CRCS-5 Statistics – 2015 Report

Global Statistics of CRCS-5

Acute Treatment Statistics of CRCS-5

Outcome Statistics of CRCS-5

Selected Subgroup Statistics of CRCS-5

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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 (HI10C2020). 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 a multicenter cohort and gathered 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 a 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, located in the southernmost island of Korea, joined CRCS-5 in October 2011. UIsan University Hospital and Chungbuk National University Hospital joined CRCS-5 registry in February 2013 and Keimyung University Dongsan Medical Center participated in May 2014. Currently, the numbers of CRCS-5 registry member sites are 15, covering most part of the Republic of Korea.

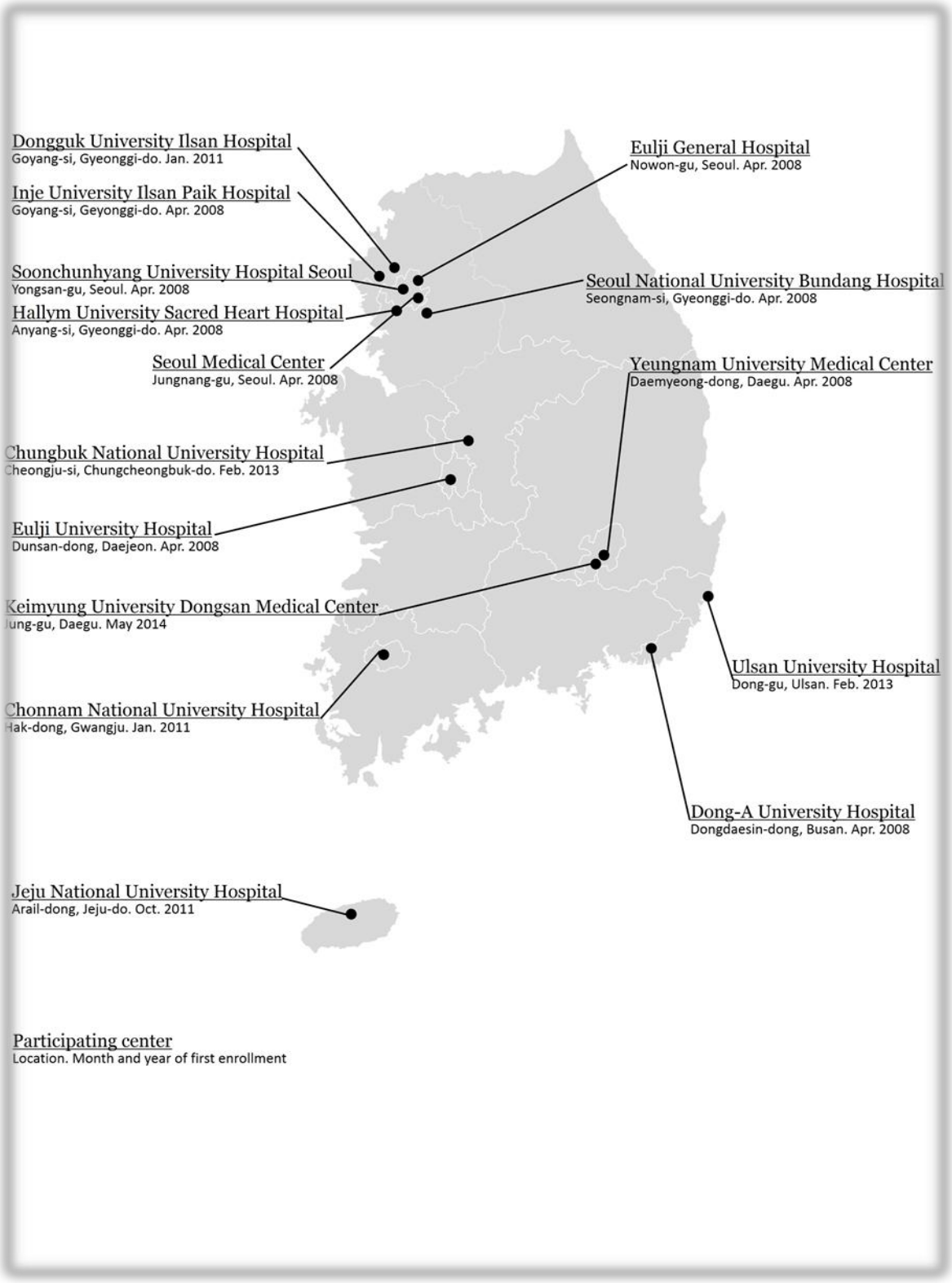

Figure 1. Participating centers and their geographic location

Participating stroke centers and site investigators

- Seoul National University Bundang Hospital: Hee-Joon Bae (director), Moon-Ku Han, Beom Joon Kim
- Eulji General Hospital, Eulji Univeristy: Jong-Moo Park, Kyusik Kang
- Eulji University Hospital: Soo Joo Lee, Youngchai Ko
- Dong-A University Hospital: Jae-Kwan Cha, Dae-Hyun Kim, Hyun-Wook Nah
- 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, Wi-Sun Ryu
- Chonnam National University Hospital: Joon-Tae Kim, Ki-Hyun Cho
- Jeju National University Hospital: Jay Chol Choi
- Ulsan University Hospital: Wook-Joo Kim
- Chungbuk National University Hospital: Dong-Ick Shin, Min-Ju Yeo
- Keimyung University Dongsan Medical Center: Sung Il Sohn, Jeong-Ho Hong
- *Statistical advisors*
    - Juneyoung Lee (Department of Biostatistics, Korea University College of Medicine)
    - Ji Sung Lee (Clinical Trial Center, Asan Medical Center)

List of Tables and Figures

Global Statistics of CRCS-5

Recruitment of acute stroke patients

- A total of 35,917 acute strokes were registered in the CRCS-5 database until November 2014 (Figure 2 Number of acute stroke patients since April 2008).
- Number of monthly recruitment was 449 cases on average. Monthly numbers of recruitment on average were 460 in year 2011, 506 in year 2012, 580 in year 2013, and 635 in year 2014 (January to Nov 2014).
    - 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 5,899 cases until November 2014 and 73 cases per month on average. However, Cheonnam National University Hospital has been most rapidly recruiting acute stroke patients, as 90 cases per month on average from Jan 2011 (Table 1 Number of registered acute stroke patients and 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 32,504 (91%).

  cf. Hemorrhagic stroke patients are customarily admitted to the neurosurgical department in usual Korean stroke centers. So that above statistics should not be interpreted as 91% of acute stroke patients are ischemic stroke in Korea.

- Number of male was 18,938 (58%) and female was 13,566 (42%).

- Average age at onset was 67.6 ± 13 and median 70 [interquartile range, 59 – 77] year-old with minimum 5 and maximum 105. Young-age stroke patients (age of onset < 45 year-old) were 1643 (5%), and oldest olds (age ≥85 year-old) were 2169 (7%).

- Female stroke patients exceeded male counterpart in the group of patients 75 year-old or older. Among male stroke patients, the largest age-group was 65-74 year-old group (31%). However, female patients were most frequent in 75-84 year-old group (35%) (Table 2 Number of acute ischemic stroke patients stratified by sex and age group).

- Increasing trend in case collection was shown in all age groups. Especially, increase in collected cases per year was observed most definitely in the 65-74 year-old group and the 75-84 year old group. (Figure 4 Secular trends of age group proportions in acute ischemia stroke).

Characteristics of Acute Ischemic Strokes

- Among a total of 32,504 acute ischemic strokes, large artery atherosclerosis (LAA) accounted for 37%, small vessel occlusion (SVO) for 18%, and cardioembolism (CE) for 22%. Ischemic strokes due to other specified etiology (ODE) were 3% (Table 3 Fractions of TOAST classification components and Figure 5 TOAST classification).

- Ischemic stroke with undetermined etiology (UDE) accounted for 21%; two or more etiologies for 4%, negative etiology (cryptogenic stroke) for 8%, and incomplete work-ups for 9%.

- A slightly increasing trend of cardioembolism (CE) was observed, while large artery atherosclerosis (LAA) and small vessel occlusion (SVO) have recently decreased. Patients who were classified to undetermined etiology-incomplete work-ups seemed to be increased (Table 4 Secular trend of TOAST classification and Figure 6 Secular trend of TOAST classification).

- Among a total of 32,504 acute ischemia strokes, lesion negative strokes were 8.4%. About the lesions categorized with arterial territories, fifty-eight percent of ischemic strokes were located in the middle cerebral artery (MCA) territory. As for anatomical territories, 47% located at cerebral cortex, 29% at corona radiate or adjacent white matters, and 33% at deep structures including putamen, internal capsule or thalamus. Twenty-nine percent of strokes had infratentorial lesions (Table 5 Arterial territory of ischemic stroke (multiple choices permitted), Figure 7 Arterial territory of ischemic stroke (multiple choices permitted), Table 6 Anatomical location of ischemic stroke (multiple choices permitted), and Figure 8 Anatomical location of ischemic stroke (multiple choices permitted)).

- Fifty-nine percent of ischemic strokes documented to have at least one steno-occlusive lesion at the relevant artery. Regarding to steno-occluded arteries, MCA accounted for 30% and extracranial internal carotid artery (eICA) for 12% (Table 7 Angiographic locations of steno-occluded arteries (multiple choices permitted) and Figure 9 Angiographic locations of steno-occluded arteries (multiple choices permitted)).

- Onset (last normal time) to hospital arrival time was 43.9 ± 219.2 hours on average and median 13.4 [interquartile range, 3.6 – 42.5] hours, for whose time-related record is available. Twenty-two percent of the patients arrived within 3 hours and 34% arrived 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).

- Onset (First abnormal time) to hospital arrival time was 41.1 ± 218.2 hours on average and median 9.0 [interquartile range, 2.4 – 37.2] hours, for those time-related records were available. Twenty-nine percent of the patients arrived within 3 hours and 42.5% arrived within 6 hours. Sixty-six percent of ischemic strokes admitted within 24 hours after onset. Secular trend of onset(FAT) to hospital arrival time was shown to be increased in the 'within 3 hours' category. (Figure 11 Onset (First abnormal time) to hospital arrival time and Figure 12 Secular trend of categorized FAT to arrival time)

- NIHSS score at hospital arrival was 6.0 ± 6.3 on average and median 4 [interquartile range, 1 – 8] points, with range between 0 and 40. NIHSS score ≤4 was documented in 58%, NIHSS score of 5 – 8 in 18%, and NIHSS score ≥25 in 1% of acute ischemic stroke patients (Figure 13 Distribution of NIHSS score at hospital arrival).

- Before index stroke, 84% of stroke cases (27,358 subjects) maintained independent living, reported to be on mRS score of 0 or 1 (Based on 32,504 ischemic stroke cases. Table 9 Distribution of premorbid mRS score)
- Twenty-one percent of stroke cases (6,908 subjects) had experienced stroke events before, and 80% was ischemic. Frequencies of other vascular events before index stroke were less than 5 percent (Table 10 History of vascular events).

- Frequencies of major vascular risk factors were as follows; Hypertension in 21,804 (67%) cases, diabetes in 10,596 (33%) cases, dyslipidemia in 9,483 (29%) cases, current smoking in 8,513 (26%) cases, and atrial fibrillation in 6,560 (20%) cases. (Table 11 Major modifiable vascular risk factors and Figure 14 Percentages of major modifiable vascular risk factors).

- Regarding major vascular risk factors, hypertension and diabetes were fairly well documented before stroke (95% and 87%, respectively) and were on regular management (83% and 76%, respectively). However, detection rates of dyslipidemia and atrial fibrillation were moderate (54% and 55%, respectively) and regular treatment for these risk factors was less than adequate (47% and 43%, respectively), Habitual smoking was reported from 12,713 (39%) and 67% of them were current smokers. Mean smoking doses were 39.9 ± 81.5 pack-years. (Table 12 Major vascular risk factors and their management before index strokes, Figure 15 Percentages of regular treatment for vascular risk factors and Figure 16 Percentages of undocumented vascular risk factors).

Evaluation and Management of Acute Ischemic Strokes

- Hyperacute revascularization treatments were performed in 4,243 (13%) cases. Among them, intravenous-only pharmacological thrombolysis was performed in 2,606 (61%) cases, while endovascular-only revascularization was done in 681 (16%) cases. Combined IV-endovascular revascularization comprised 23% of the hyperacute revascularization treatments. Regarding pharmacological modality of intravenous thrombolysis, recombinant tissue plasminogen activator was the most frequently utilized medication (84%). Secular trend of proportion of revascularization modalities shown to be increased regardless of the modality. (Table 13 Profile of hyperacute treatment for ischemic strokes, Table 14. Secular trend of revascularization modalities, Figure 17 Composition of hyperacute revascularization treatment modalities and Figure 18 Secular trend of revascularization modalities).

- Potential sources of cardioembolic stroke were detected in 6,353 (20%) for high risk sources and in 1,927 (6%) for medium risk sources. Atrial fibrillation was the most common high risk source (90%); patent foramen ovale (34%) and congestive heart failure (27%) were leading sources of medium risk (Table15 Frequencies of potential cardioembolic sources (risk stratification according to the TOAST classification scheme)).

- Magnetic resonance images (MRI) including diffusion-weighted image (DWI) were performed in more than 90% of registered strokes. MR angiography was done in 87%, while only 33% had carotid Doppler. Most common cardiac evaluation was transthoracic echocardiography (72%), followed by 24-hour electrocardiogram (Holter) monitoring (33%), and transesophageal echocardiography (15%). (Table 16 Frequency of etiological work-ups and Table 17 Profile of laboratory tests).

- Regarding acute stroke medications, aspirin (81%) and clopidogrel (32%) were the two most frequently prescribed drugs. (Table 18 Profile of acute stroke

medications (multiple choices permitted) and Figure 19 Percentages of acute stroke medications (multiple choices permitted)).

- As with stroke medications for secondary prevention used at disharge, aspirin (69%) and clopidogrel (35%) were the two most frequently utilized medications . Warfarin was prescribed in 5,797 (18%) cases, while direct oral anticoagulants (DOACs) Apixaban (n=7; 0.0%), Dabigatran (n=69; 0.2%) and Rivaroxaban (n=56; 0.2%) were used in only small proportion of patients (Table 19 Profile of secondary preventive medications at discharge (multiple choices permitted) and Figure 20 Percentages of secondary preventive medications at discharge (multiple choices permitted)).

- Secular trend of acute stroke medications was shown increased in using warfarin. But secular trend of using heparin was shown to be relatively decreased. Secular trend of using aspirin and clopidogrel was similar among years. Secular trend of secondary preventive medications at discharge was shown similar in all medications (Table 19 Secular trend of revascularization modalities, Figure 20 Secular trend of revascularization modalities , Table 21 Secular trend of acute stroke medications (multiple choices permitted), and Figure 22 Secular trend of acute stroke medications (multiple choices permitted).

