases.

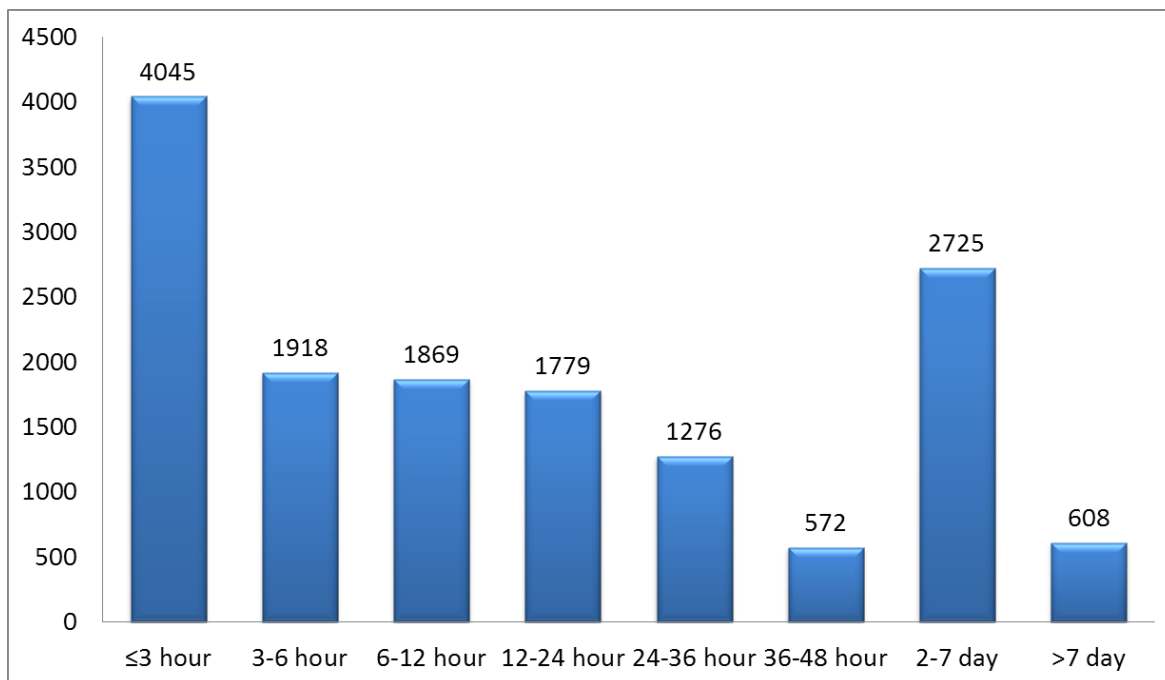


Figure 10 Onset (last normal time) to hospital arrival time

- Based on 14,792 ischemic stroke cases.

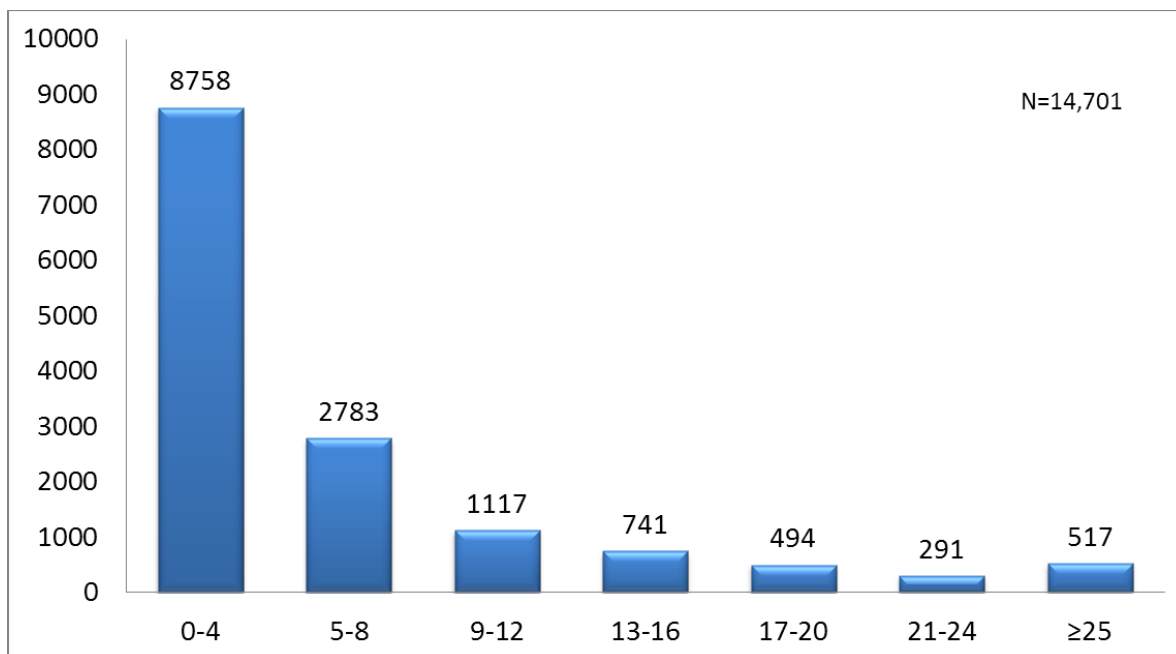


Figure 11 NIHSS score at discharge (missing in 91 cases)

- Based on 14,792 ischemic stroke cases.

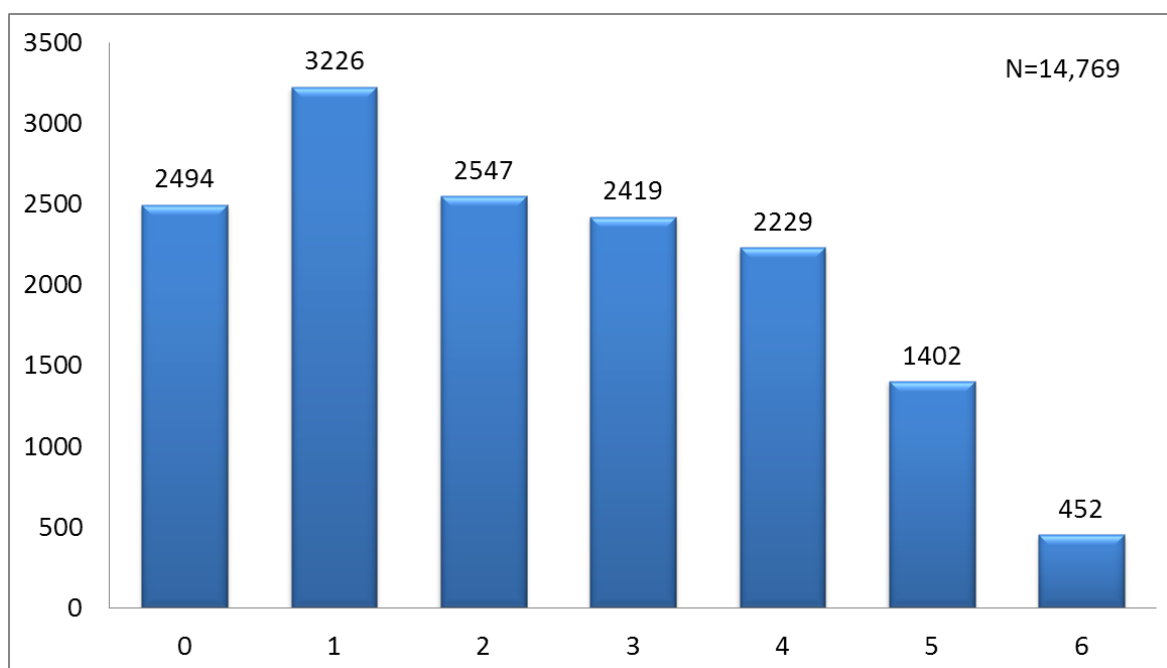


Figure 12 mRS score at discharge (missing in 23 cases)

- Based on 14,792 ischemic stroke cases.

Table 7 History of vascular events in CRCS-5 registered strokes

	Frequency	Percentage
History of TIA	417	2.8
History of stroke	3213	21.7
Hemorrhagic stroke	396	12.3*
Ischemic stroke	2573	80.1*
Mixed stroke	76	2.4*
Unknown	169	5.3*
Missing	1	0.0*
Family history of coronary heart disease	172	1.2
History of peripheral arterial disease	134	0.9
History of symptomatic carotid artery disease	610	4.1
History of acute myocardial infarction	423	2.9
History of anginal attack	654	4.4
History of coronary artery intervention [†]	529	3.6

* Percentages of stroke history are calculated from 3213 subjects.

† including coronary artery stenting or bypass graft surgery

- Based on 14,792 ischemic stroke cases.

Table 8 Major modifiable vascular risk factors

	Frequency	Percentage
Hypertension	10062	68.0
Diabetes	4914	33.2
Dyslipidemia	4637	31.3
Habitual smoking	5792	39.2
Atrial fibrillation	2852	19.3

● Based on 14,792 ischemic stroke cases.

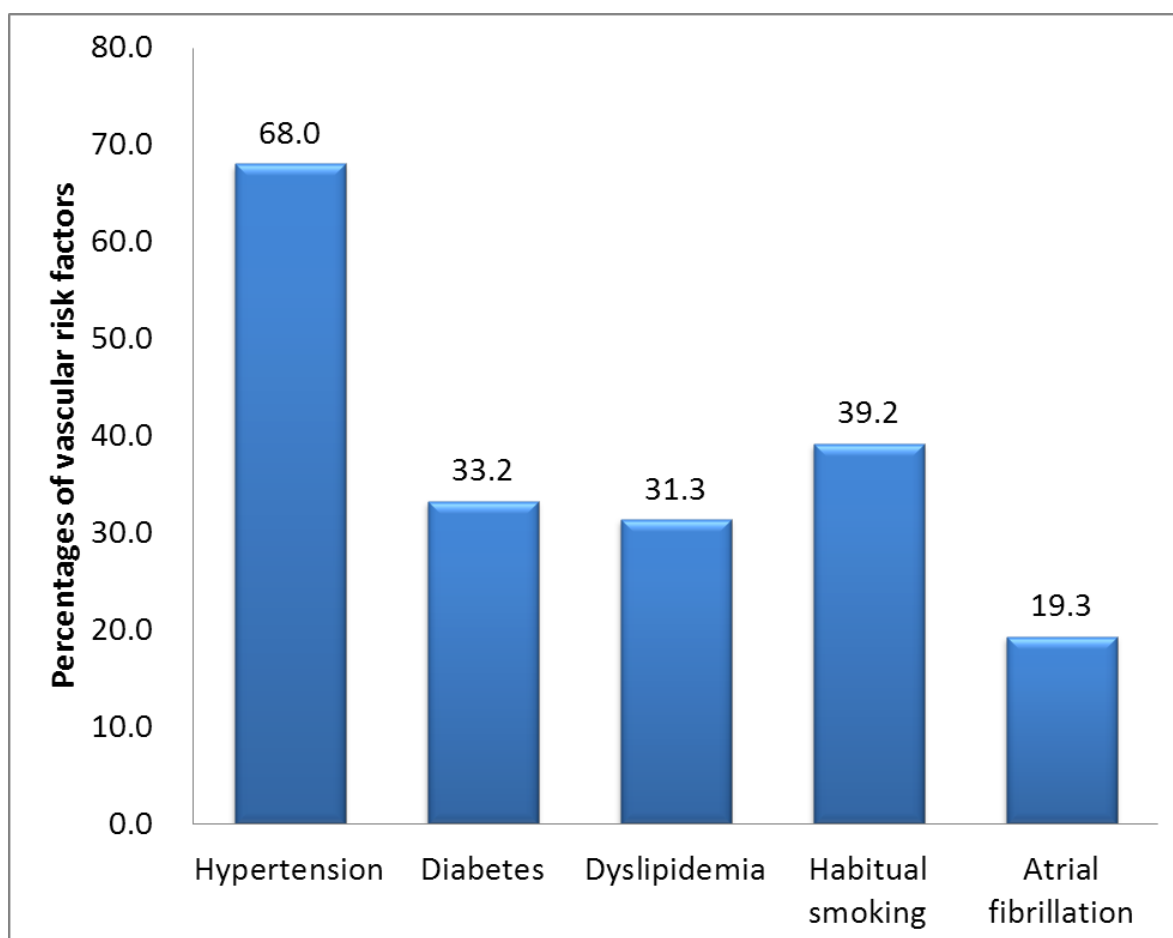


Figure 13 Percentages of major modifiable vascular risk factors in CRCS-5 database

● Based on 14,792 ischemic stroke cases.

Table 9 Frequencies of potential cardioembolic sources (risk stratification according to the TOAST classification scheme)

	Frequency	Percentage*
Potential cardioembolic source - high risk	2888	19.5
Mechanical prosthetic valve	30	1.0
Mitral stenosis with atrial fibrillation	77	2.7
Atrial fibrillation(other than lone atrial fibrillation)	2306	79.8
Left atrial/atrial appendage thrombus	61	2.1
Sick sinus syndrome	45	1.6
Recent myocardial infarction(<4 week)	56	1.9
Left ventricular thrombus	24	0.8
Dilated cardiomyopathy	75	2.6
Akinetic left ventricular segment	100	3.5
Atrial myxoma	13	0.5
Infective endocarditis	19	0.7
Others	82	2.8
Potential cardioembolic source - medium risk	1179	8.0
Mitral valve prolapse	9	0.8
Mitral annulus calcification	1	0.1
Mitral stenosis without atrial fibrillation	15	1.3
Left atrial turbulence(smoke)	6	0.5
Atrial septal aneurysm	12	1.0
Patent foramen ovale	384	32.6
Atrial flutter	41	3.5
Lone atrial fibrillation	209	17.7
Bioprosthetic cardiac valve	8	0.7
Nonbacterial thrombotic endocarditis	2	0.2
Congestive heart failure	294	24.9
Hypokinetic left ventricular segment	151	12.8
Myocardial infarction(>4weeks, <6months)	47	4.0

* Percentages of components are calculated from the total number of each risk stratum.

- Based on 14,792 ischemic stroke cases.

Table 10 Frequency of etiological work-ups

Work-ups	Frequency	Percentage
CT	8176	55.3
CT angiography	5285	35.7
CT perfusion image	1736	11.7
MRI	12696	85.8
MR Angiography	12991	87.8
Diffusion-weighted image	13888	93.9
Perfusion-weighted MR image	4679	31.6
Gradient-echo MR image	12941	87.5
Contrast-enhanced MR angiography	2527	17.1
Transthoracic echocardiography	11200	75.7
Transesophageal echocardiography	1927	13.0
24-hour Holter monitoring	4438	30.0
Transcranial Doppler sonography	11642	78.7
Carotid Doppler sonography	4461	30.2
Peripheral vascular study	2713	18.3
24-hour BP monitoring	468	3.2
Single-Photon Emission Computed Tomography (SPECT)	530	3.6
Positron Emission Tomography (PET)	28	0.2
Other studies	756	5.1

- Based on 14,792 ischemic stroke cases.

Table 11 Profile of laboratory tests

Laboratory variables	Average ± SD	Median [IQR]
White blood cell count ($\times 10^3 /\mu\text{L}$)	8.9 ± 13.8	7.8 [6.3 – 9.8]
Blood Urea Nitrogen (mg/dL)	17.1 ± 9.2	15 [12 – 19.5]
Creatinine (mg/dL)	1.0 ± 1.0	0.9 [0.72 – 1.1]
GOT (IU/L)	27.9 ± 34.6	23 [19 – 30]
GPT (IU/L)	22.8 ± 24.4	18 [13 – 26]
Hemoglobin (g/dL)	13.6 ± 2.0	13.7 [12.5 – 14.9]
Hematocrit (%)	40.7 ± 19.5	40 [36.6 – 43.3]
Total cholesterol (mg/dL)	181 ± 43	178 [152 – 206]
High density lipoprotein cholesterol (mg/dL)	45 ± 13	43 [36 – 52]
Low density lipoprotein cholesterol (mg/dL)	110 ± 36	108 [84 – 132]
Glucose (mg/dL)	124 ± 54	108 [92 – 138]
Platelet count ($\times 10^3 /\mu\text{L}$)	241 ± 81	232 [191 – 282]
Hb A1c (%)	6.5 ± 1.4	6.0 [5.6 – 6.8]
Prothrombin time (INR)	1.03 ± 0.26	1.00 [0.95 – 1.06]
Systolic blood pressure (mm Hg)	147 ± 27	144 [130 – 162]
Diastolic blood pressure (mm Hg)	86 ± 16	84 [76 – 95]

- Based on 14,792 ischemic stroke cases.

Table 12 Profile of hyperacute treatment for ischemic strokes

	Frequency	Percentage
Hyperacute thrombolysis	1736	11.7
IV thrombolysis	1138	65.5
IA thrombolysis	260	15.0
Combined IV and IA thrombolysis	338	19.4
Modality of pharmacological thrombolysis		
rt-PA	1497	86.2
Urokinase	426	24.5
Abciximab	27	1.6

- Based on 14,792 ischemic stroke cases.

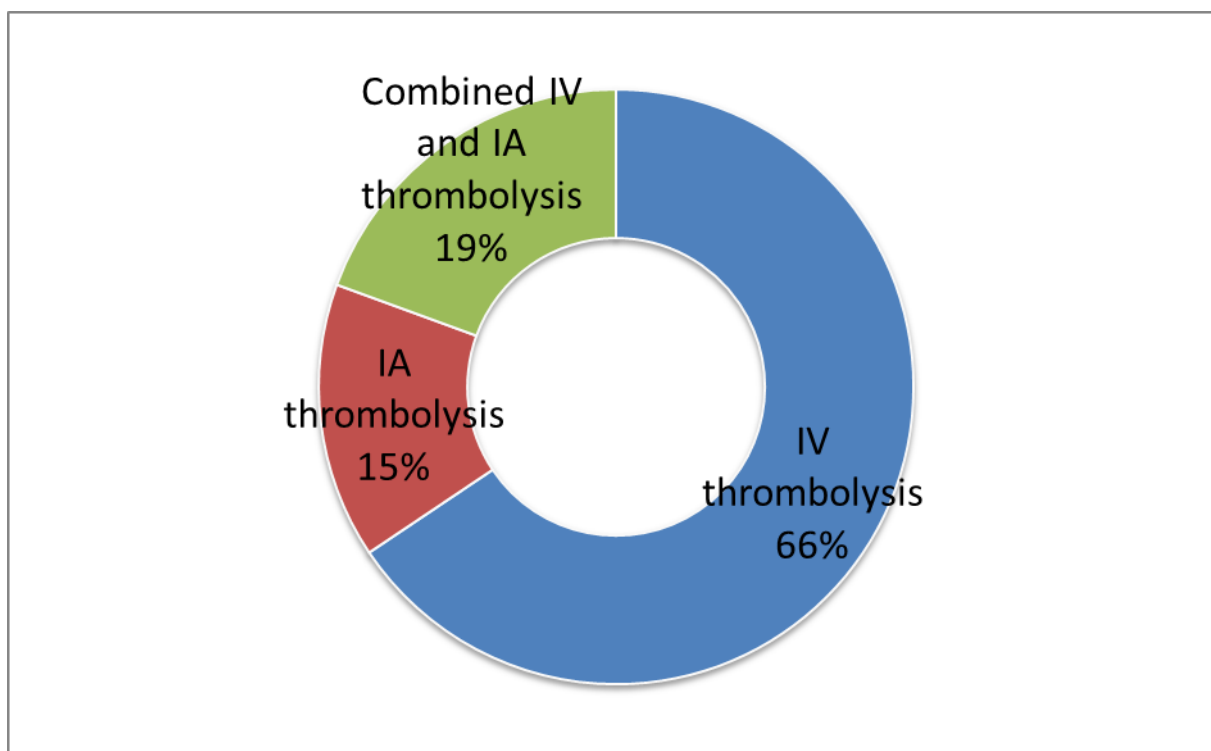


Figure 14 Composition of hyperacute revascularization treatment modalities

- Based on 14,792 ischemic stroke cases.

Table 13 Profile of acute stroke medications (multiple choices permitted)

	Frequency	Percentage
Aspirin	12074	81.6
Clopidogrel	4835	32.7
Dipyridamole	3	0.0
Cilostazol	415	2.8
Triflusal	91	0.6
Ticlopidine	53	0.4
Heparin	1228	8.3
Warfarin	1087	7.3
Low-molecular weight heparin	103	0.7
Thrombin inhibitor	43	0.3
Other medication	35	0.2

● Based on 14,792 ischemic stroke cases.