- Surgical or radiological interventions were not frequently performed (n=837; 2%) in CRCS-5 registered stroke cases (Table 22 Profile of surgical interventions during acute period of stroke (multiple choices permitted) and Figure 23 Percentages of surgical interventions during acute period of stroke (multiple choices permitted)).

- Duration of hospitalization was 11.6 ± 16.6 days on average and median 8 [interquartile range, 6 – 13].

- At the time of discharge, NIHSS score was 5.0±7.5 on average and median 2 [interquartile range, 1 – 6]; mRS score was 2.3± 1.7 on average and median 2 [interquartile range, 1 – 4]. Missing cases were 312 and 114, respectively. Functional independence at discharge (mRS score 0 or 1) was achieved in 12,231 (38%) cases, and catastrophic consequences at discharge (mRS score 5 or 6) was documented in 4,080 (13%) cases. (Figure 24 NIHSS score at discharge and Figure 25 mRS score at discharge).

- In-hospital mortality occurred in 926 (3%) subjects, after 10.9 ± 23.3 days on average and median 5 [interquartile range, 3 – 11] days after stroke. Among the mortality cases, 582 (68%) were directly related to stroke; 267 (26%) were from complications related to stroke; and 57 (6%) were from other causes unrelated to stroke.

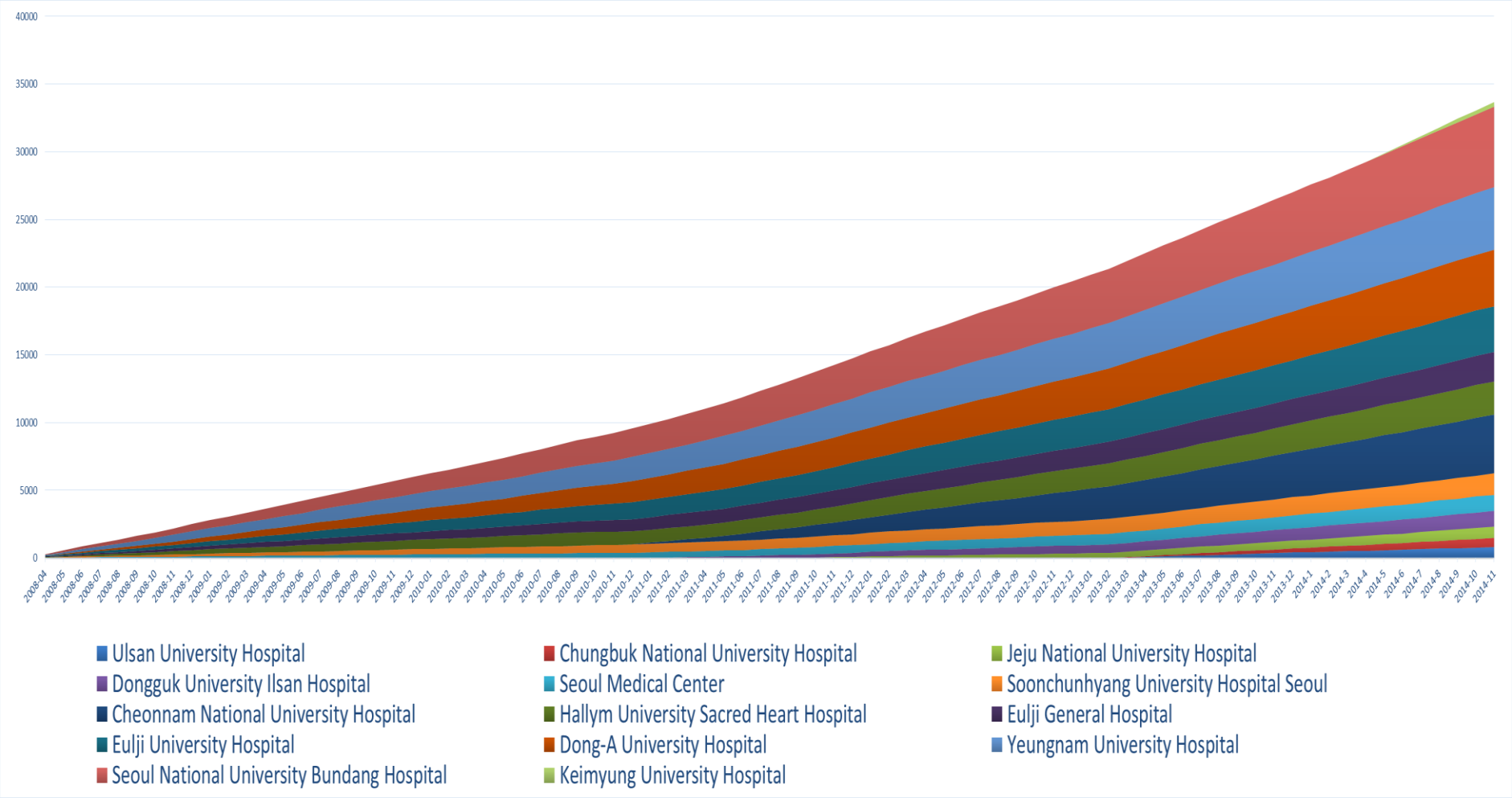

Figure 2 Number of acute stroke patients since April 2008 (N=35,917)

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 1Q	`12 2Q	`12 3Q	`12 4Q	`13 1Q	`13 2Q	`13 3Q	`13 4Q	`14 1Q	`14 2Q	`14 3Q	`14 4Q	Sum
Ulsan University Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	118	119	127	106	96	123	79	808
Chungbuk National University Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	107	90	81	96	104	109	55	669
Jeju National University Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	86	49	61	47	60	69	63	69	54	58	77	49	823
Dongguk University Ilsan Hospital	0	0	0	0	0	0	0	0	0	0	0	60	81	96	69	92	64	68	67	69	61	83	92	64	70	74	67	1177
Seoul Medical Center	43	32	38	34	33	38	34	34	31	37	35	23	37	54	58	48	50	43	47	58	55	58	51	62	69	55	42	1199
Soonchunhyang University Hospital Seoul	65	51	60	56	55	43	62	49	61	60	52	43	41	52	58	61	70	56	67	70	55	76	67	66	67	56	45	1564
Cheonnam National University Hospital	0	0	0	0	0	0	0	0	0	0	0	245	260	272	292	300	291	264	289	270	281	262	304	289	266	287	165	4337
Inje University Ilsan Paik Hospital	62	81	60	62	88	96	67	71	79	89	68	81	106	86	79	102	94	92	83	92	83	98	105	91	84	75	68	2242
Hallym University Sacred Heart Hospital	94	85	114	92	94	114	88	79	101	101	0	0	37	95	109	117	99	110	108	101	92	123	102	91	135	103	74	2458
Eulji General Hospital	82	71	92	76	82	93	83	75	84	84	79	89	72	79	76	87	81	91	79	84	88	76	75	75	88	100	52	2193
Eulji University Hospital	110	86	101	122	125	105	111	123	111	127	141	128	111	135	139	148	150	122	125	143	151	123	114	148	147	142	77	3365
Dong-A University Hospital	90	88	113	130	133	157	168	137	160	189	185	180	182	163	164	163	160	148	167	190	174	200	152	168	158	173	105	4197
Yeungnam University Hospital	201	174	173	165	157	166	132	140	142	158	171	151	195	202	190	192	150	174	179	198	193	179	164	172	170	200	134	4622
Seoul National University Bundang Hospital	163	185	186	153	195	187	206	184	209	225	200	196	190	242	220	246	229	232	218	208	258	241	278	261	311	279	197	5899
Keimyung University Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	157	101	364
Sum	**910**	**853**	**937**	**890**	**962**	**999**	**951**	**892**	**978**	**1070**	**931**	**1196**	**1312**	**1476**	**1535**	**1642**	**1487**	**1461**	**1476**	**1610**	**1785**	**1791**	**1781**	**1743**	**1929**	**2010**	**1310**	**35917**

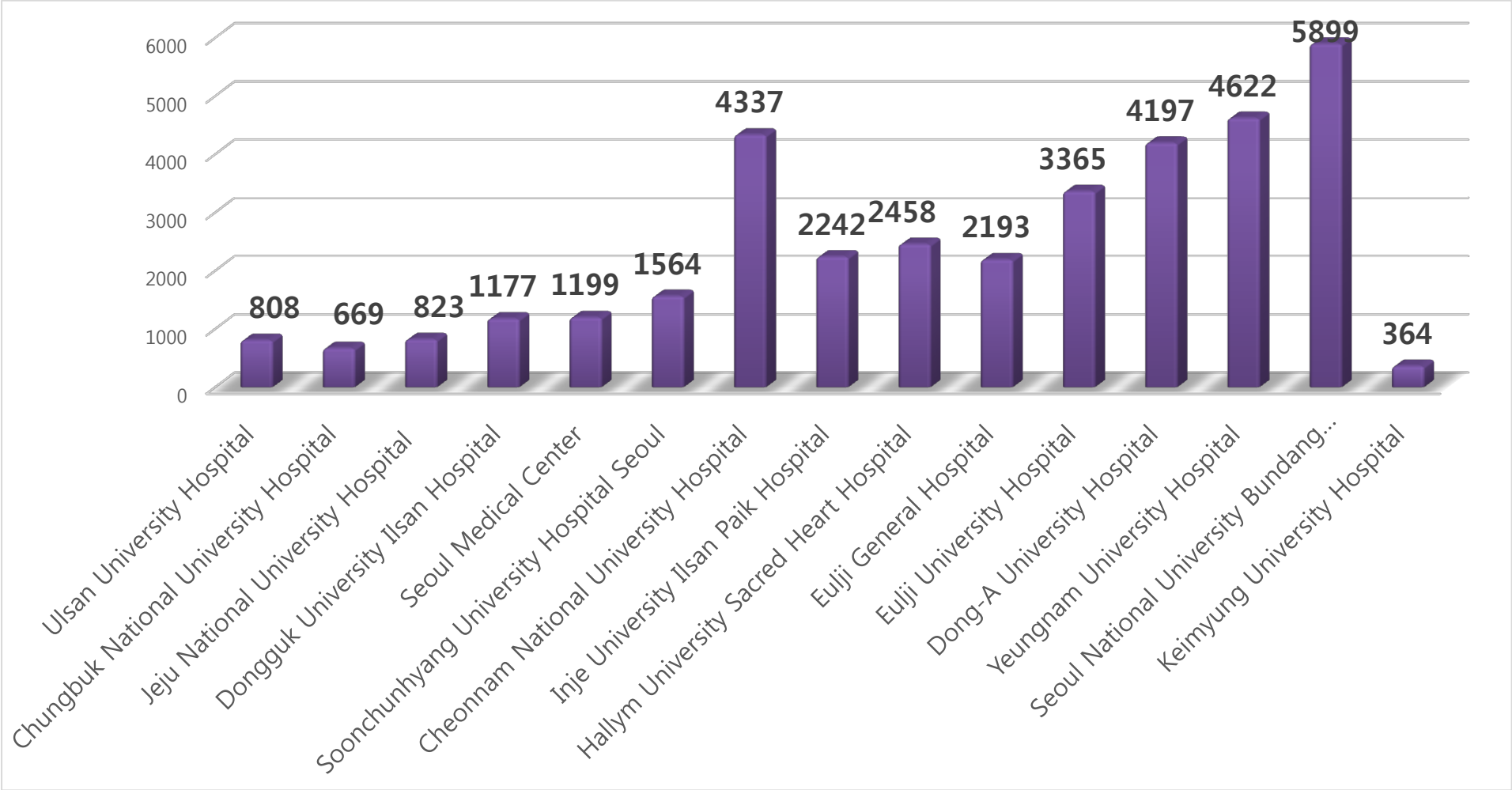

Figure 3. Number of registered acute stroke patients from each center (N=35,917)

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

Age group	Whole(n)	Per (%)	Male(n)	Per (%)	Female(n)	Per (%)
45	1643	5.1	1163	6.1	480	3.5
45-54	3741	11.5	2782	14.7	959	7.1
55-64	6291	19.4	4511	23.8	1780	13.1
65-74	10041	30.9	5857	30.9	4184	30.8
75-84	8619	26.5	3888	20.5	4731	34.9
85	2169	6.7	737	3.9	1432	10.6
	32504	100	18938	100	13566	100

- Based on 32,504 ischemic stroke cases.

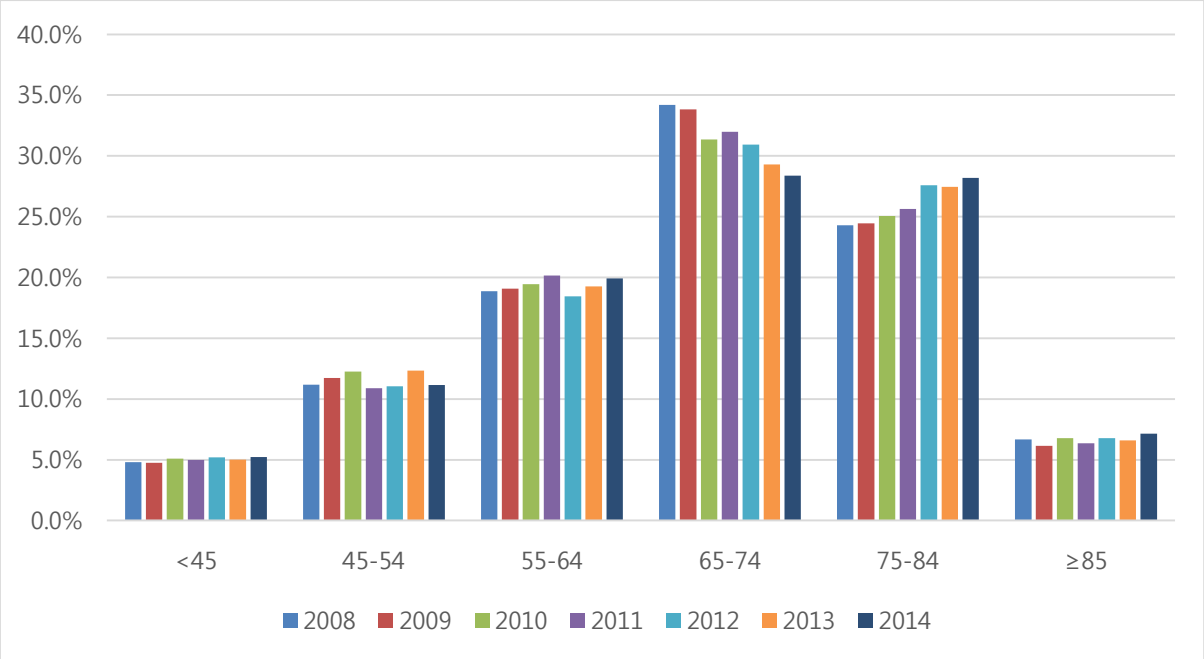

Figure 4. Secular trends of age group proportions in acute ischemia stroke

- Based on 32,504 ischemic stroke cases.