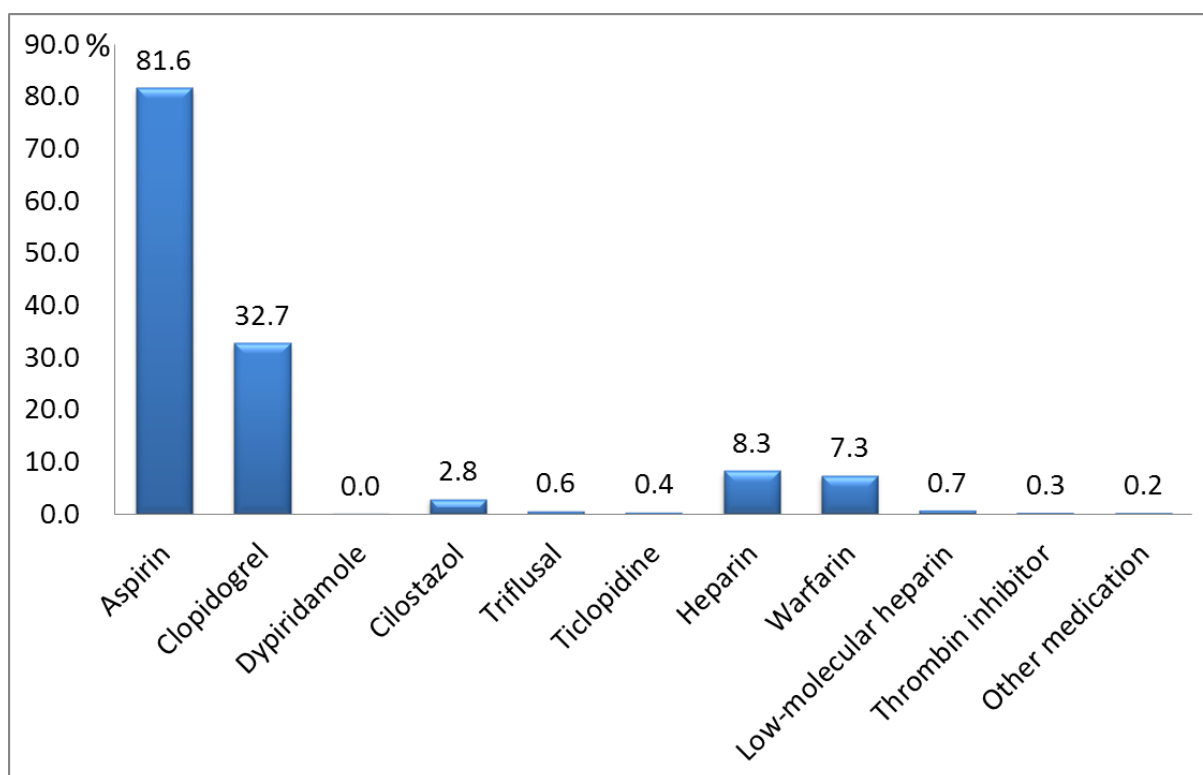


Figure 15 Percentages of acute stroke medications (multiple choices permitted)

● Based on 14,792 ischemic stroke cases.

Table 14 Profile of secondary preventive medications at discharge (multiple choices permitted)

	Frequency	Percentage
Aspirin	10252	69.3
Clopidogrel	5556	37.6
Dipyridamole	1	0.0
Cilostazol	1024	6.9
Triflusal	242	1.6
Ticlopidine	141	1.0
Other antiplatelets	67	0.5
Warfarin	2707	18.3
Other anticoagulants	110	0.7

● Based on 14,792 ischemic stroke cases.

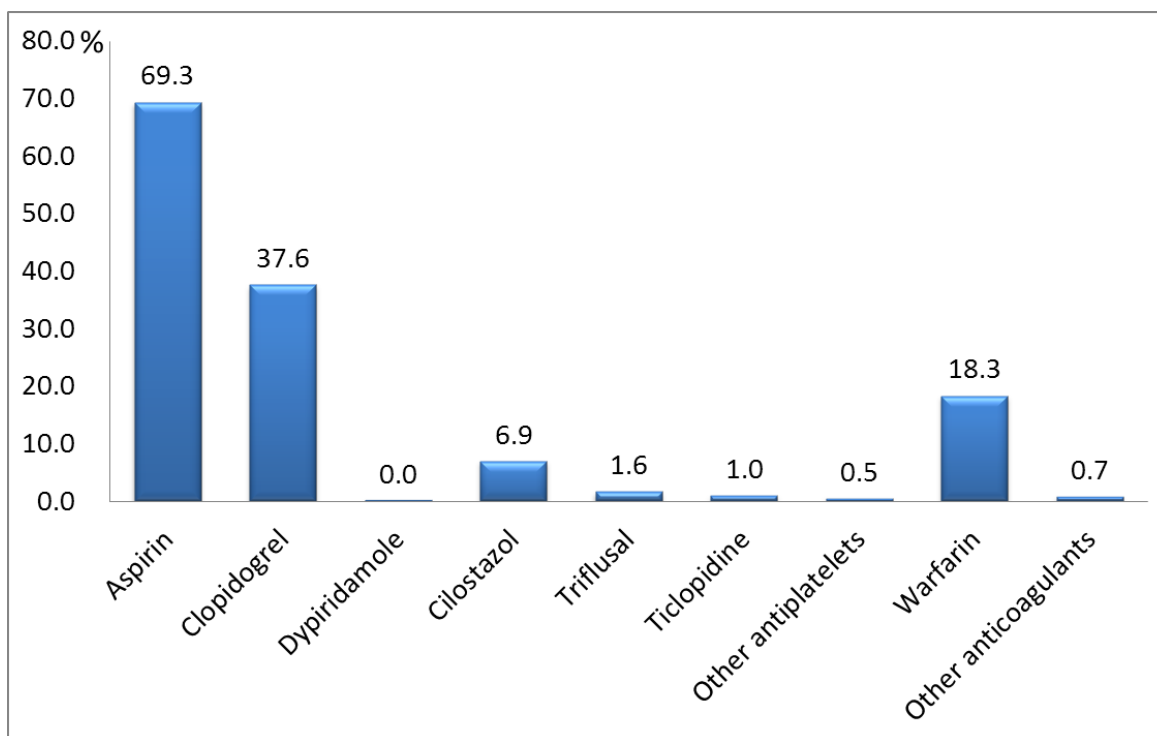


Figure 16 Percentages of secondary preventive medications at discharge (multiple choices permitted)

● Based on 14,792 ischemic stroke cases.

Table 15 Profile of surgical interventions during acute period of stroke (multiple choices permitted)

	Frequency	Percentage
Decompressive surgery	82	0.6
Bypass surgery	10	0.1
Endarterectomy	26	0.2
Angioplasty or stenting	279	1.9

- Based on 14,792 ischemic stroke cases.

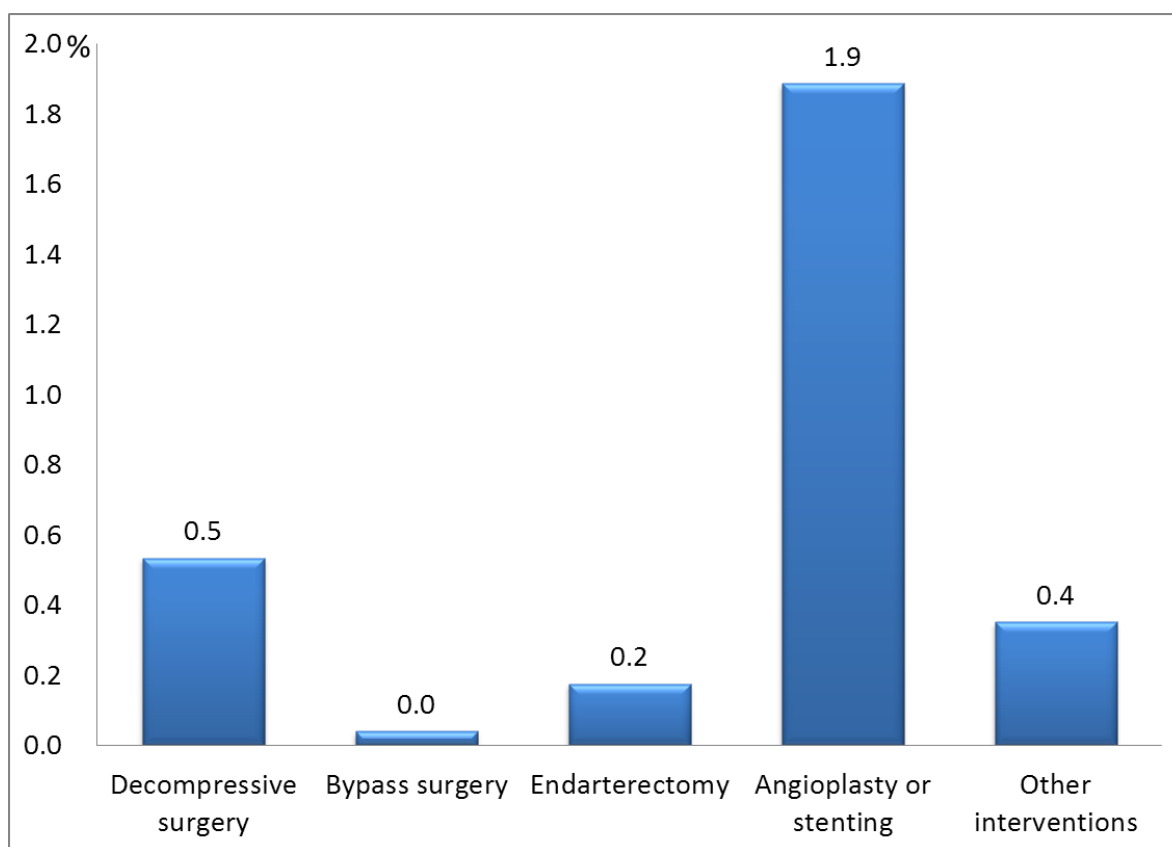


Figure 17 Percentages of surgical interventions during acute period of stroke (multiple choices permitted)

- Based on 14,792 ischemic stroke cases.

Table 16 Major vascular risk factors and their management before index strokes

Risk factors and prior managements	Value (percentage*)
Hypertension	10062 (68.0%)
Never diagnosed as hypertension	1150 (11.4%)
Diagnosed but never treated of hypertension	549 (5.5%)
Ever-used BP-lowering medications	8542 (84.9%)
Ceased using BP-lowering medications	380 (3.8%)
Currently using BP-lowering medications	8168 (81.2%)
Without regular treatment	331 (3.3%)
With regular treatment	7837 (77.9%)
Diagnosed at the index admission	971 (9.7%)
Diabetes	4914 (33.2%)
Never diagnosed as diabetes	1027 (20.9%)
Diagnosed but never treated of diabetes	215 (4.4%)
Ever-used glucose-lowering medications	3985 (81.1%)
Ceased using glucose-lowering medications	186 (3.8%)
Currently using glucose-lowering medications	3800 (77.3%)
Without regular treatment	172 (3.5%)
With regular treatment	3628 (73.8%)
Diagnosed at the index admission	716 (14.6%)
Dyslipidemia	4637 (31.3%)
Never diagnosed as dyslipidemia	2539 (54.8%)
Diagnosed but never treated of dyslipidemia	168 (3.6%)
Ever-used cholesterol-lowering medications	1955 (42.2%)
Ceased using cholesterol -lowering medications	116 (2.5%)
Currently using cholesterol -lowering medications	1843 (39.7%)
Without regular treatment	56 (1.2%)
With regular treatment	1787 (38.5%)
Diagnosed at the index admission	2517 (54.3%)
Habitual smoking	5792 (39.2%)
Current smoker	4022 (69.4%)
Ex-smoker, quit within 5 years	551 (9.5%)
Ex-smoker, quit more than 5 years ago	1219 (21.0%)
Pack-year	33.5 ± 18.9
Atrial fibrillation	2852 (19.3%)
Diagnosed at the index admission	1359 (47.7%)
Diagnosed before index stroke	1488 (52.2%)
Without regular treatment	397 (13.9%)
With regular treatment	1092 (38.3%)

* Percentages of management categories were calculated based on the frequency of each risk factor.