Table 3. Fractions of TOAST classification components

	Frequency (n)	Percentage (%)
Large Artery Atherosclerosis	12000	36.9
Small Vessel Occlusion	5946	18.3
Cardioembolism	7048	21.7
Other Determined Etiology	828	2.5
Undetermined Etiology - 2 or more	1350	4.2
Undetermined Etiology - Negative	2558	7.9
Undetermined Etiology - Incomplete work-ups	2774	8.5
	32504	

- Based on 32,504 ischemic stroke cases.

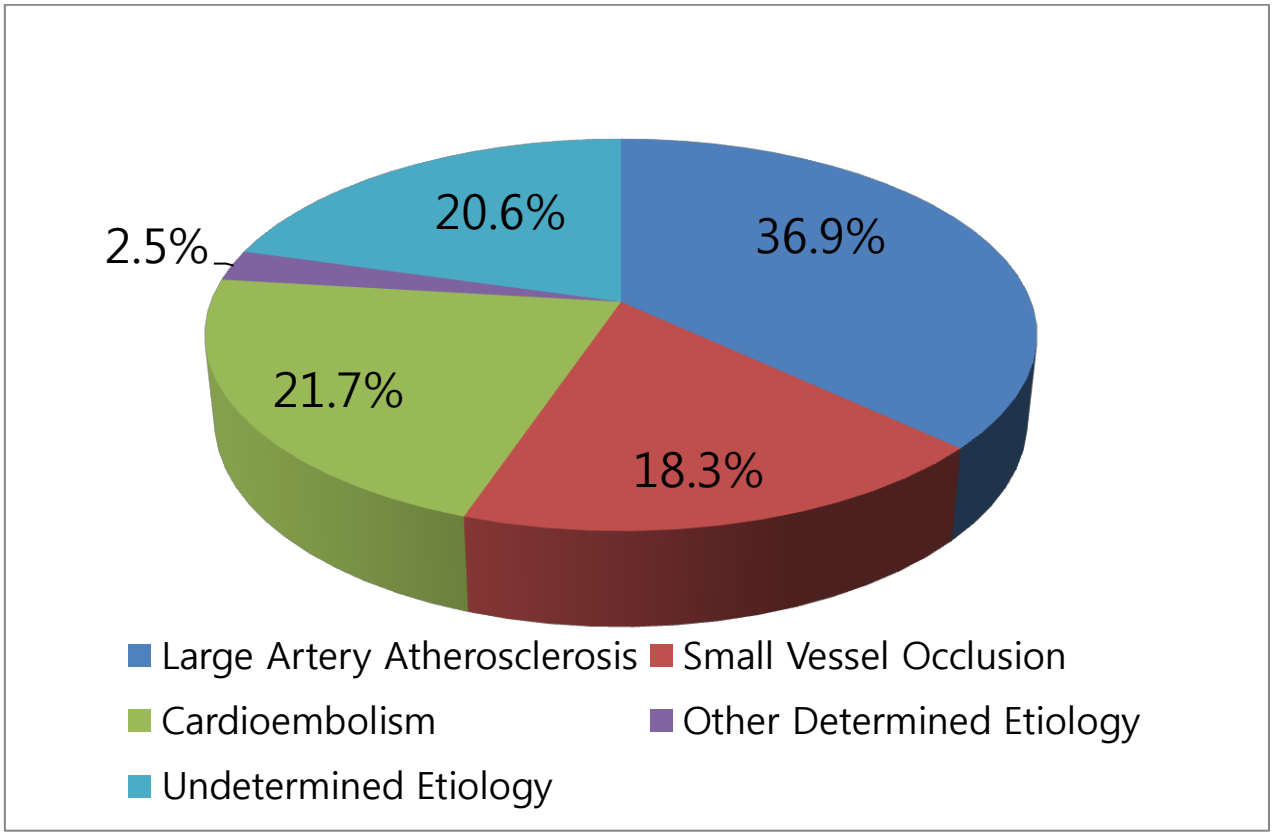

Figure 5. TOAST classification

- Based on 32,504 ischemic stroke cases.

Table 4. Secular trend of TOAST Classification

	Number of prescription (%)						
	2008†	**2009**	**2010**	**2011**	**2012**	**2013**	**2014‡**
Large Artery Atherosclerosis	923(37.4)	1330(38.2)	1318(37.3)	1897(38.0)	2136(38.8)	2300(36.4)	2096(33.9)
Small Vessel Occlusion	556(22.5)	786(22.6)	777(22.0)	830(16.6)	870(15.8)	1079(17.1)	1048(16.9)
Cardioembolism	512(20.7)	698(20.0)	752(21.3)	1099(22.0)	1221(22.2)	1357(21.5)	1409(22.8)
Other Determined Etiology	49(2.0)	91(2.6)	101(2.9)	104(2.1)	135(2.5)	165(2.6)	183(3.0)
Undetermined Etiology - 2 or more	102(4.1)	142(4.1)	113(3.2)	223(4.5)	245(4.5)	267(4.2)	258(4.2)
Undetermined Etiology - Negative	244(9.9)	301(8.6)	290(8.2)	385(7.7)	357(6.5)	492(7.8)	489(7.9)
Undetermined Etiology - Incomplete work-ups	85(3.4)	137(3.9)	180(5.1)	457(9.1)	541(9.8)	666(10.5)	708(11.4)
TOTAL	2471	3485	3531	4995	5505	6326	6191

● Based on 32,504 ischemic stroke cases.
† From Apr 2008; ‡ Until Nov 2014

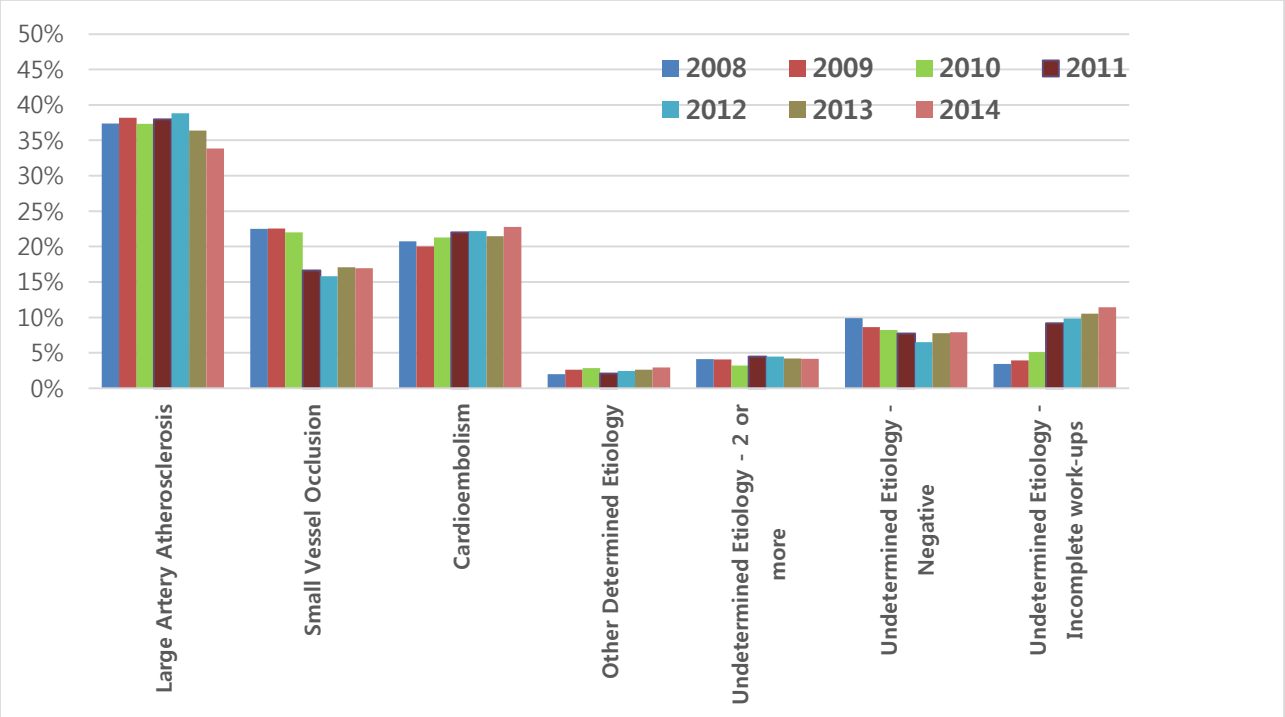

Figure 6. Secular trend of TOAST Classification

Table 5. Arterial territory of ischemic stroke (multiple choices permitted)

Arterial Territory of Ischemic Stroke	Frequency (n)	Percentage (%)
Internal Carotid Artery	929	2.9
Middle Cerebral Artery	18811	57.9
Anterior Cerebral Artery	1843	5.7
Posterior Cerebral Artery	4440	13.7
Basilar artery	3688	11.3
Vertebral artery	861	2.6
Superior Cerebellar Artery	1003	3.1
Anterior Inferior Cerebellar Artery	355	1.1
Posterior Inferior Cerebellar Artery	2964	9.1
Borderzone	1051	3.2
Total	35945	

- Based on 32,504 ischemic stroke cases.

Table 6. Anatomical location of ischemic stroke (multiple choices permitted)

Anatomical Location of Ischemic Stroke	Frequency (n)	Percentage (%)
Cortex	15267	47.0
Corona Radiata	9487	29.2
Putamen - Internal capsule	8069	24.8
Thalamus	2652	8.2
Midbrain	743	2.3
Pons	3771	11.6
Medulla Oblongata	1217	3.7
Cerebellum	3627	11.2
Total	44833	

- Based on 32,504 ischemic stroke cases.

Table 7. Angiographic location of relevant steno-occlusion (multiple choices permitted)

Angiographic Location of Steno-Occlusion	Frequency (n)	Percentage (%)
Anterior Cerebral Artery	1096	3.4
Middle Cerebral Artery	9604	29.5
Posterior Cerebral Artery	2291	7.0
Basilar Artery	2335	7.2
Vertebral Artery	2751	8.5
Extracranial Internal Carotid Artery	4000	12.3
Intracranial Internal Carotid Artery	2724	8.4
Common Carotid Artery	207	0.6
Aorta	48	0.1
Total	25056	

- Based on 32,504 ischemic stroke cases.

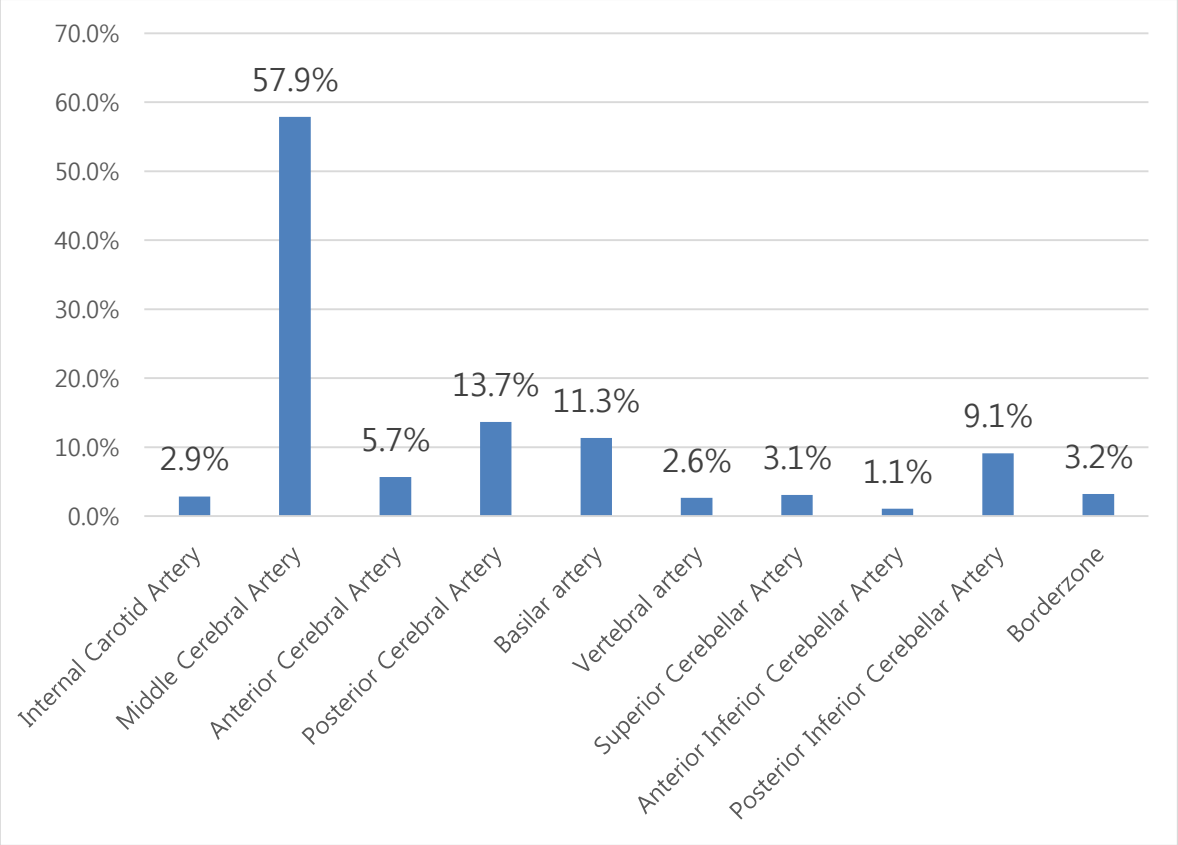

Figure 7. Arterial territory of ischemic strokes (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