- Based on 14,792 ischemic stroke cases.

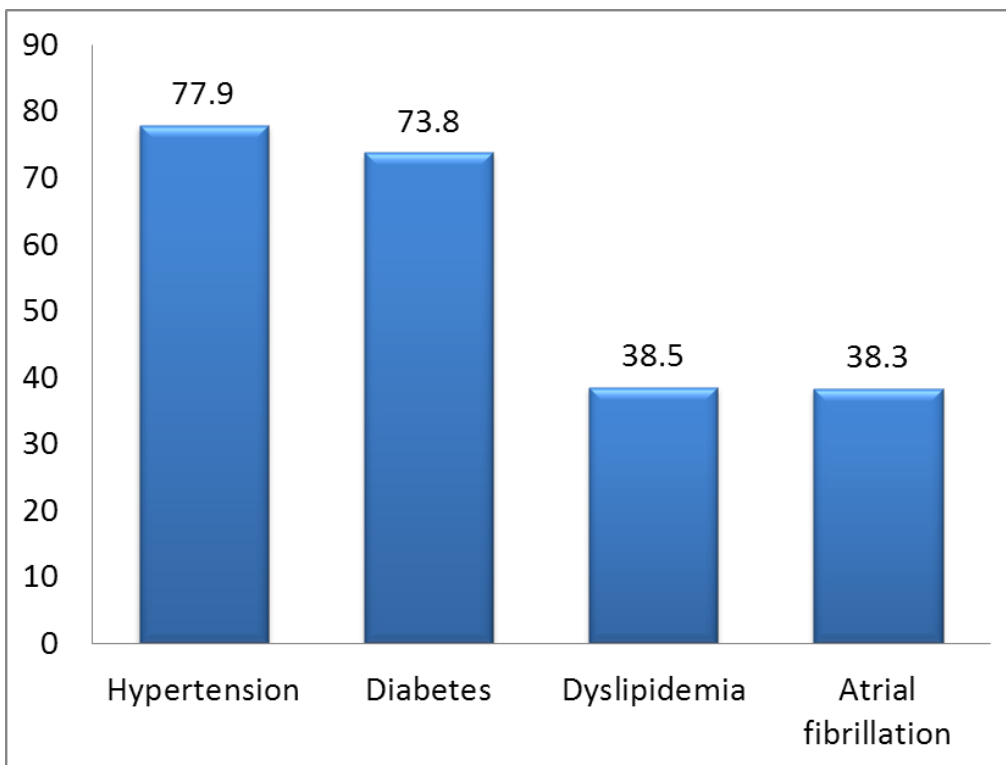


Figure 18 Percentages of regular treatment for vascular risk factors

- Based on 14,792 ischemic stroke cases.

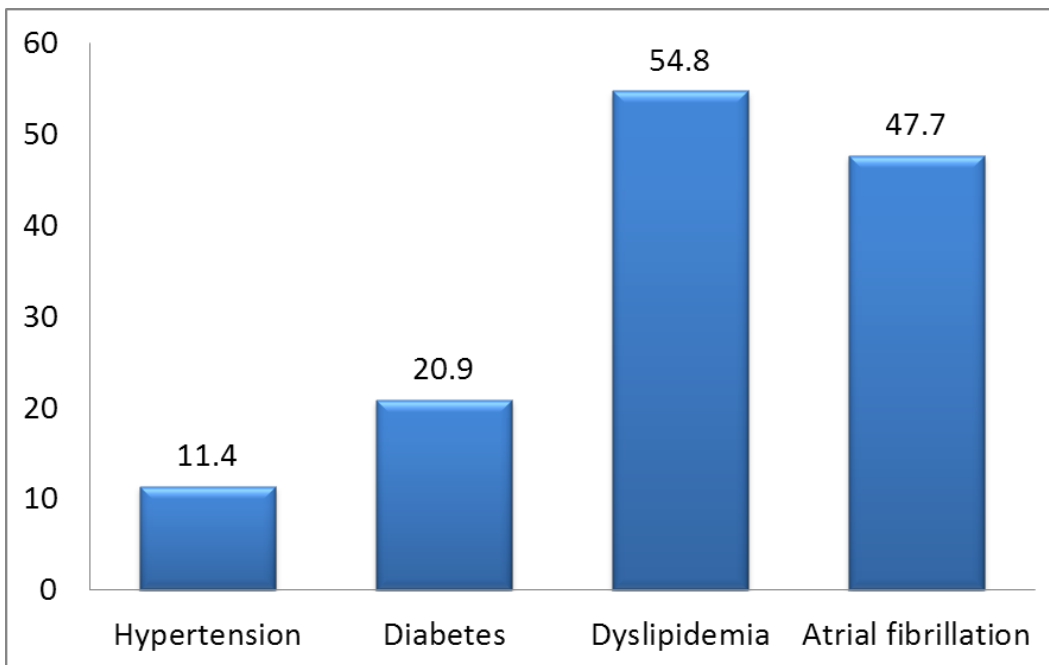


Figure 19 Percentages of undocumented vascular risk factors

- Based on 14,792 ischemic stroke cases.

Table 17 Distribution of premorbid mRS score in the included stroke cases

Prestroke mRS score	Frequency (percentage)
0	12128 (82.0%)
1	927 (6.3%)
2	655 (4.4%)
3	648 (4.4%)
4	321 (2.2%)
5	113 (0.8%)

- Based on 14,792 ischemic stroke cases.

Acute Treatment Statistics of CRCS-5

Establishment of acute treatment database in CRCS-5

- From November 2009, five centers (Eulji General Hospital, Seoul National University Bundang Hospital, Seoul Medical Center, Soonchunhyang University Hospital Seoul and Inje University Ilsan Paik Hospital) initiated acute treatment database devoted to collect clinical and treatment information of acute ischemic stroke. At January 2011, six new members were introduced to acute treatment database (Eulji University Hospital, Dong-A University Hospital, Yeungnam University Medical Center, Hallym University Sacred Heart Hospital, Chonnam National University Hospital and Dongguk University Ilsan Hospital) and Jeju National University Hospital further participated in at October 2011.
- Data registration and auditing process are identical to the CRCS-5 DB.
- Acute treatment database is focusing on the revascularization process of hyperacute ischemic stroke patients.

Revascularization treatment for acute ischemic stroke

- A total of 1269 (17% of 7284 registered stroke cases during identical period) cases received revascularization treatment for acute ischemic stroke. Intravenous-only pharmacological thrombolysis (IV thrombolysis) was performed in 822 (65%), endovascular-only revascularization (IA thrombolysis) in 182 (14%), and combined IV-endovascular revascularization (Combined IV-IA thrombolysis) in 265 (21%) strokes (Table 18 Modality of revascularization treatment for acute ischemic stroke).

- Overall, endovascular recanalization strategies were utilized in 35% of revascularization treatments (Table 19 Discrepancy in onset (last normal time) to arrival time according to the treatment modality).
- Onset-to-arrival time delay was 2.7 ± 3.5 hours on average, with median 1.5 [interquartile range, 0.75 – 3.0]. Average onset-to-arrival time of IV thrombolysis and combined IV-IA thrombolysis was around 2 hours, but that of IA thrombolysis exceeded 6 hours (median 4.7 hour) (Table 20 Categorized onset-to-arrival time and Table 21 Door-to-treatment time according to treatment modality).
- Of acute ischemic strokes with revascularization treatment, 93% of cases arrived stroke centers within 6 hours after onset.
- Door-to-treatment time varied according to the treatment modality (Table 22 Door-to-endovascular time according to treatment modality).
- Medications used in pharmacological thrombolysis was as follows (multiple choices permitted); recombinant tissue plasminogen activator 1075 (85%), urokinase 292 (23%), and abciximab 23 (1.8%).
- Door-to-endovascular treatment time was 2.3 ± 2.2 hours, with median 1.9 [interquartile range, 1.5 – 2.4].
- Endovascular radiological intervention was done in 118 (9.3%) cases; angioplasty in 34 (29%) cases and emergent stenting in 84 (71%) cases.
- Average NIHSS score at arrival was 12.3 ± 6.7 points, with median 12 [interquartile range, 7 – 17]. At day #1 after revascularization treatment, average NIHSS score was 10.6 ± 8.4 points, with median 9 [interquartile range, 4 – 16] (available in 966 cases). 312 (32%) cases showed early neurological improvement, defined as NIHSS score decrease ≥ 4 -point.
- Symptomatic hemorrhagic transformation, associated with NIHSS score increase ≥ 4 -point, occurred in 99 (7.8%) cases. Sixty-seven percent of symptomatic hemorrhagic transformations (67 cases) developed within 2 days after revascularization treatment.

Stroke center statistics for revascularization treatment

- Volume of acute revascularization treatment varied for each stroke center (Figure 20 Difference of NIHSS score over arrival and day #1 post-revascularization (available in 966 strokes) and Figure 21 Volume of acute revascularization treatment for each stroke center).
- Revascularization modality also varied among stroke centers. Rate of endovascular treatment, including both IA thrombolysis and combined IV-IA thrombolysis, range from 6% (Hospital #11) to 56% (Hospital #1). However, onset-to-arrival time and NIHSS score at arrival did not show noticeable difference between stroke centers (Table 23 Discrepancy of revascularization modality among stroke centers, Figure 22 Discrepancy of revascularization modality among stroke centers and Table 24 Onset-to-arrival times and NIHSS scores between stroke centers).

Table 18 Modality of revascularization treatment for acute ischemic stroke

Treatment modality	Frequency (percentage)
Intravenous-only thrombolysis	822 (64.8%)
Endovascular-only revascularization	182 (14.3%)
Combined IV-endovascular revascularization	265 (20.9%)
Total	1269

- Based on 9,779 cases from acute treatment database (from November 2009)

Table 19 Discrepancy in onset (last normal time) to arrival time according to the treatment modality

Treatment modality	Mean \pm SD (hour) Median [interquartile range]
Intravenous-only thrombolysis	2.2 \pm 2.9 1.35 [0.7 – 2.4]
Endovascular-only revascularization	6.3 \pm 5.0 4.7 [2.6 – 9.3]
Combined IV-endovascular revascularization	1.9 \pm 2.1 1.2 [0.6 – 2.3]

- Based on 9,779 cases from acute treatment database (from November 2009)

Table 20 Categorized onset-to-arrival time

Onset-to-arrival time	Frequency (percentage)
\leq 3 hours	1037 (81.7%)
3 – 6 hours	145 (11.4%)
6 – 12 hours	34 (2.7%)
12 – 24 hours	21 (1.7%)
24 – 36 hours	10 (0.8%)
36 – 48 hours	3 (0.2%)
>48 hours	18 (1.4%)
Total	1269

- Based on 9,779 cases from acute treatment database (from November 2009)

Table 21 Door-to-treatment time according to treatment modality

Treatment modality	Mean ± SD (hour) Median [interquartile range]
Intravenous-only thrombolysis	1.0 ± 1.5 0.8 [0.6 – 1.0]
Endovascular-only revascularization	2.5 ± 3.0 1.8 [1.4 – 2.4]
Combined IV-endovascular revascularization	1.1 ± 1.7 0.7 [0.6 – 1.0]

- Based on 9,779 cases from acute treatment database (from November 2009)

Table 22 Door-to-endovascular time according to treatment modality

Treatment modality	Mean ± SD (hour) Median [interquartile range]
Endovascular-only revascularization	2.5 ± 3.0 1.8 [1.4 – 2.4]
Combined IV-endovascular revascularization	2.1 ± 1.4 1.9 [1.5 – 2.5]

- Based on 9,779 cases from acute treatment database (from November 2009)

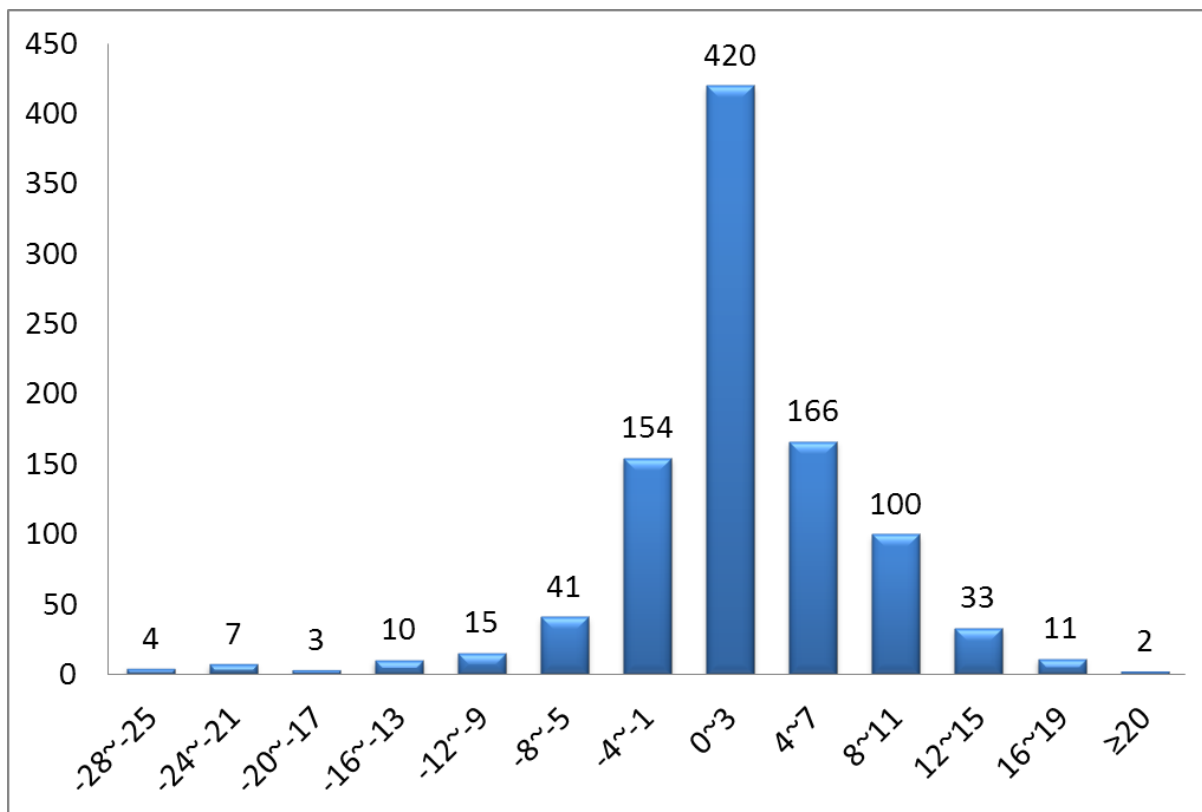


Figure 20 Difference of NIHSS score over arrival and day #1 post-revascularization (available in 966 strokes)

- Based on 9,779 cases from acute treatment database (from November 2009)

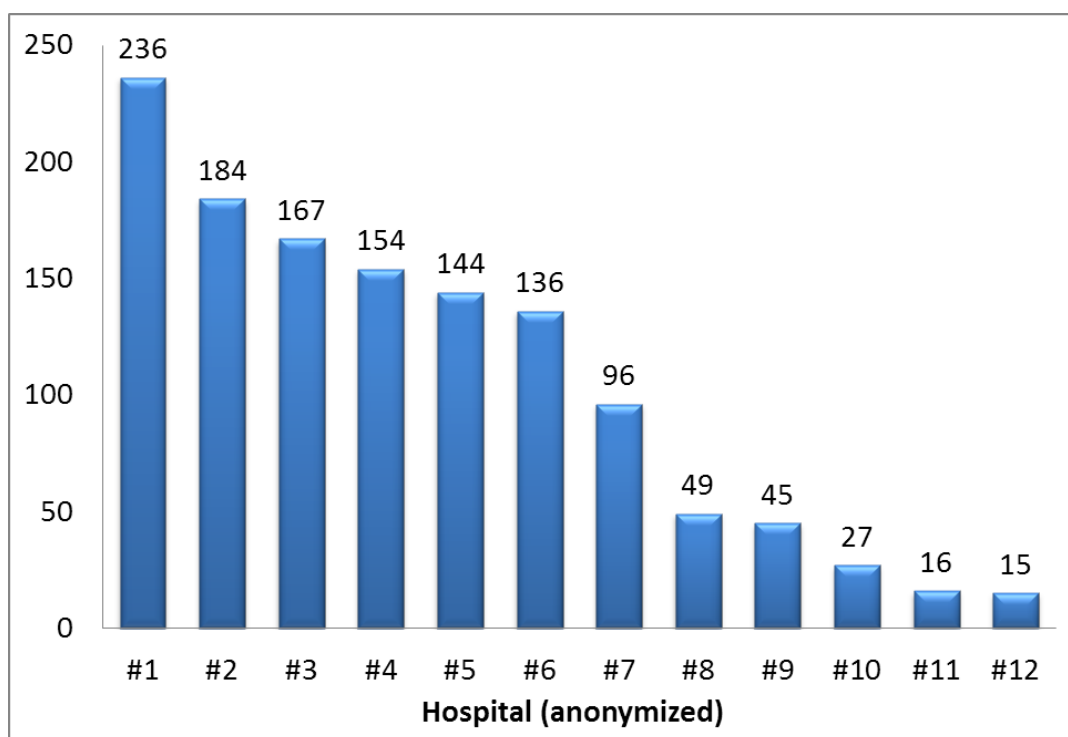


Figure 21 Volume of acute revascularization treatment for each stroke center

- Based on 9,779 cases from acute treatment database (from November 2009)

Table 23 Discrepancy of revascularization modality among stroke centers

Hospital (Anonymized)	IV-only	IA-only	Combined	Total
#1	105 (44.5%)	59 (25.0%)	72 (30.5%)	236
#2	125 (67.9%)	26 (14.1%)	33 (17.9%)	184
#3	101 (60.5%)	35 (21.0%)	31 (18.6%)	167
#4	108 (70.1%)	22 (14.3%)	24 (15.6%)	154
#5	88 (61.1%)	16 (11.1%)	40 (27.8%)	144
#6	116 (85.3%)	5 (3.7%)	15 (11.0%)	136
#7	51 (53.1%)	15 (15.6%)	30 (31.2%)	96
#8	45 (91.8%)	2 (4.1%)	2 (4.1%)	49
#9	36 (80.0%)	1 (2.2%)	8 (17.8%)	45
#10	21 (77.8%)	1 (3.7%)	5 (18.5%)	27
#11	15 (93.8%)	0 (0%)	1 (6.2%)	16
#12	11 (73.3%)	0 (0%)	4 (26.7%)	15
Total	822 (64.8%)	182 (14.3%)	265 (20.9%)	1269

- Based on 9,779 cases from acute treatment database (from November 2009)

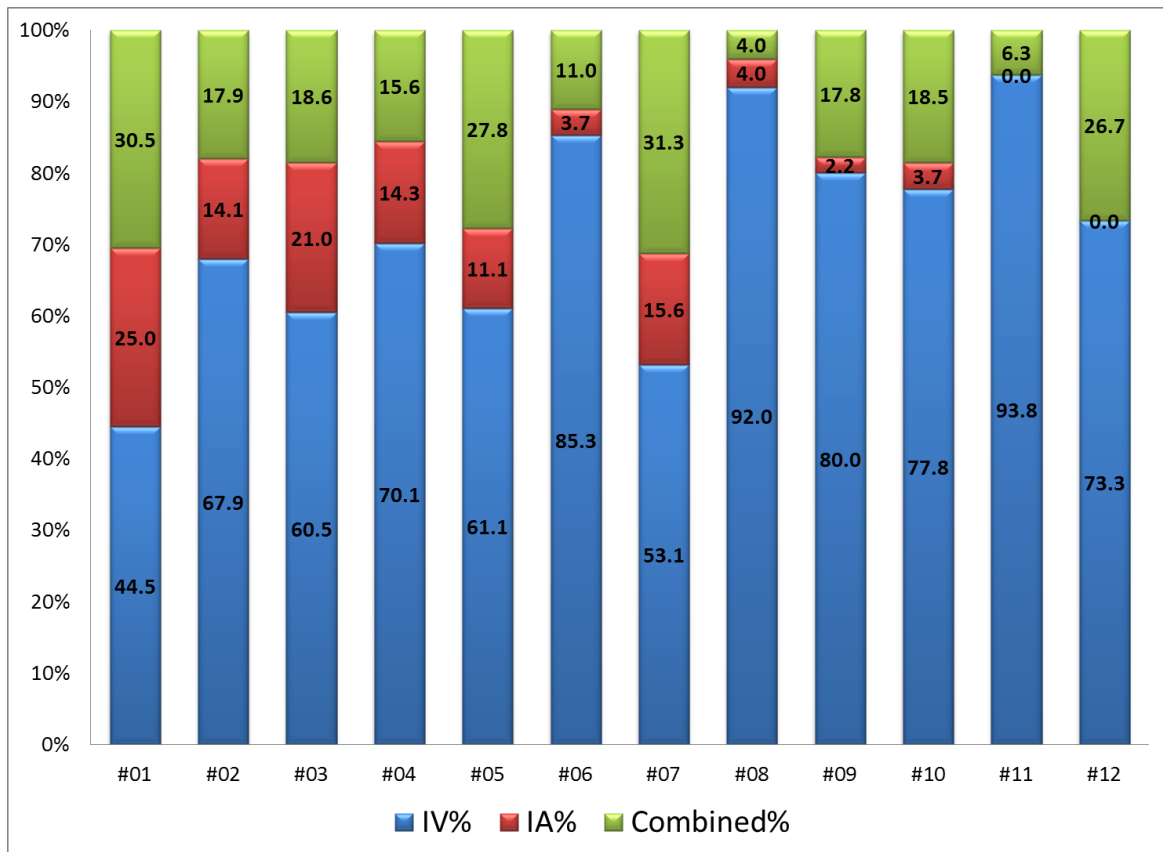


Figure 22 Discrepancy of revascularization modality among stroke centers

- Based on 9,779 cases from acute treatment database (from November 2009)