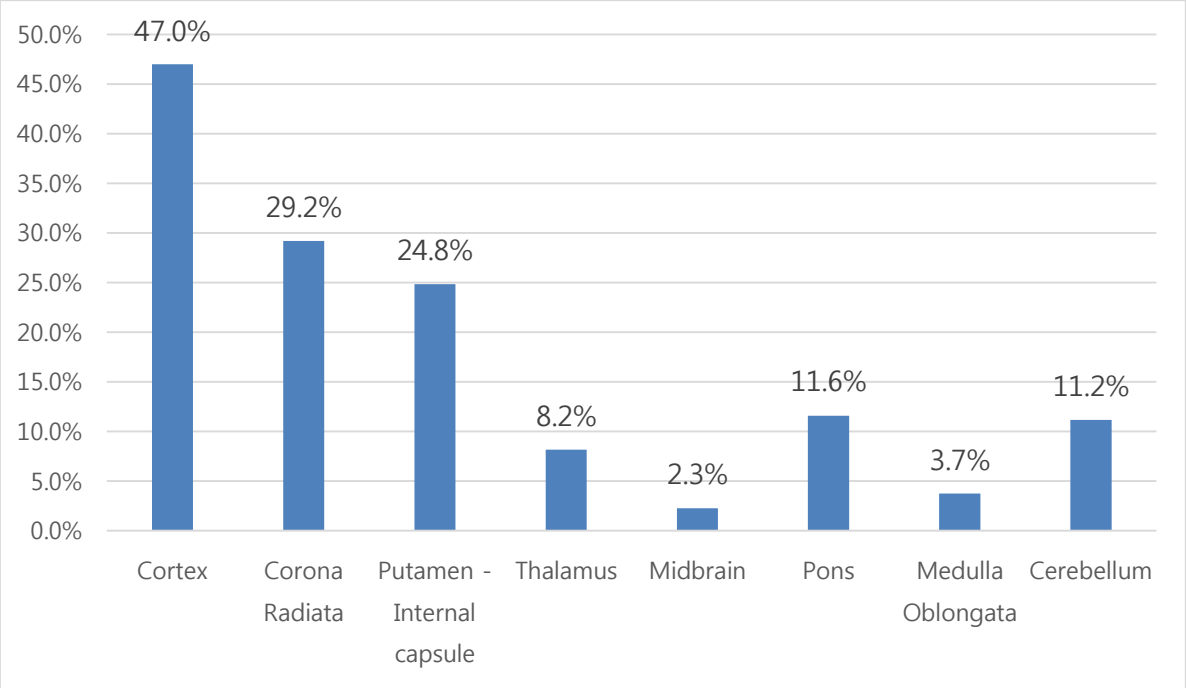

Figure 8. Anatomical location of ischemic strokes (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

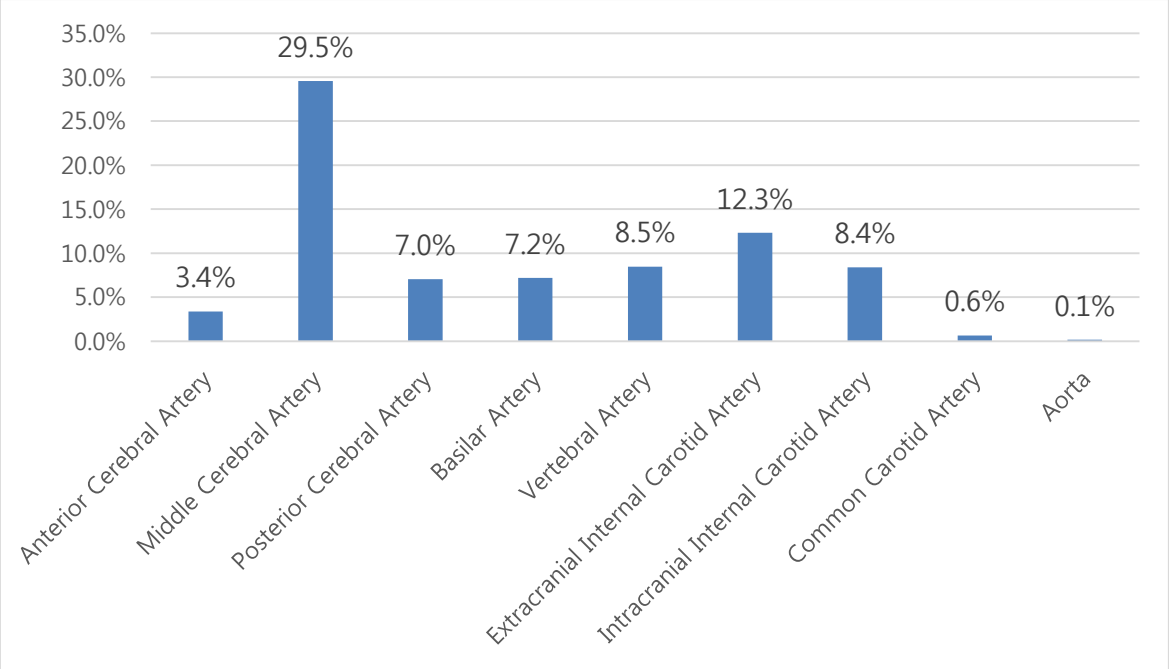

Figure 9. Angiographic location of relevant steno-occlusion (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

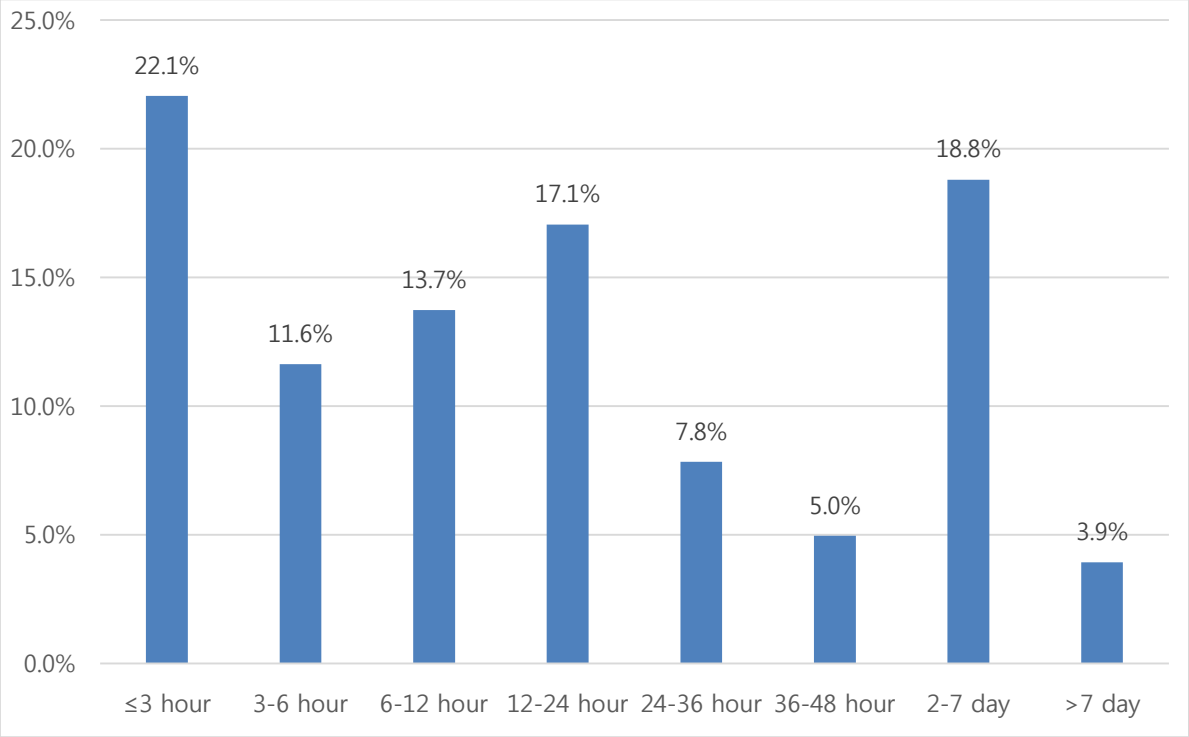

Figure 10. Onset (last normal time) to hospital arrival time

- Based on 32,504 ischemic stroke cases.

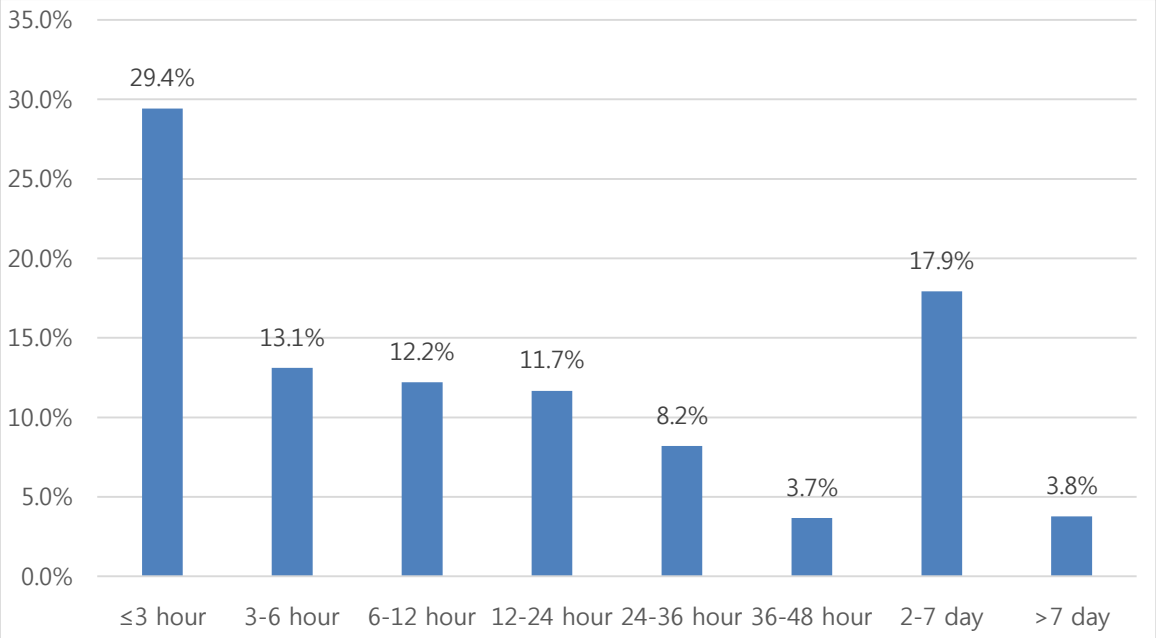

Figure 11. Onset (First abnormal time) to hospital arrival time

- Based on 32,504 ischemic stroke cases.

Table 8. Secular trend of categorized FAT to arrival time

	Number of prescription (%)						
	2008†	**2009**	**2010**	**2011**	**2012**	**2013**	**2014‡**
≤3 hour	646(26.1)	914(26.2)	981(27.8)	1455(29.1)	1583(28.8)	1925(30.4)	2062(33.3)
3-6 hour	304(12.3)	432(12.4)	434(12.3)	692(13.9)	778(14.1)	847(13.4)	773(12.5)
6-12 hour	295(11.9)	472(13.5)	426(12.1)	625(12.5)	707(12.8)	756(12.0)	690(11.1)
12-24 hour	299(12.1)	414(11.9)	450(12.7)	572(11.5)	642(11.7)	719(11.4)	697(11.3)
24-36 hour	223(9.0)	323(9.3)	315(8.9)	398(8.0)	424(7.7)	490(7.7)	495(8.0)
36-48 hour	117(4.7)	137(3.9)	122(3.5)	181(3.6)	211(3.8)	200(3.2)	223(3.6)
2-7 day	458(18.5)	637(18.3)	656(18.6)	906(18.1)	1010(18.3)	1134(17.9)	1027(16.6)
>7 day	129(5.2)	156(4.5)	147(4.2)	166(3.3)	150(2.7)	255(4.0)	224(3.6)
TOTAL	2471	3485	3531	4995	5505	6326	6191

- Based on 32,504 ischemic stroke cases.

† From Apr 2008; ‡ Until Nov 2014

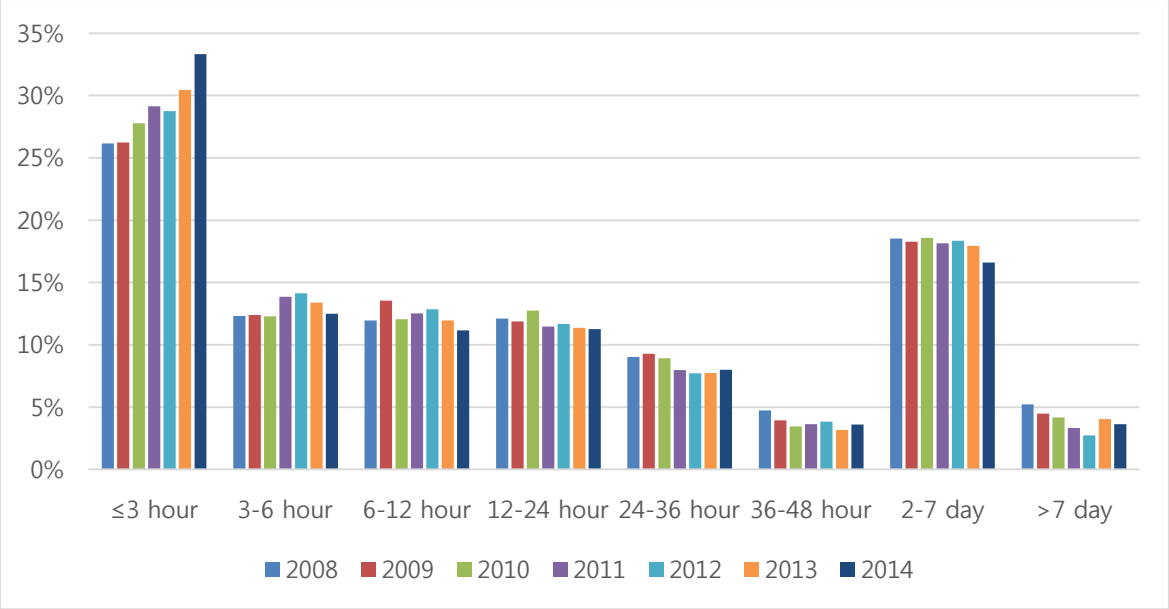

Figure 12. Secular trend of categorized FAT to arrival time

- Based on 32,504 ischemic stroke cases.

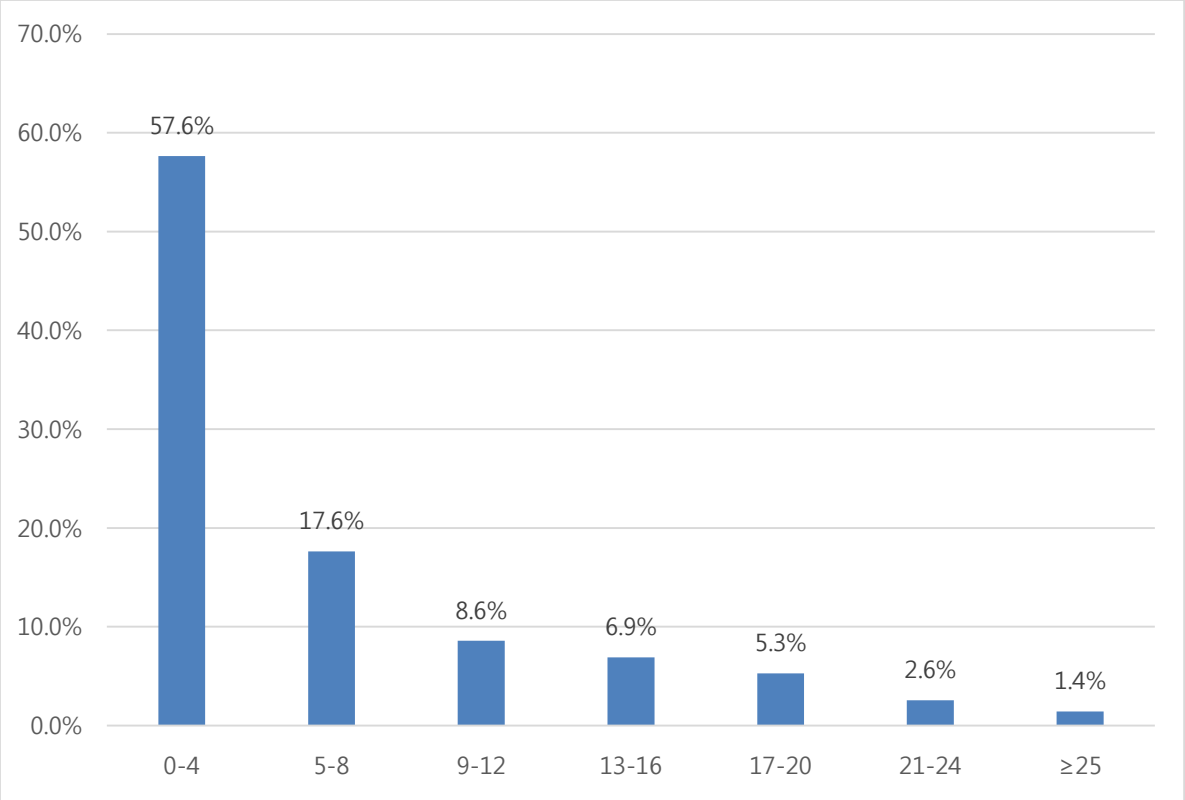

Figure 13. Distribution of NIHSS score at hospital arrival

- Based on 32,504 ischemic stroke cases.

Table 9. Distribution of prestroke mRS score

Prestroke mRS score	Frequency (n)	Percentage (%)
0	25036	77.0
1	2322	7.1
2	1947	6.0
3	1763	5.4
4	899	2.8
5	537	1.7

- Based on 32,504 ischemic stroke cases

Table 10. History of vascular events

	Frequency (n)	Percentage (%)
History of TIA	814	2.5
History of stroke	6908	21.3
Hemorrhagic stroke	784	11.3*
Ischemic stroke	5535	80.1*
Mixed stroke	157	2.3*
Unknown	432	6.3*
Family history of coronary heart disease	284	0.9
History of peripheral arterial disease	218	0.7
History of symptomatic carotid artery disease	1077	3.3
History of acute myocardial infarction	765	2.4
History of silent MI or myocardial ischemia	499	1.5
History of angina attack	1283	3.9
History of coronary artery intervention†	1201	3.7

- Based on 32,504 ischemic stroke cases.

* Percentages of stroke history are calculated from 6908 subjects.

Table 11. Major modifiable vascular risk factors

	n	Per (%)	Male		Female	
			n	Per (%)	n	Per (%)
Hypertension	21804	67.1	12109	63.9	9695	71.5
Diabetes	10596	32.6	6217	32.8	4379	32.3
Dyslipidemia	9483	29.2	5313	28.1	4170	30.7
Current smoking	8513	26.2	7778	41.1	735	5.4
Atrial fibrillation	6560	20.2	3321	17.5	3239	23.9

- Based on 32,504 ischemic stroke cases. (Male=18,938, Female=13,566)

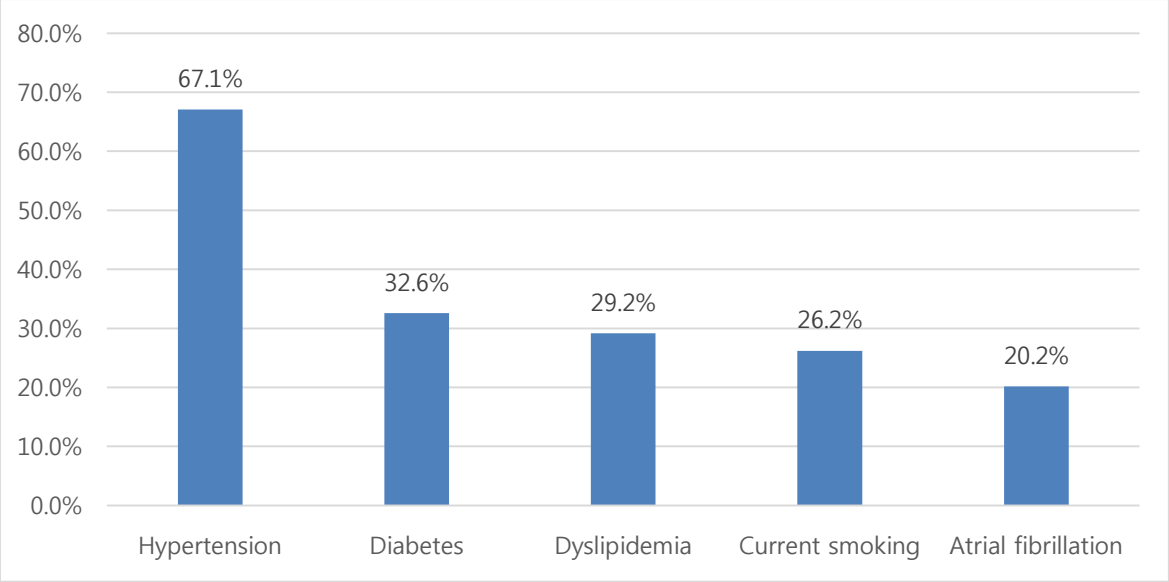

Figure 14. Percentages of major modifiable vascular risk factors

- Based on 32,504 ischemic stroke cases.

Table 12. Major vascular risk factors and their management before index strokes

Risk factors and prior managements	Frequency (n)	Percentage (%)
Hypertension	20804	64.0
Never diagnosed as hypertension	2200	10.6
Diagnosed but never treated of hypertension	1021	4.9
Ever-used BP-lowering medications	18771	90.2
Ceased using BP-lowering medications	840	4.5
Currently using BP-lowering medications	17938	95.6
Without regular treatment	606	3.4
With regular treatment	17328	96.6
Diagnosed at the index admission	2018	91.7
Diabetes	10596	32.6
Never diagnosed as diabetes	1762	16.6
Diagnosed but never treated of diabetes	418	3.9
Ever-used glucose-lowering medications	8754	82.6
Ceased using glucose-lowering medications	378	4.3
Currently using glucose-lowering medications	8380	95.7
Without regular treatment	291	3.5
With regular treatment	8088	96.5
Diagnosed at the index admission	1433	81.3
Dyslipidemia	9483	29.2
Never diagnosed as dyslipidemia	4410	46.5
Diagnosed but never treated of dyslipidemia	333	3.5
Ever-used cholesterol-lowering medications	4808	50.7
Ceased using cholesterol -lowering medications	278	5.8
Currently using cholesterol -lowering medications	4534	94.3

Without regular treatment	121	2.7
With regular treatment	4413	97.3
Diagnosed at the index admission	4366	99.0
Habitual smoking	12713	39.1
Current smoker	8513	67.0
Ex-smoker, quit within 5 years	2689	21.2
Ex-smoker, quit more than 5 years ago	1507	11.9
Pack-year	39.96±81.15	
Atrial fibrillation	6560	20.2
Diagnosed at the index admission	2925	44.6
Diagnosed before index stroke	3632	55.4
Without regular treatment	802	22.1
With regular treatment	2840	78.2

- Based on 32,504 ischemic stroke cases.

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

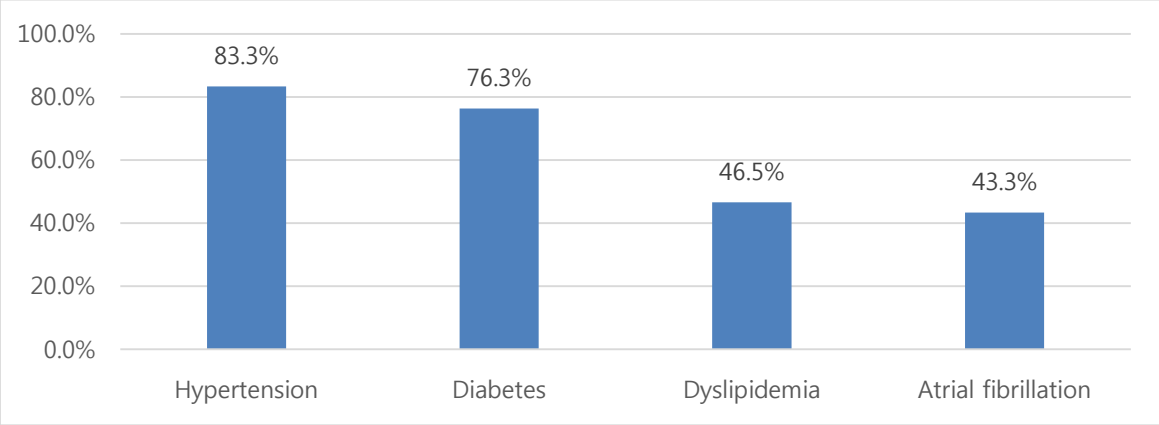

Figure 15. Percentages of regular treatment for vascular risk factors before stroke

- Based on 32,504 ischemic stroke cases.

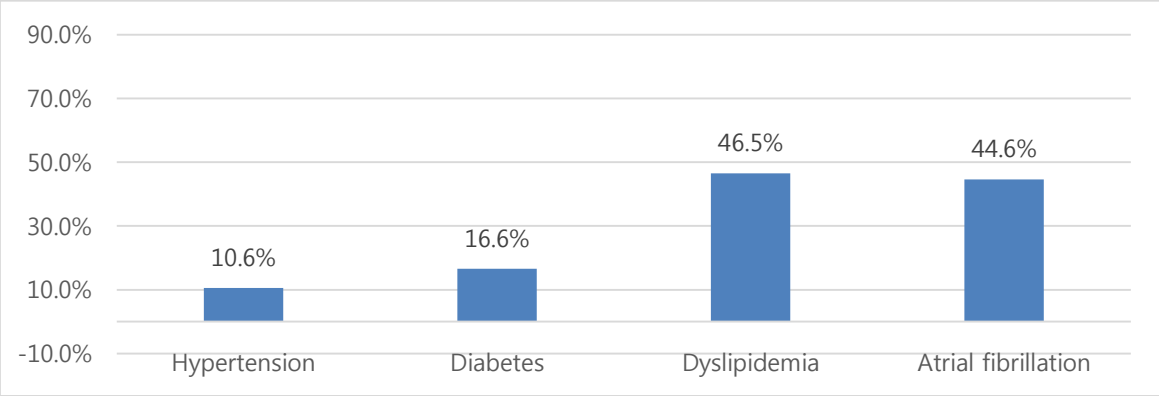

Figure 16. Percentages of undocumented vascular risk factors before stroke

- Based on 32,504 ischemic stroke cases.

Table 13. Profile of method of revacularization therapies for ischemic strokes

	Frequency (n)	Percentage* (%)	Percentage+ (%)
Method of revacularization therapies	4243	13.1	
Intravenous	2606	8.0	61.4
Intraarterial	681	2.1	16.0
Combined IV and IA	956	2.9	22.5
Types of thrombolytic agents			
rt-PA	3559	10.9	83.9
Urokinase	675	2.1	15.9
Abciximab	37	0.1	0.9

- Based on 32,504 ischemic stroke cases

* Percentages of ischemic stroke cases from 32,504 subjects

+ Percentages of revacularization therapies cases from 4,243 subjects

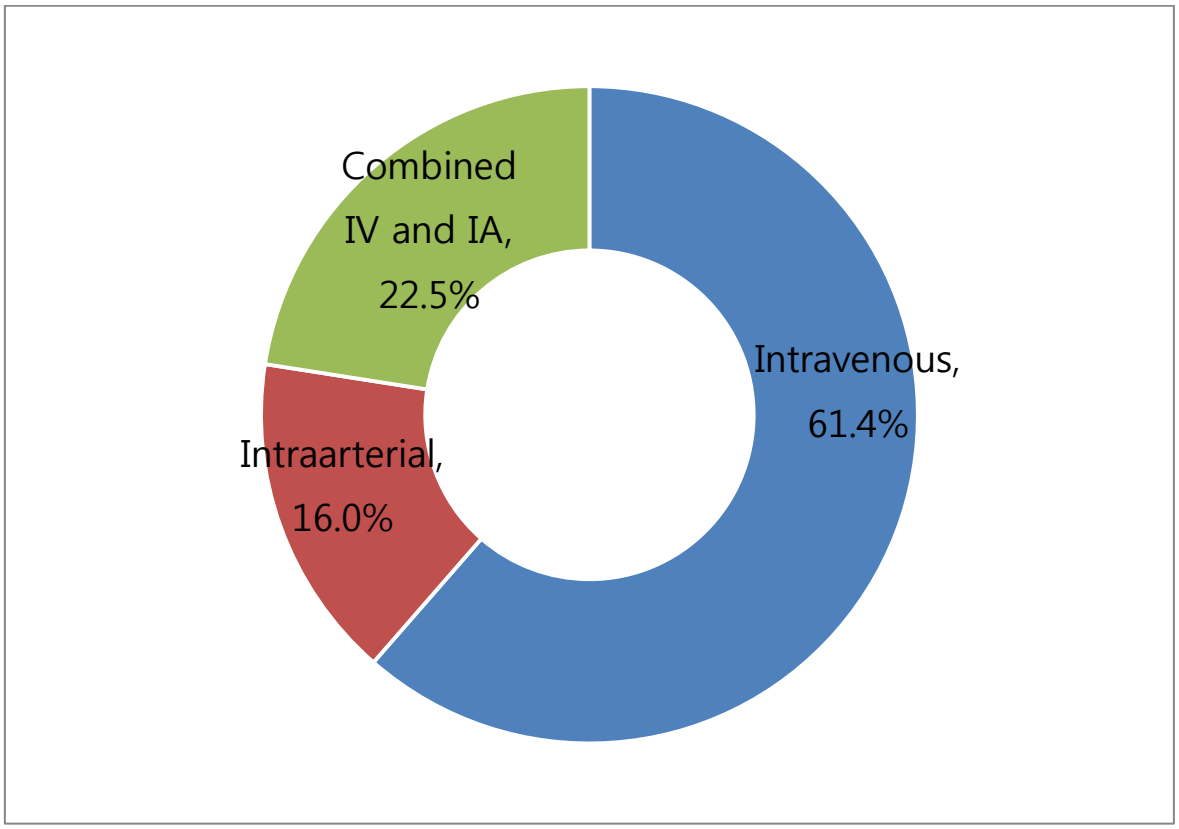

Figure 17. Composition of hyperacute revascularization treatment modalities

- Based on 32,504 ischemic stroke cases.