Table 24 Onset-to-arrival times and NIHSS scores between stroke centers

Hospital (Anonymized)	Onset to arrival time (hour)	NIHSS score at arrival
#1	3.9 ± 4.6	13.0 ± 7.4
#2	2.8 ± 2.6	11.7 ± 5.8
#3	2.7 ± 4.0	12.1 ± 6.9
#4	2.8 ± 3.2	10.8 ± 4.9
#5	1.9 ± 2.2	12.8 ± 8.2
#6	3.0 ± 3.6	12.6 ± 7.1
#7	2.1 ± 3.6	12.0 ± 6.2
#8	1.7 ± 3.4	13.7 ± 5.7
#9	1.1 ± 1.0	14.5 ± 6.6
#10	1.4 ± 1.7	11.4 ± 5.2
#11	1.5 ± 1.0	11.6 ± 7.9
#12	2.4 ± 2.5	12.0 ± 5.9
Total	2.7 ± 3.5	12.3 ± 6.7

- Based on 9,779 cases from acute treatment database (from November 2009)

Outcome Statistics of CRCS-5

Establishment of stroke outcome database in CRCS-5

- Along with acute treatment database, five centers (Eulji General Hospital, Seoul National University Bundang Hospital, Seoul Medical Center, Soonchunhyang University Hospital Seoul and Inje University Ilsan Paik Hospital) initiated prospective capture system of stroke outcomes and constructed stroke outcome database. Registrars of each stroke center contacted stroke survivors by telephone 3 months and 1 year after stroke onset, and rated modified Rankin scale score and occurrence of any vascular events.
- After January 2011, six centers participated in the prospective capture of stroke outcomes, and gathering information was expanded to include early neurological deteriorations within 3 weeks after stroke and medication adherence until 3 months, as well as modified Rankin scale scores at 3 month and 1 year. With current outcome gathering strategy, CRCS-5 launched a separate but parallel study, MOSAIC (Multicenter prospective Observational Study about recurrence and its determinants after Acute IsChemic stroke).
- Definition of early neurological deterioration (END) is any new neurological symptoms/signs or any neurological worsening occurred 3 weeks within the onset of index stroke. Aggravated neurological status includes 1) NIHSS score increase ≥ 2 -point; 2) NIHSS score 1a, 1b or 1c subscore increase ≥ 1 -point; 3) NIHSS score 5a, 5b, 6a, 6b (motor subscore) increase ≥ 1 -point; or 4) any kind of newly developed neurological symptom.
- Causes of ENDs include recurrence of stroke, progression of stroke, symptomatic hemorrhagic transformation, other causes (deep venous thrombosis, pulmonary embolism, myocardial infarction or others), or unknown etiologies.
- Early stroke recurrence is defined as END associated with new infarctions

documented by diffusion-weighted image or computed tomography image after stabilization of initial neurological symptoms/signs more than 24 hours, and excluding potential influence from edema, mass effect, brain shifting or hemorrhagic transformation of the incident cerebral infarction.

- Stroke progression is defined as an END after neurological stability lasting more than 24 hours associated with progressive ischemia, swelling or edema of index infarction and documented by neuroimaging studies.
- Symptomatic hemorrhagic transformation is defined as an END associated with neuroimaging-documented hemorrhagic transformation.
- Other cause of END is defined as an END associated with other general medical conditions, such as deep venous thrombosis or pulmonary embolism.
- Unknown etiology of END is defined as an END associated with other causes no mentioned previously.
- Late stroke outcomes include late recurrence of stroke, myocardial infarction, vascular death, and all kinds of death.
- Late recurrence of stroke is defined as a new neurological symptom/sign due to cerebrovascular causes lasting more than 24 hours and documented by medical doctors.
- Myocardial infarction is defined as a new diagnosis of acute myocardial infarction by medical doctors and related visit to a hospital.
- Vascular death is defined as a death caused by stroke, acute myocardial infarction, or sudden death.
- All kinds of death are defined as a death caused by other etiologies than stroke, acute myocardial infarction, or sudden death.
- The present outcome statistics is based on the database distributed on June 2012, which is as current of January 2012.

Modified Rankin scale score at 3 month and 1 year after stroke

- From MOSAIC study database, mRS scores at 3 month after stroke are available in 4885 (90%) cases and mRS score at 1 year in 1102 (20%) cases (Table 25 Distribution of mRS score at 3 month and 1 year after stroke and Table 26 mRS score matrix of 3 months and 1 year after stroke.).
- Including prospective data collection before MOSAIC kicked off, mRS scores at 3 month are available in 6700 (92%) subjects, and mRS score at 1 year in 2711 (37%) subjects.

MOSAIC study, multicenter-collaborative prospective outcome capture

- A total of 5412 stroke cases were included in the MOSAIC database, as current of January 2012.
- Early neurological deterioration occurred in 927 (17%) cases, with 1074 events (Table 27 Frequencies of early neurological deteriorations (END) occurred within 3 weeks after stroke).
- Medication adherence of stroke survivors, rated by Morisky scale, has been recorded in 4124 (76%) cases.
- Information on 3-month event was gathered from 5201 (96%) cases. Vascular events until 3 months occurred in 366 (7%) cases, with 371 events (Table 28 Type of recurrent strokes within 3 weeks from onset or during hospitalization, Table 29 Later vascular events until 3 month after stroke (excluding END period) and Figure 25 Later vascular events until 3 month after stroke (excluding END period)).
- Information on the events during 3-month to 1-year after stroke was gathered from 877 (16%) cases. Vascular events between 3 months and 1 year after stroke occurred in 83 (10%) cases, with 85 events. (Table 30 Later vascular events

between 3 month and 1 year after stroke (excluding events before 3 month) and Figure 26
Later vascular events between 3 month and 1 year after stroke (excluding events before 3
month))

- Among 877 cases who completed 1-year follow up, incidence of early neurological deterioration was 14.7%, vascular events within 3 month after stroke was 6.7% and vascular events between 3 month and 1 year was 9.5% (Figure 27 Incidence of END and vascular events after stroke (N=877 who completed 1-year follow-up)).

Table 25 Distribution of mRS score at 3 month and 1 year after stroke

mRS score	3 months	1 year
0	1268 (26%)	272 (24.7%)
1	1105 (22.6%)	184 (16.7%)
2	741 (15.2%)	112 (10.2%)
3	636 (13.0%)	82 (7.4%)
4	486 (9.9%)	54 (5.9%)
5	362 (7.4%)	52 (4.7%)
6	287 (5.9%)	335 (30.4%)
Available cases	4885 (90.3%)	1102 (20.4%)

- Based on 5,412 cases for MOSAIC study (from January 2011).

Table 26 mRS score matrix of 3 months and 1 year after stroke.

		1 year						
		0	1	2	3	4	5	6
3 months*	0	193	13	4	1	1	2	0
	1	53	120	11	2	1	1	3
	2	12	30	63	8	1	3	0
	3	0	2	24	53	5	2	3
	4	0	0	5	13	39	12	10
	5	0	0	0	2	14	29	23
	6	0	0	0	0	0	0	287

- Based on 1,045 cases whose mRS scores at 3 months and 1 year were available.

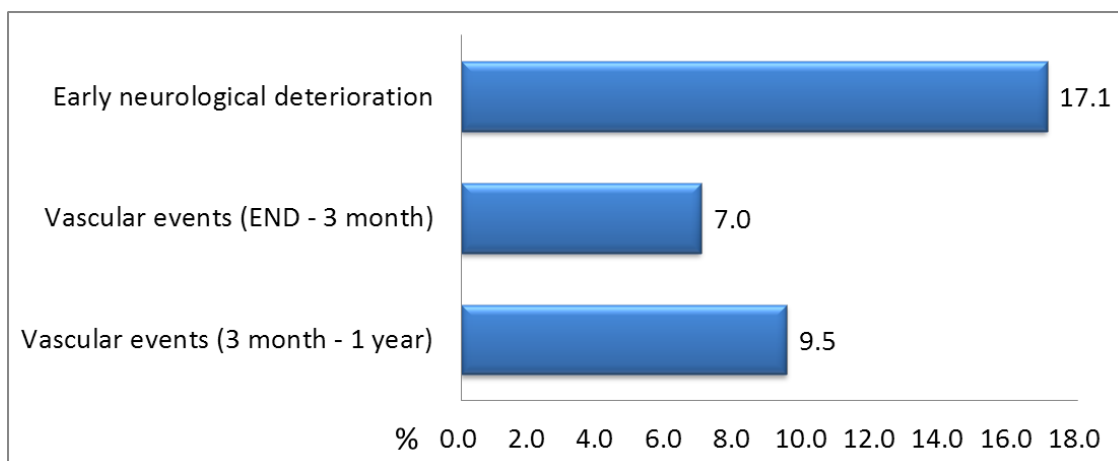


Figure 23 Frequencies of post-stroke events

- Based on 5,412 cases for MOSAIC study (from January 2011).

Table 27 Frequencies of early neurological deteriorations (END) occurred within 3 weeks after stroke

Type of early neurological deterioration	Frequency (percentage)
Stroke recurrence	116 (10.8%)
Stroke progression	679 (63.2%)
Symptomatic hemorrhagic transformation	77 (7.2%)
Other ENDS	54 (5.0%)
Unknown	141 (13.1%)
Missing	7 (0.7%)
Total events	1074

- Based on 5,412 cases for MOSAIC study (from January 2011).