Table 14. Secular trend of revascularization modalities

	Number (%)					
	2009†	2010	2011	2012	2013	2014‡
Intravenous-only thrombolysis	71(3.3)	251(11.2)	444(13.7)	533(14.8)	601(14.6)	653(15.9)
Endovascular-only revascularization	19(0.9)	64(2.9)	89(2.7)	123(3.4)	154(3.7)	193(4.7)
Combined IV-endovascular revascularization	15(0.7)	72(3.2)	175(5.4)	177(4.9)	218(5.3)	286(7.0)

● Based on 20,955 cases from acute treatment database.
† From Nov 2009; ‡ Until Nov 2014

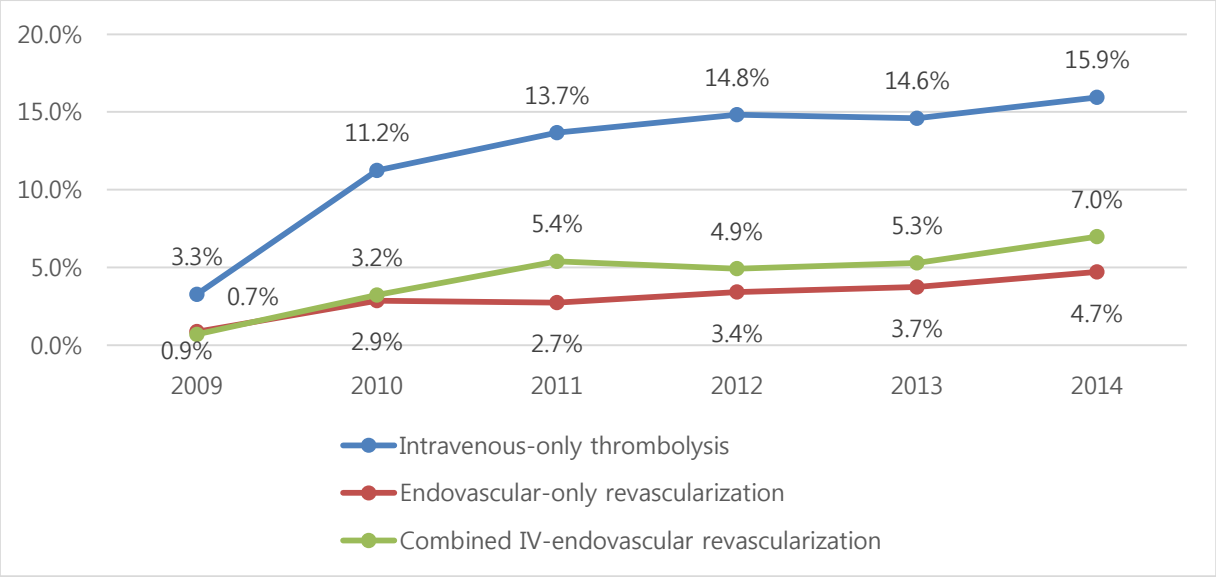

Figure 18. Secular trend of revascularization modalities

● Based on 20,955 cases from acute treatment database.
† From Nov 2009; ‡ Until Nov 2014

Table 15. Frequencies of potential cardioembolic sources (risk stratification according to the TOAST classification scheme)

	Frequency (n)	Percentage (%)*
Potential cardioembolic source - high risk	**6353**	**19.5**
Mechanical prosthetic valve	64	1.0
Mitral stenosis with atrial fibrillation	125	2.0
Atrial fibrillation(other than lone atrial fibrillation)	5705	89.8
Left atrial/atrial appendage thrombus	107	1.7
Sick sinus syndrome	76	1.2
Recent myocardial infarction(<4 week)	96	1.5
Left ventricular thrombus	34	0.5
Dilated cardiomyopathy	131	2.1
Akinetic left ventricular segment	161	2.5
Atrial myxoma	21	0.3
Infective endocarditis	34	0.5
Others	140	2.2
Potential cardioembolic source - medium risk	**1927**	**5.9**
Mitral valve prolapse	21	1.1
Mitral annulus calcification	3	0.2
Mitral stenosis without atrial fibrillation	30	1.6
Left atrial turbulence(smoke)	8	0.4
Atrial septal aneurysm	19	1.0
Patent foramen ovale	654	33.9
Atrial flutter	85	4.4
Lone atrial fibrillation	337	17.5
Bioprosthetic cardiac valve	23	1.2
Nonbacterial thrombotic endocarditis	3	0.2
Congestive heart failure	527	27.3
Hypokinetic left ventricular segment	285	14.8
Myocardial infarction(>4weeks, <6months)	60	3.1

- Based on 32,504 ischemic stroke cases.

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

Table 16. Frequency of etiological work-ups

Work-ups	Frequency (n)	Percentage (%)
CT	18027	55.5
CT angiography	11698	36.0
CT perfusion image	3146	9.7
Diffusion-weighted image	30273	93.1
Perfusion-weighted MR image	10436	32.1
Gradient-echo MR image	26220	80.7
MR Angiography	28130	86.5
Contrast-enhanced MR angiography	4990	15.4
Transthoracic echocardiography	23417	72.0
Transesophageal echocardiography	4993	15.4
24-hour Holter monitoring	10786	33.2
Transcranial Doppler sonography	23287	71.6
Carotid Doppler sonography	10809	33.3
Peripheral vascular study	5458	16.8
24-hour BP monitoring	1226	3.8
Single-Photon Emission Computed Tomography (SPECT)	1558	4.8
Positron Emission Tomography (PET)	672	2.1
Other studies	2807	8.6

- Based on 32,504 ischemic stroke cases.

Table 17. Profile of laboratory tests

Laboratory variables	Mean ± SD	Median [IQR]
White blood cell count (x 10^3 /μL)	8.5 ±7.7	7.7 [6.3 – 9.7]
Hemoglobin (g/dL)	13.58±2.00	13.70 [12.50 - 14.90]
Hematocrit (%)	40.57±17.87	40.00 [36.60 - 43.30]
Platelet count (x 103 / μ L)	29.31±83.79	234.00 [190.00 - 297.00]
Blood Urea Nitrogen (mg/dL)	17.14±9.05	15.00 [12.00 - 19.70]
Creatinine (mg/dL)	1.03±0.99	0.90 [0.70 - 1.09]
GOT (IU/L)	27.92±33.38	23.00 [19.00 - 30.00]
GPT (IU/L)	23.07±29.34	18.00 [13.00 - 26.00]
Total cholesterol (mg/dL)	177.35±42.93	175.00 [148.00 - 203.00]
Low density lipoprotein cholesterol (mg/dL)	109.10±37.40	107.00 [83.00 - 132.00]
High density lipoprotein cholesterol (mg/dL)	44.93±13.34	43.00 [36.00 - 52.00]
Triglyceride (mg/dL)	122.5±82.22	102.2 [73.00 - 147.00]
Initial Glucose (mg/dL)	145.45±59.88	125.0 [105.00 - 151.00]
Fasting Glucose (mg/dL)	122.87±52.58	108.00 [92.00 - 135.00]
Hb A1c (%)	6.39±1.42	5.90 [5.50 - 6.70]
Prothrombin time (INR)	1.04±0.28	1.00 [0.95 - 1.06]
Systolic blood pressure (mm Hg)	146.20±27.02	141.00 [130.00 - 160.00]
Diastolic blood pressure (mm Hg)	85.05±15.71	83.00 [75.00 - 94.00]

- Based on 32,504 ischemic stroke cases.

Table 18. Profile of acute stroke medications (multiple choices permitted)

	Frequency (n)	Percentage (%)
Aspirin	26378	81.2
Clopidogrel	10236	31.5
Dypiridamole	4	0.0
Cilostazol	1143	3.5
Triflusal	168	0.5
Ticlopidine	91	0.3
Warfarin	2592	8.0
Heparin	1924	5.9
Low-molecular weight heparin	403	1.2
Thrombin inhibitor	131	0.4
Other medication	88	0.3

- Based on 32,504 ischemic stroke cases.

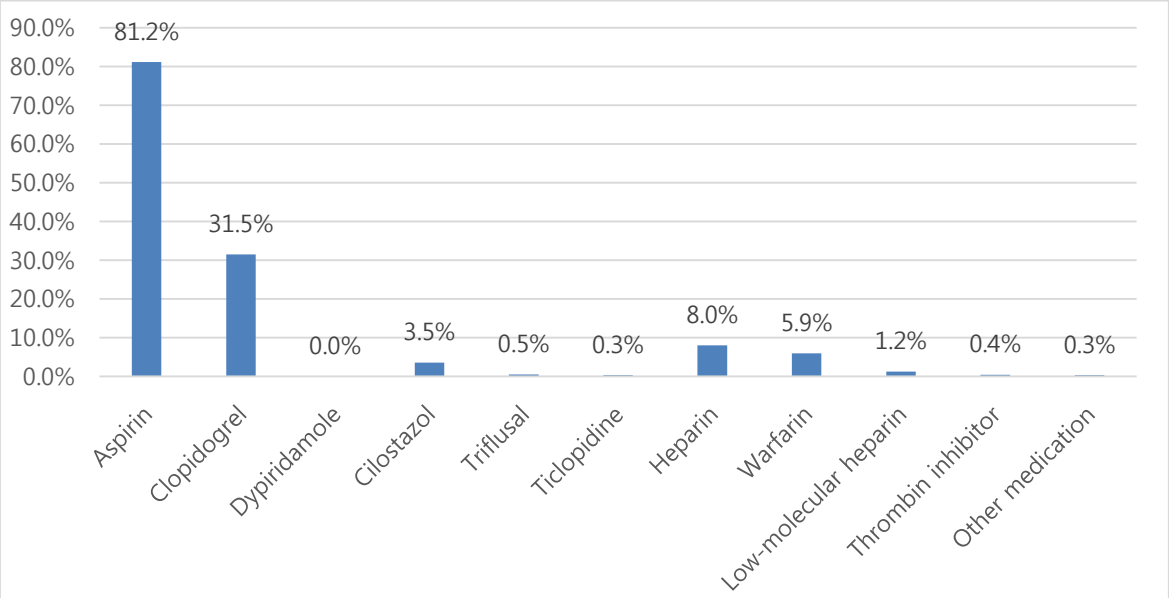

Figure 19. Percentages of acute stroke medications (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

Table 19. Secular trend of acute stroke medications (multiple choices permitted)

	Number of prescription (%)						
	2008†	2009	2010	2011	2012	2013	2014‡
Aspirin	1932(78.2)	2779(79.7)	2908(82.4)	4188(83.8)	4320(78.5)	5286(83.6)	4965(80.2)
Clopidogrel	721(29.2)	1097(31.5)	1258(35.6)	1651(33.1)	1645(29.9)	1854(29.3)	2010(32.5)
Warfarin	119(4.8)	208(6.0)	256(7.3)	458(9.2)	517(9.4)	521(8.2)	513(8.3)
Heparin*	243(9.8)	386(11.1)	344(9.7)	348(7.0)	335(6.1)	428(6.8)	243(3.9)
Other medications	7(0.3)	5(0.1)	9(0.3)	15(03)	10(0.2)	29(0.5)	14(0.2)

- Based on 32,504 ischemic stroke cases.

† From Apr 2008; ‡ Until Nov 2014

* Both conventional and low-molecular-weighted heparin

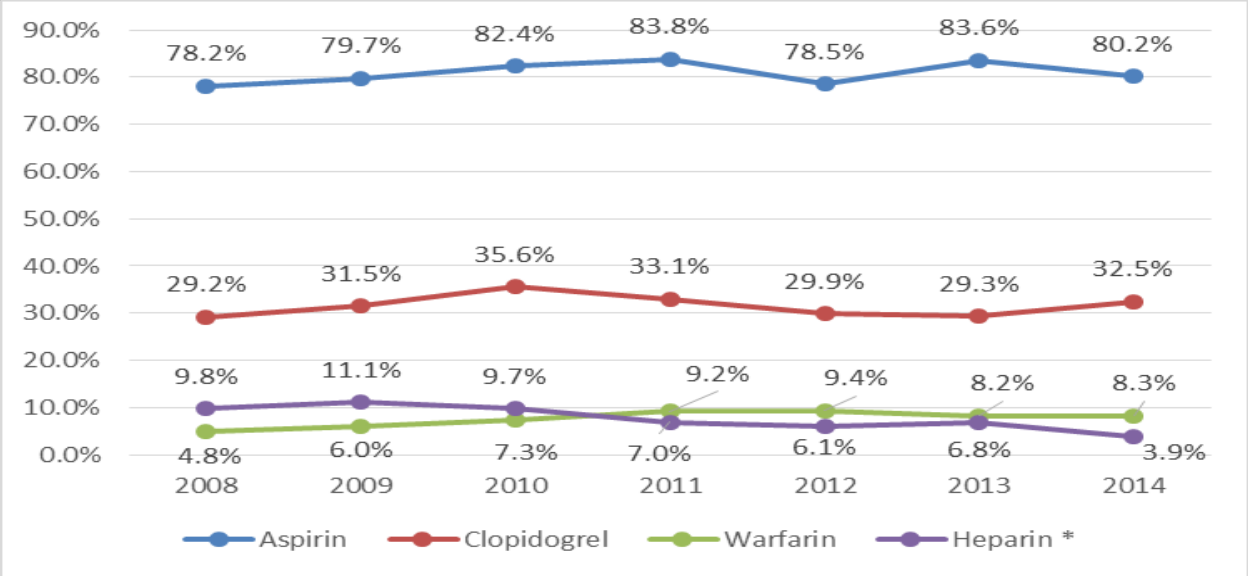

Figure 20. Secular trend of acute stroke medications (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

† From Apr 2008; ‡ Until Nov 2014

* Both conventional and low-molecular-weighted heparin

Table 20. Profile of secondary preventive medications at discharge (multiple choices permitted)

	Frequency (n)	Percentage (%)
Aspirin	22479	69.2
Clopidogrel	11479	35.3
Dypiridamole	1	0.0
Cilostazol	2557	7.9
Triflusal	403	1.2
Ticlopidine	353	1.1
Other antiplatelets	134	0.4
Warfarin	5797	17.8
DOAC*	122	0.4
Other anticoagulants	344	1.1

- Based on 32,504 ischemic stroke cases.