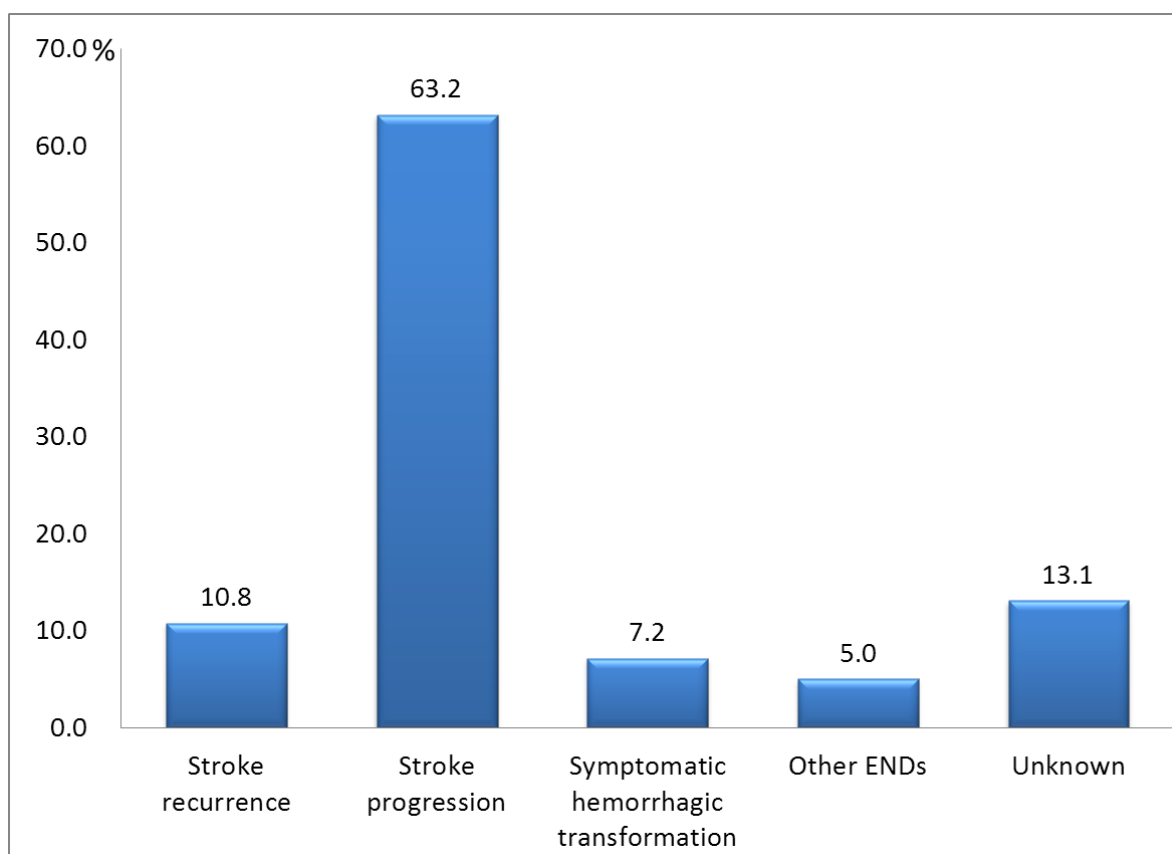


Figure 24 Frequencies of early neurological deteriorations (END) occurred within 3 weeks after stroke

- Based on 5,412 cases for MOSAIC study (from January 2011).

Table 28 Type of recurrent strokes within 3 weeks from onset or during hospitalization

Type of recurrent strokes	Frequency (percentage)
Ischemic stroke	105 (90.5%)
Hemorrhagic stroke	4 (3.4%)
Transient ischemic attack	7 (6.0%)
Unknown	0
Total events	116

- Based on 5,412 MOSAIC study population (from January 2011)

Table 29 Later vascular events until 3 month after stroke (excluding END period)

Type of vascular events	Frequency (percentage)
Recurrent stroke	133 (35.8%)
Cardiovascular events	27 (7.3%)
Other death	211 (56.9%)
Total events	371

- Based on 5,412 cases for MOSAIC study (from January 2011).
- END stands for early neurological deterioration.

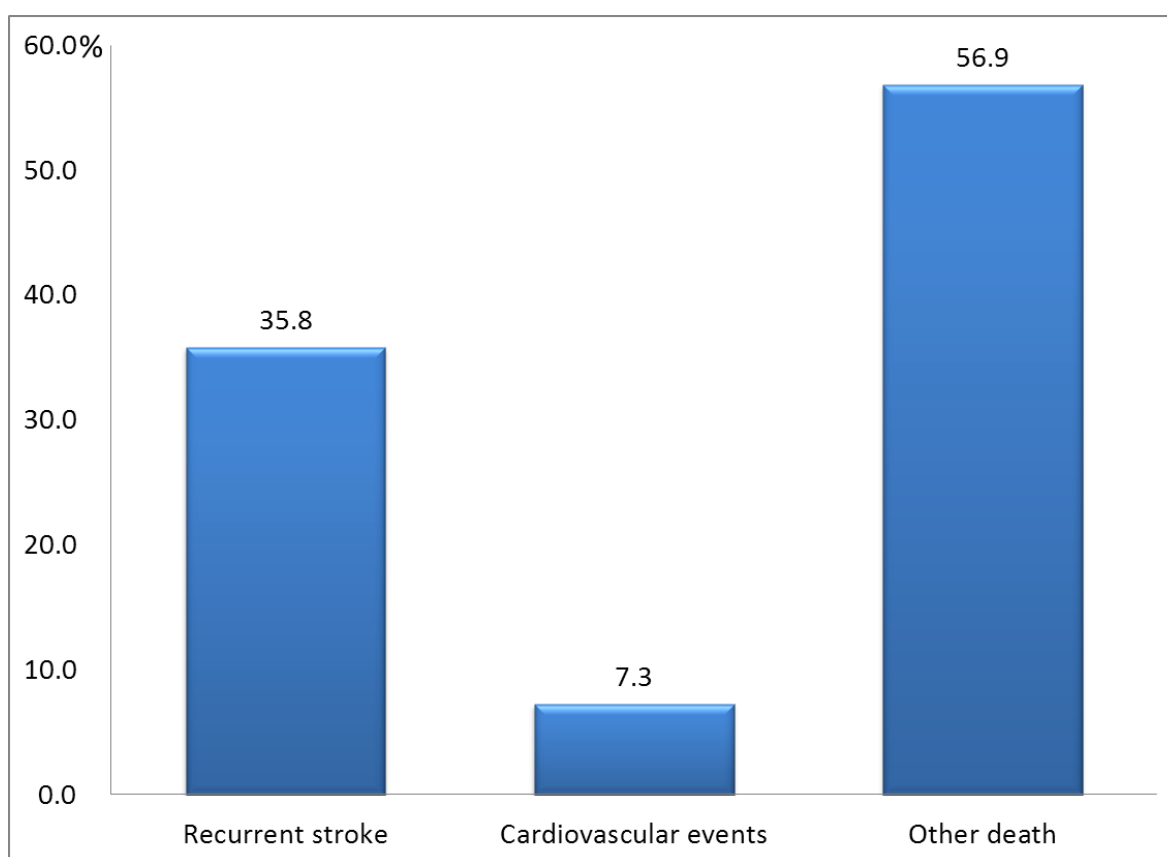


Figure 25 Later vascular events until 3 month after stroke (excluding END period)

- Based on 5,412 cases for MOSAIC study (from January 2011).
- END stands for early neurological deterioration.

Table 30 Later vascular events between 3 month and 1 year after stroke (excluding events before 3 month)

Type of vascular events	Frequency (percentage)*
Recurrent stroke	32 (38.1%)
Cardiovascular events	4 (4.8%)
Other death	48 (57.1%)
Total events	84

* Missing in 1 case.

- Based on 5,412 cases for MOSAIC study (from January 2011).

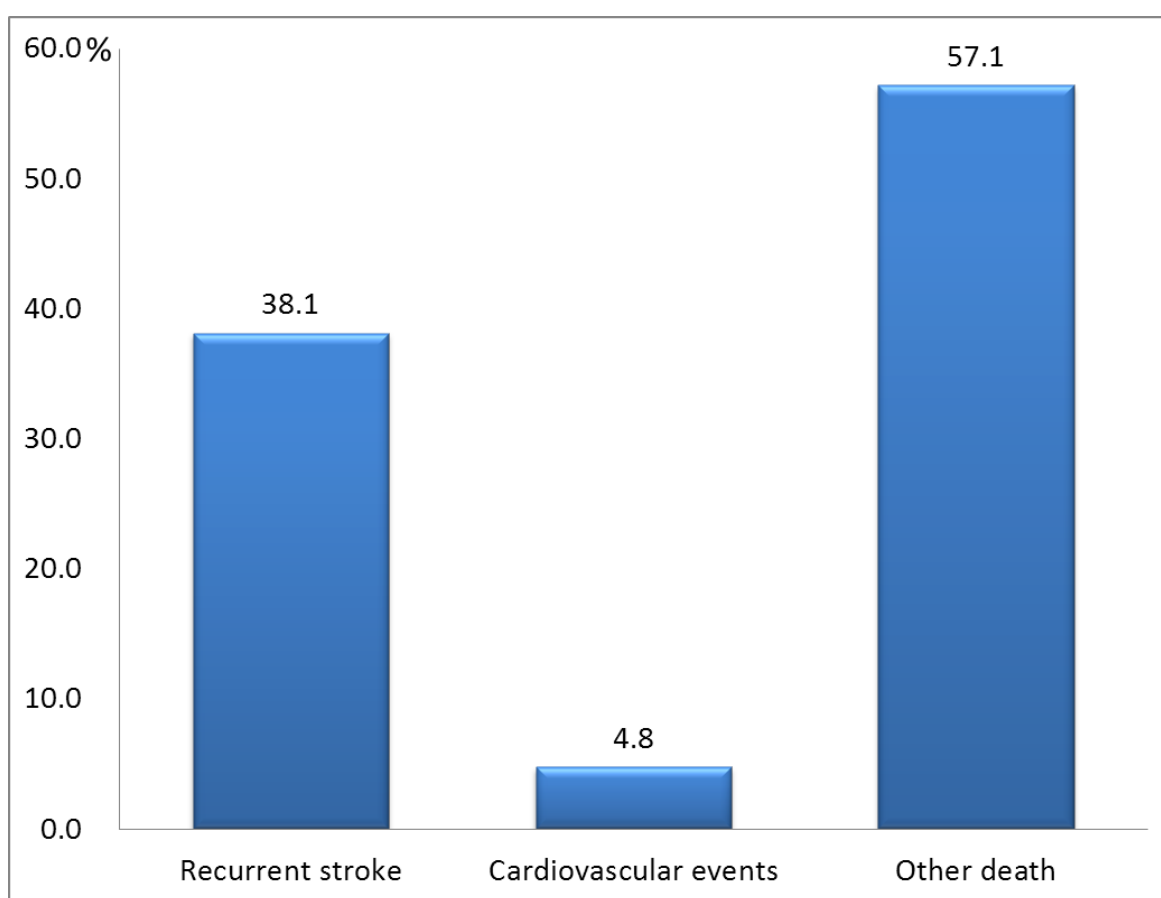


Figure 26 Later vascular events between 3 month and 1 year after stroke (excluding events before 3 month)

- Based on 5,412 cases for MOSAIC study (from January 2011).

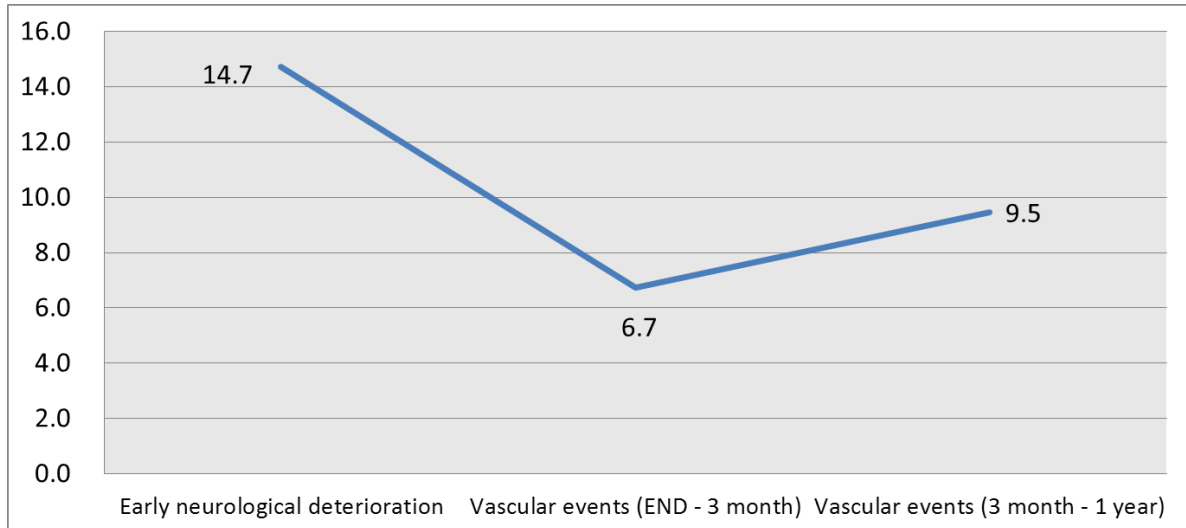


Figure 27 Incidence of END and vascular events after stroke (N=877 who completed 1-year follow-up)

- Based on 5,412 cases for MOSAIC study (from January 2011).
- END stands for early neurological deterioration.

Selected Subgroup Statistics of CRCS-5

Subgroup statistics according to sex

- From a total of 14792 registered acute ischemic stroke cases, male was 8601 (58%) and female was 6191 (42%) (Table 31 Subgroup statistics according to sex).
- Age showed noticeable difference between two sexes; 71 ± 12 year-old in female and 65 ± 13 year-old in male cases.
- For vascular risk factors, 62% of male cases reported to smoke, whereas only 8% of female cases smoked.
- Overall, there was no disparity in revascularization and medications between male and female.
- Initial severity and morbidity after stroke were higher in female cases.

Subgroup statistics according to age

- Stroke cases in young-age group (<45 year-old) was 721 (5%), extreme-old age group (≥ 80 year-old) was 2491 (17%) and middle-age group (45 – 79 year-old) was 11 580 (78%) (Table 32 Subgroup statistics to age).
- Noticeable difference was detected in sex and vascular risk factors among age-groups.
- Regarding TOAST classification of ischemic stroke, young-age cases had higher frequency of other determined etiology and cryptogenic stroke (undetermined etiology – negative).
- Overall, there was no disparity in revascularization and medications among

age-groups.

- Stroke cases from young-age groups had milder initial neurological severity. Neurological and functional dependency after stroke as well as mortality was rather proportional to age-groups.

Table 31 Subgroup statistics according to sex

	Female [N=6191]	Male [N=8601]
Age	71.2 ± 11.9	64.9 ± 12.5
Vascular Risk Factors		
Hypertension	4488 (72.5%)	5574 (64.8%)
Diabetes	2025 (32.7%)	2889 (33.6%)
Dyslipidemia	2056 (33.2%)	2581 (30.0%)
Smoking	476 (7.7%)	5316 (61.8%)
Atrial fibrillation	1434 (23.2%)	1418 (16.5%)
TOAST classification		
Large Artery Atherosclerosis	2144 (34.6%)	3418 (39.7%)
Small Vessel Occlusion	1257 (20.3%)	1752 (20.4%)
Cardioembolism	1516 (24.5%)	1638 (19.0%)
Other Determined Etiology	121 (2.0%)	236 (2.7%)
Undetermined Etiology - 2 or more	256 (4.1%)	345 (4.0%)
Undetermined Etiology - Negative	499 (8.1%)	726 (8.4%)
Undetermined Etiology - Incomplete work-ups	398 (6.4%)	486 (5.7%)
Stroke characteristics		
Onset to arrival time (hour)	34.2 ± 48.5	32.5 ± 47.6
NIHSS score at admission	14.8 [4.0 – 44.8]	13.1 [3.8 – 39.6]
NIHSS score ≥10-point	4 [2 – 10]	4 [2 – 8]
NIHSS score ≥10-point	1594 (25.7%)	1686 (19.6%)
Revascularization treatment		
Thrombolytic treatment	716 (11.6%)	1021 (11.9%)
IV thrombolysis	459 (7.4%)	679 (7.9%)
IA thrombolysis	115 (1.9%)	145 (1.7%)
Combined IV and IA thrombolysis	141 (2.3%)	196 (2.3%)
Admission medication		
Aspirin	4995 (80.7%)	7079 (82.3%)
Clopidogrel	1893 (30.6%)	2942 (34.2%)
Other antiplatelet	263 (4.2%)	280 (3.3%)
Heparin	535 (8.6%)	693 (8.1%)
Warfarin	492 (7.9%)	595 (6.9%)
Discharge medication		
Aspirin	4112 (83.4%)	6140 (87.1%)
Clopidogrel	2157 (59.1%)	3399 (63.9%)
Other antiplatelet	604 (9.8%)	768 (8.9%)
Warfarin	1220 (19.7%)	1487 (17.3%)
Consequences of stroke		
NIHSS score at discharge	6.1 ± 8.5	4.8 ± 7.2
mRS score at discharge	3 [1 – 8]	2 [1 – 5]
In-hospital mortality	2.5 ± 1.8	2.2 ± 1.6
In-hospital mortality	3 [1 – 4]	2 [1 – 3]
In-hospital mortality	250 (4.0%)	202 (2.4%)

mRS score at 3 month	2.4 ± 1.9	1.8 ± 1.8
	2 [1 – 4]	1 [0 – 3]
0	528 (23.0%)	918 (28.3%)
1	437 (19.0%)	812 (25.0%)
2	300 (13.1%)	527 (16.2%)
3	337 (14.7%)	375 (11.5%)
4	275 (12.0%)	270 (8.3%)
5	251 (10.9%)	173 (5.3%)
6	170 (7.4%)	174 (5.4%)

- Based on 14,792 ischemic stroke cases.

Table 32 Subgroup statistics to age

	<45 year-old [N=721]	45-79 year-old [N=11580]	≥80 year-old [N=2491]
Male sex	537 (74.5%)	7106 (61.4%)	958 (38.5%)
Vascular Risk Factors			
Hypertension	265 (36.8)	7960 (68.7%)	654 (73.7%)
Diabetes	102 (14.1%)	7432 (35.8%)	664 (26.7%)
Dyslipidemia	175 (24.3%)	3797 (32.8%)	665 (26.7%)
Smoking	414 (57.4%)	4827 (41.7%)	551 (22.1%)
Atrial fibrillation	26 (3.6%)	2042 (17.6%)	784 (31.5%)
TOAST classification			
Large Artery Atherosclerosis	209 (29.0%)	4485 (38.7%)	868 (34.8%)
Small Vessel Occlusion	155 (21.5%)	2512 (21.7%)	342 (13.7%)
Cardioembolism	91 (12.6%)	2306 (19.9%)	757 (30.4%)
Other Determined Etiology	104 (14.4%)	234 (2.0%)	19 (0.8%)
Undetermined Etiology - 2 or more	16 (2.2%)	428 (3.7%)	157 (6.3%)
Undetermined Etiology - Negative	104 (14.4%)	978 (8.4%)	143 (5.7%)
Undetermined Etiology - Incomplete work-ups	42 (5.8%)	637 (5.5%)	205 (8.2%)
Stroke characteristics			
Onset to arrival time (hour)	28.1 ± 43.7	33.6 ± 48.6	33.1 ± 46.3
NIHSS score at admission	4.3 ± 5.1	5.7 ± 6.0	8.3 ± 7.2
	3 [1 – 6]	4 [2 – 8]	6 [3 – 13]
NIHSS score ≥10-point	88 (12.2%)	2328 (20.1%)	864 (34.7%)
Revascularization treatment			
Thrombolytic treatment	76 (10.5%)	1377 (11.9%)	284 (11.4%)
IV thrombolysis	56 (7.8%)	893 (7.7%)	189 (7.6%)
IA thrombolysis	10 (1.4%)	204 (1.8%)	46 (1.8%)
Combined IV and IA thrombolysis	10 (1.4%)	278 (2.4%)	49 (2.0%)
Admission medication			
Aspirin	618 (85.7%)	9511 (82.1%)	1945 (78.1%)
Clopidogrel	158 (21.9%)	3945 (34.1%)	732 (29.4%)
Other antiplatelet	7 (1.0%)	451 (3.9%)	85 (3.4%)
Heparin	53 (7.4%)	924 (8.0%)	2551 (10.1%)
Warfarin	33 (4.6%)	814 (7.0%)	240 (9.6%)
Discharge medication			
Aspirin	557 (88.7%)	8164 (86.3%)	1531 (81.0%)
Clopidogrel	208 (52.3%)	4494 (63.3%)	854 (58.0%)
Other antiplatelet	70 (9.7%)	1048 (9.1%)	254 (10.2%)
Warfarin	102 (14.1%)	2077 (17.9%)	528 (21.2%)
Consequences of stroke			
NIHSS score at discharge	3.1 ± 5.5	4.9 ± 7.4	8.0 ± 9.6
	1 [0 – 4]	2 [1 – 6]	4 [2 – 11]
mRS score at discharge	1.6 ± 1.5	2.2 ± 1.7	3.1 ± 1.7
	1 [0 – 3]	2 [1 – 3]	3 [2 – 4]
In-hospital mortality	9 (1.2%)	301 (2.6%)	142 (5.7%)

mRS score at 3 month			
0	134 (49.3%)	1199 (27.7%)	113 (11.9%)
1	67 (24.6%)	1067 (24.6%)	115 (12.2%)
2	39 (14.3%)	677 (15.6%)	111 (11.7%)
3	16 (5.9%)	535 (12.4%)	161 (17.0%)
4	9 (3.3%)	372 (8.6%)	164 (17.3%)
5	1 (0.4%)	278 (6.4%)	145 (15.3%)
6	6 (2.2%)	201 (4.6%)	137 (14.5%)

- Based on 14,792 ischemic stroke cases.