* DOAC (Apixaban, Dabigatran, Rivaroxaban)

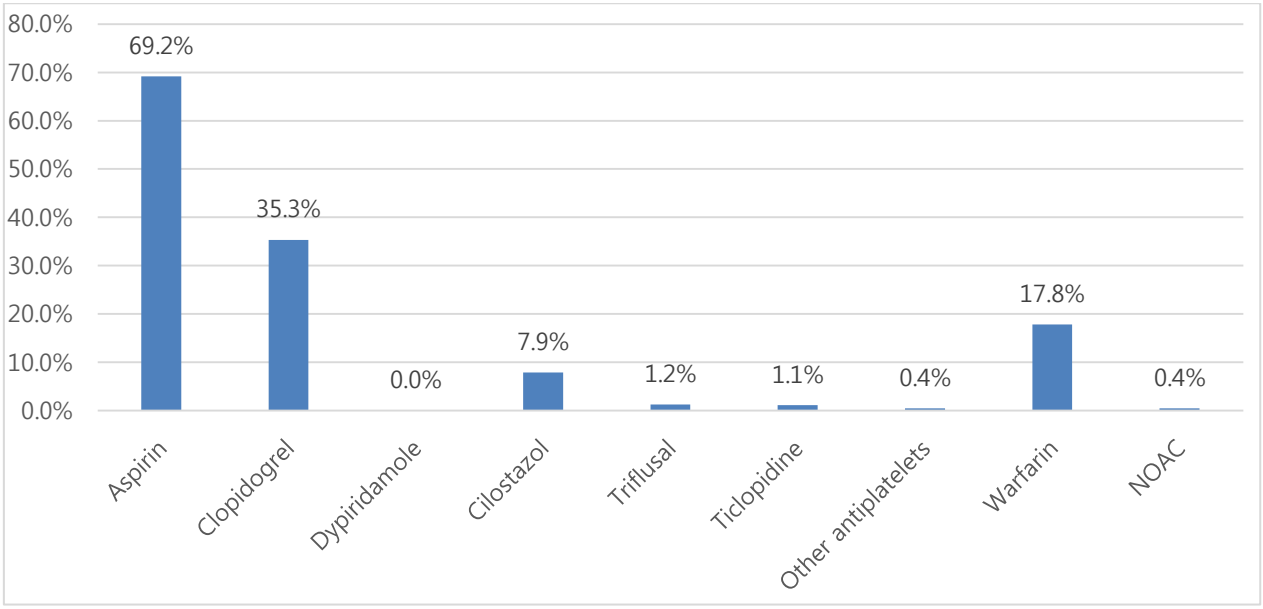

Figure 21. Percentages of secondary preventive medications at discharge (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

Table 21. Secular trend of secondary preventive medications at discharge (multiple choices permitted)

	Number of prescription (%)						
	2008†	2009	2010	2011	2012	2013	2014‡
Aspirin	1701(68.8)	2408(69.1)	2451(69.4)	3493(69.9)	3672(66.7)	4508(71.3)	4246(68.6)
Clopidogrel	940(38.0)	1334(38.3)	1371(38.8)	1820(36.4)	1730(31.4)	2040(32.2)	2244(36.2)
Warfarin	454(18.4)	627(18.0)	670(19.0)	876(17.5)	977(17.7)	1072(16.9)	1121(18.1)
DOACs*	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	70(1.1)	62(1.0)
Other medications	16(0.6)	31(0.9)	59(1.7)	68(1.4)	114(2.1)	125(2.0)	65(1.0)

- Based on 32,504 ischemic stroke cases.

† From Apr 2008; ‡ Until Nov 2014

* DOACs (Apixaban, Dabigatran, Rivaroxaban)

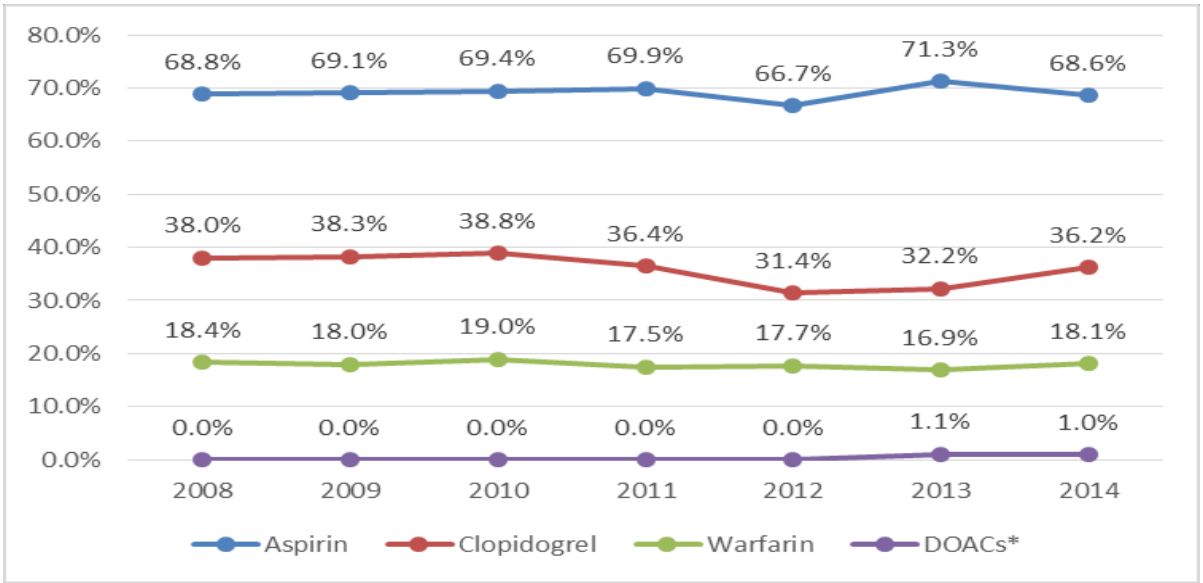

Figure 22. Secular trend of secondary preventive medications at discharge (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

† From Apr 2008; ‡ Until Nov 2014

* DOACs (Apixaban, Dabigatran, Rivaroxaban)

Table 22. Profile of surgical interventions during acute period of stroke (multiple choices permitted)

	Frequency (n)	Percentage (%)
Decompressive surgery	139	0.4
Bypass surgery	21	0.1
Endarterectomy	83	0.3
Angioplasty or stenting	504	1.6
Other interventions	90	0.3

- Based on 32,504 ischemic stroke cases.

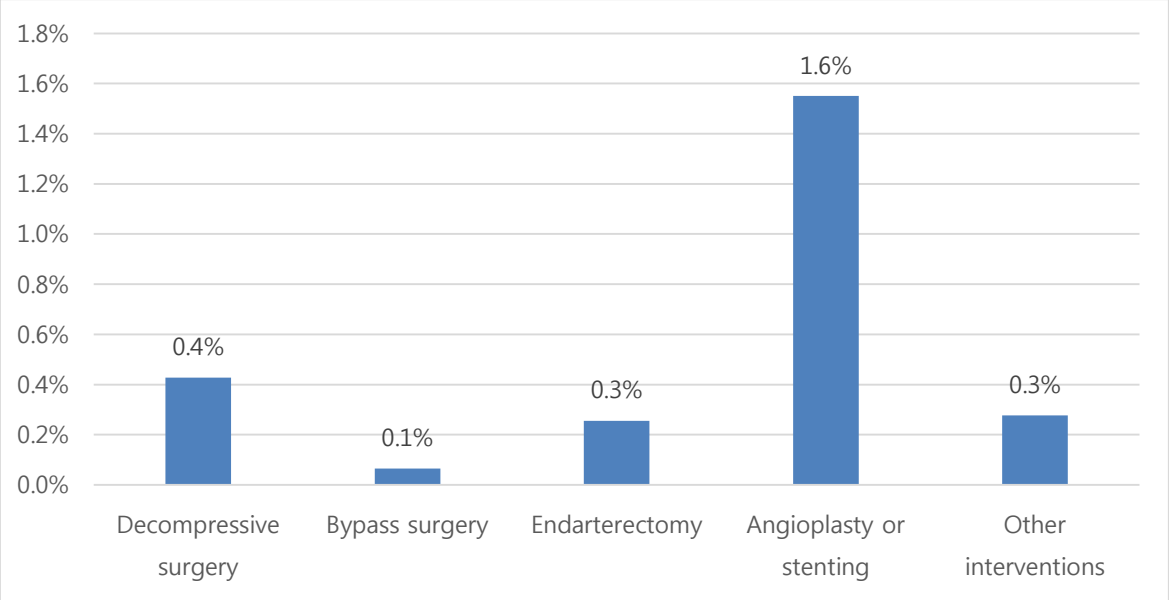

Figure 23. Percentages of surgical interventions during acute period of stroke (multiple choices permitted)

- Based on 32,504 ischemic stroke cases.

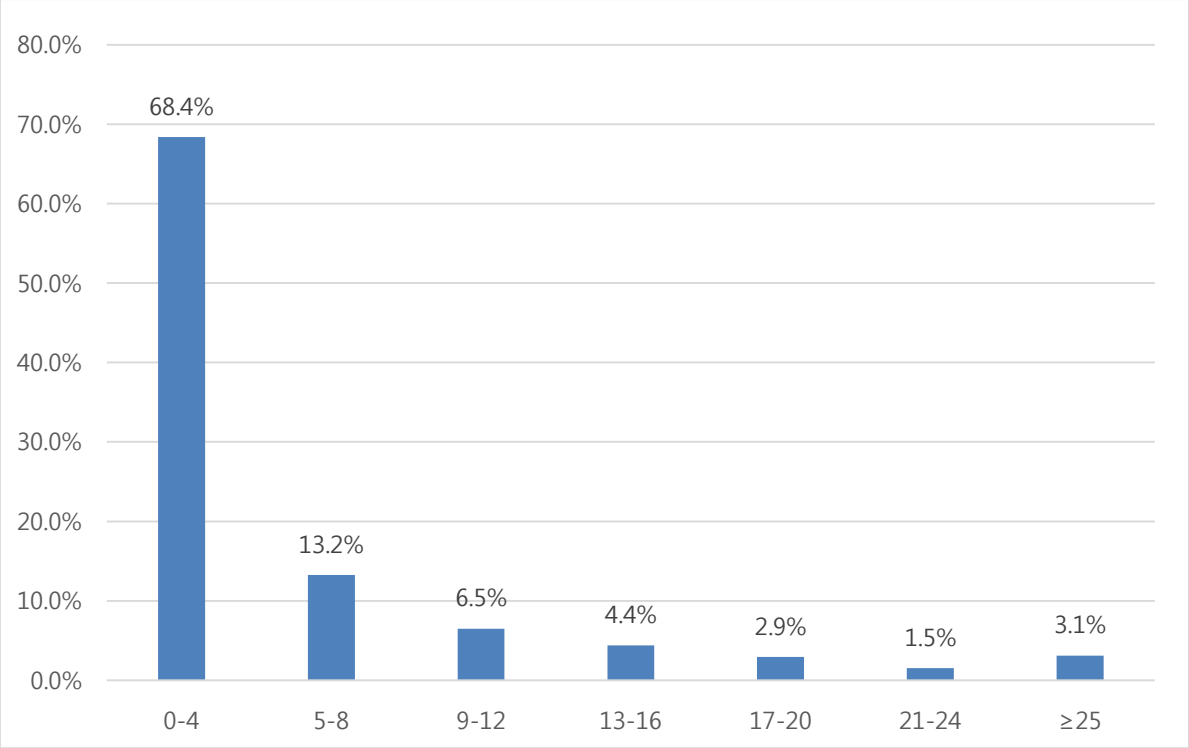

Figure 24. NIHSS score at discharge

- Based on 32,504 ischemic stroke cases.

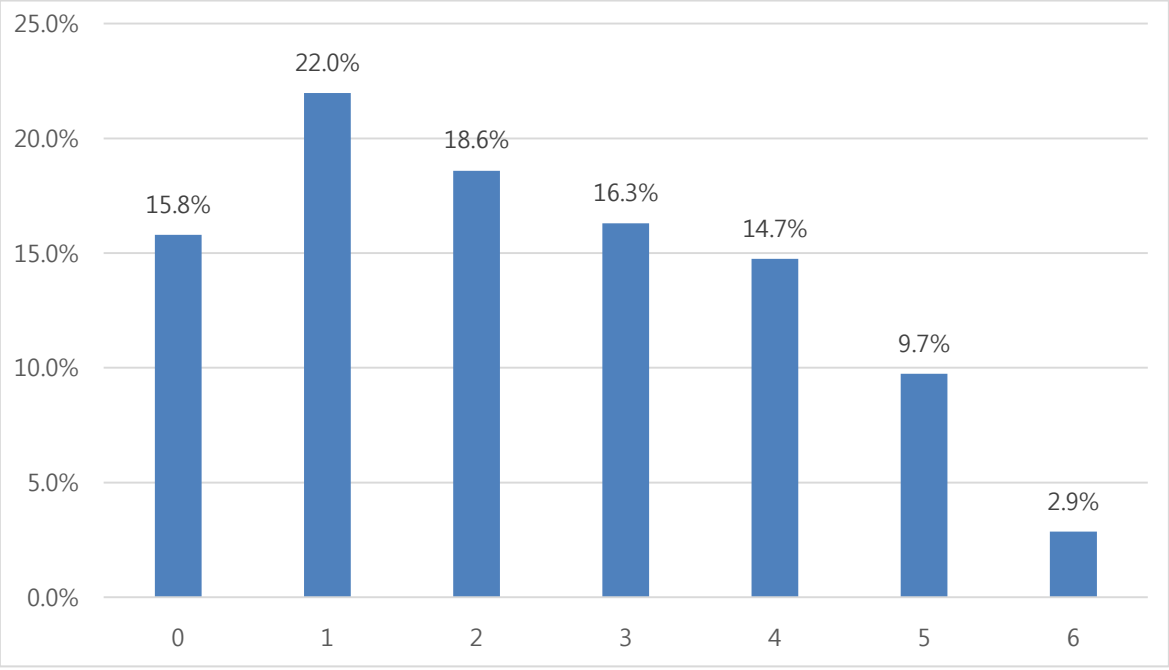

Figure 25. mRS score at discharge

- Based on 32,504 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 an acute treatment database devoted to collect clinical and treatment information of acute ischemic stroke. At January 2011, six new members were introduced to the acute treatment database (Eulji University Hospital, Dona-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 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 4,139 (20% of 20,955 registered stroke cases during identical period) cases received revascularization treatment for acute ischemic stroke. Intravenous-only pharmacological thrombolysis was performed in 2,553 (62%), endovascular-only revascularization in 642 (16%), and combined IV-endovascular revascularization in 944 (23%) strokes. Overall, endovascular recanalization strategies were utilized in 38% of revascularization treatments (Table 23 Modality of revascularization treatment for acute ischemic stroke).

- Fifty percent (n=10,513) of the registered cases admitted to the stroke unit for acute treatment.

- For stroke cases with hyperacute treatment, onset-to-arrival time delay was 3.9 ± 14.7 hours on average, with median 1.6 [interquartile range, 0.85 – 2.9]. Average onset-to-arrival time of intravenous only thrombolysis and combined IV-endovascular revascularization was around 4 hours, but that of endovascular-only revacularization exceeded 6 hours (9.9± 27.1 hours on average, median 5.1 hour) (Table 24 Discrepancy in onset (last normal time) to arrival time according to the treatment modality).

- Onset (Last normal time) to arrival time was mostly (86%) clear in cases who arrived within 3 hours, and shown to have a larger proportion of unclear onset as onset to arrival time increases (Figure 26. Proportions of clear onset, unclear onset by categorized onset (Last normal time) to arrival time).

- For acute ischemic strokes with revascularization treatment, 89% of cases arrived stroke centers within 6 hours after onset (last normal time). Door-to-needle time was achieved within 1 hour in 86.4% of the cases and door-to-puncture time within 1 hour in 9.6% (Table 25 Categorized onset-to-arrival time (last normal time), Table 27 Categorized door-to-needle time and Table 28 Categorized door-to-puncture time).

- 2,608 cases (21%) showed worsening of the symptom in 1 day after revascularization treatment. 70% underwent mild progression (NIHSS score

increment within 4 points) (Figure 27 Difference of NIHSS score over arrival and post-revascularization day #1)

Stroke center statistics for revascularization treatment

- Median door-to-needle time was 39 minutes, and median door-to-puncture time was 110 minutes. There was a discrepancy with door-to-needle time and door-to-puncture time among centers (Table 29 Door-to-needle time and door-to-puncture time by center)..

- Volume of acute revascularization treatment varied for each stroke center Revascularization modality also varied among stroke centers. Rate of endovascular treatment, including both endovascular-only revascularization (IA-only) and combined IV-endovascular revascularization (Combined), range from 11% (Hospital #08) to 64% (Hospital #02). However, the differences in onset-to-arrival time and NIHSS score between stroke centers were noticeable (Table 30 Onset-to-arrival times and NIHSS scores between stroke centers, Table 31 Discrepancy of revascularization modality among stroke centers, and Figure 29 Discrepancy of revascularization modality among stroke centers).

Table 23. Modality of revascularization treatment for acute ischemic stroke

Treatment modality	Frequency (n)	Percentage (%)
Intravenous-only thrombolysis	2553	12.2
Endovascular-only revascularization	642	3.1
Combined IV-endovascular revascularization	944	4.5
Total	4139	

- Based on 20,955 cases from acute treatment database

Table 24. Discrepancy in onset (last normal time) to arrival time according to the treatment modality

Treatment modality	Mean ± SD (hour)	Median [IQR]
Intravenous-only thrombolysis	3.9±14.7	1.6 [0.85,2.9]
Endovascular-only revascularization	9.9±27.1	5.1 [2.7,10.2]
Combined IV-endovascular revascularization	4.0±22.0	1.5 [0.7,2.8]

- Based on 20,955 cases from acute treatment database

Table 25. Categorized onset(Last normal time) to arrival time

Onset-to-arrival time	Frequency (n)	Percentage (%)
≤3 hours	2925	70.7
3 - 4.5 hours	540	13.0
4.5 – 6 hours	198	4.8
6 – 12 hours	306	7.4
> 12 hours	170	4.1
Total	4139	

- Based on 20,955 cases from acute treatment database

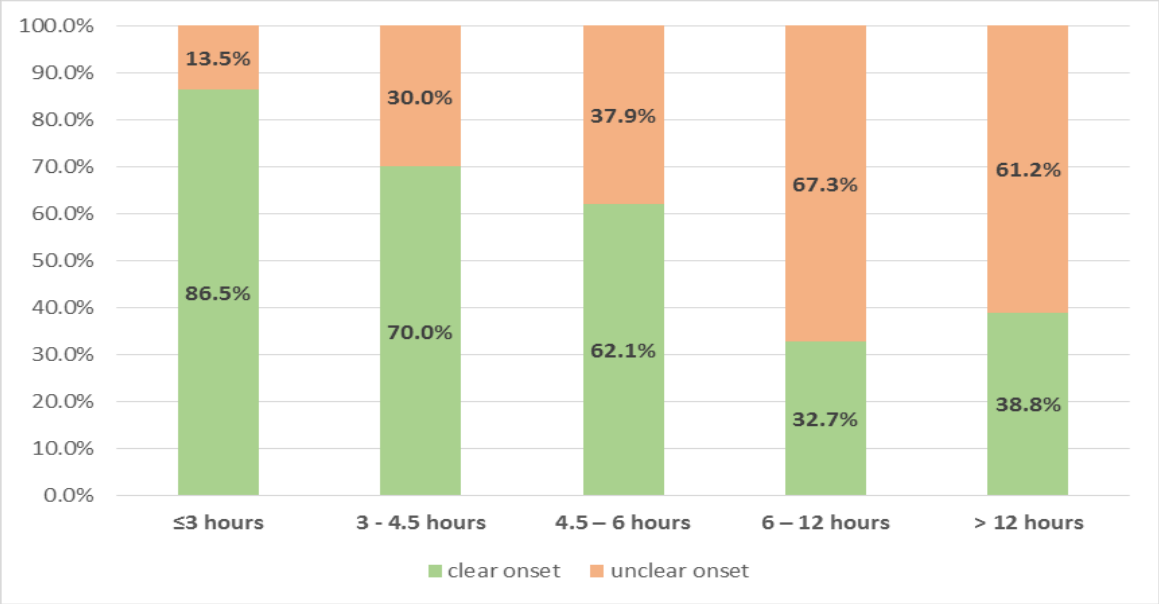

Figure 26. Proportions of clear onset, unclear onset by categorized onset (Last normal time) to arrival time

- Based on 20,955 cases from acute treatment database

Table 26. Categorized onset(First abnormal time) to arrival time

Onset-to-arrival time	Frequency (n)	Percentage (%)
≤3 hours	3320	80.2
3 - 4.5 hours	455	11.0
4.5 – 6 hours	154	3.7
6 – 12 hours	127	3.1
> 12 hours	83	2.0
Total	4139	

- Based on 20,955 cases from acute treatment database

Table 27. Categorized door-to-needle time

Door-to-needle time	Frequency (n)	Percentage (%)
≤ 0.5 hours	1268	36.5
0.5 -1 hours	1734	49.9
1 -2 hours	381	11.0
> 2 hours	88	2.6
Total	3471	

- Based on 3,497 cases from acute treatment database

Table 28. Categorized door-to-puncture time

Door-to-puncture time	Frequency (n)	Percentage (%)
≤ 0.5 hours	39	2.5
0.5 -1 hours	110	7.1
1 -2 hours	799	51.5
> 2 hours	603	38.9
Total	1551	

- Based on 1,586 cases from acute treatment database

Table 29. Door-to-needle time and door-to-puncture time by center

Hospital (Anonymized)	Door to needle time (minute)	Door to puncture time (minute)
	Median [q1,q3]	Median [q1,q3]
1	29 [26, 36]	91.5 [74.5, 115.5]
2	48 [38, 64]	148 [115, 172]
3	45 [33, 56.5]	109.5 [92, 127.5]
4	40 [32, 52]	165 [143, 180]
5	28 [20, 38]	103 [88, 134]
6	41 [30, 56]	94 [77, 113]
7	41 [29, 51]	151 [116, 173]
8	50 [40.5, 64.5]	172.5 [153, 199]
9	42 [34, 54]	128.5 [109, 149]
10	44 [34, 55]	155 [119, 172]
11	42 [34, 55]	76 [56, 104.5]
12	35 [27, 45]	114.5 [93, 129]
13	36 [30, 47]	145 [108, 169]
14	41 [29, 55]	87.5 [70, 118]
15	48 [38, 58]	213.5 [161, 254]
Total	39 [29, 52]	110 [86, 139]

- Based on 3,497 cases from acute treatment database

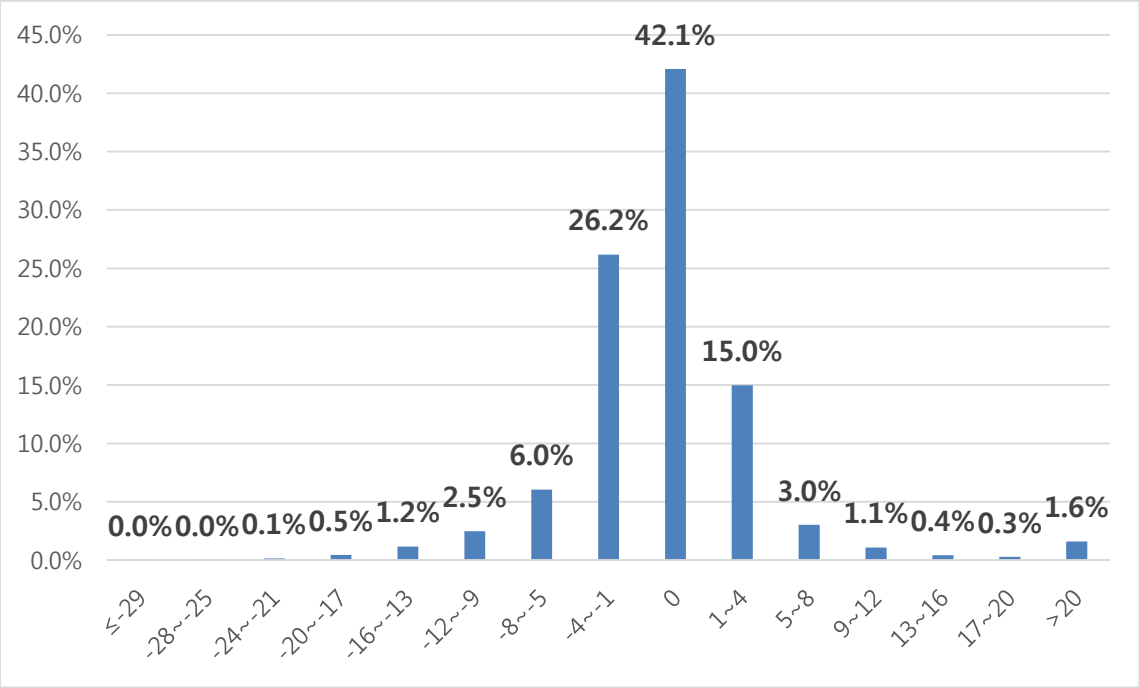

Figure 27. Difference of NIHSS score over arrival and post-revascularization day #1

- Based on 20,955 cases from acute treatment database

* The horizontal axis is demonstrated as
[NIHSS score at post-revascularization day #1] - [NIHSS score at arrival]

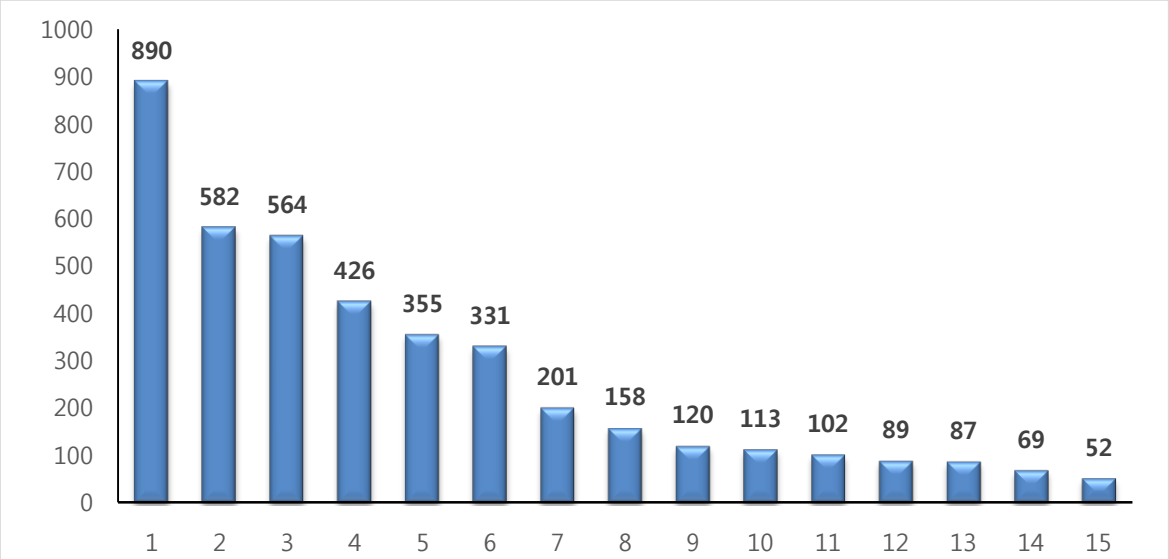

Figure 28. Volume of acute revascularization treatment for each stroke center (Anonymized)

(Available in 3,382 cases)

- Based on 20,955 cases from acute treatment database

Table 30. Onset(FAT)-to-arrival times and NIHSS scores between stroke centers

Hospital (Anonymized)	Onset to arrival time (hour)*	NIHSS score at arrival *
1	5.8±6.55	7.62±7.87
2	3.38±6.55	6.61±6.35
3	6.22±6.33	7.2±6.85
4	6.52±6.19	6.06±5.92
5	5.89±5.63	7.52±6.68
6	6.02±6.19	6.43±7.18
7	5.4±13.9	6.75±6.38
8	6.1±6.6	6.86±7.03
9	6.33±6.09	6.94±7.01
10	5.99±6.39	6.66±6.57
11	5.74±6.11	7.63±8.07
12	6.02±5.78	6.66±5.93
13	5.42±5.97	7.5±7.24
14	6.15±6.5	5.75±5.55
15	5.83±7.08	7.04±7.00
Total	6.04±6.53	6.92±6.82

- Based on 20,955 cases from acute treatment database

*Mean ± SD

Table 31. Discrepancy of revascularization modality among stroke centers

Hospital (Anonymized)	IV-only (n)	Per (%)	IA-only (n)	Per (%)	Combined (n)	Per (%)	Total (n)	Per (%)
1	569	63.9	138	15.5	183	20.6	890	4.2
2	208	35.7	181	31.1	193	33.2	582	2.8
3	402	71.3	51	9.0	111	19.7	564	2.7
4	251	58.9	85	20.0	90	21.1	426	2.0
5	231	65.1	53	14.9	71	20.0	355	1.7
6	205	61.9	31	9.4	95	28.7	331	1.6
7	123	61.2	26	12.9	52	25.9	201	1.0
8	141	89.2	7	4.4	10	6.3	158	0.8
9	83	69.2	12	10.0	25	20.8	120	0.6
10	86	76.1	5	4.4	22	19.5	113	0.5
11	64	62.7	11	10.8	27	26.5	102	0.5
12	71	79.8	3	3.4	15	16.9	89	0.4
13	58	66.7	9	10.3	20	23.0	87	0.4
14	35	50.7	16	23.2	18	26.1	69	0.3
15	26	50.0	14	26.9	12	23.1	52	0.2
Total	2553		642		944		4139	

- Based on 20,955 cases from acute treatment database

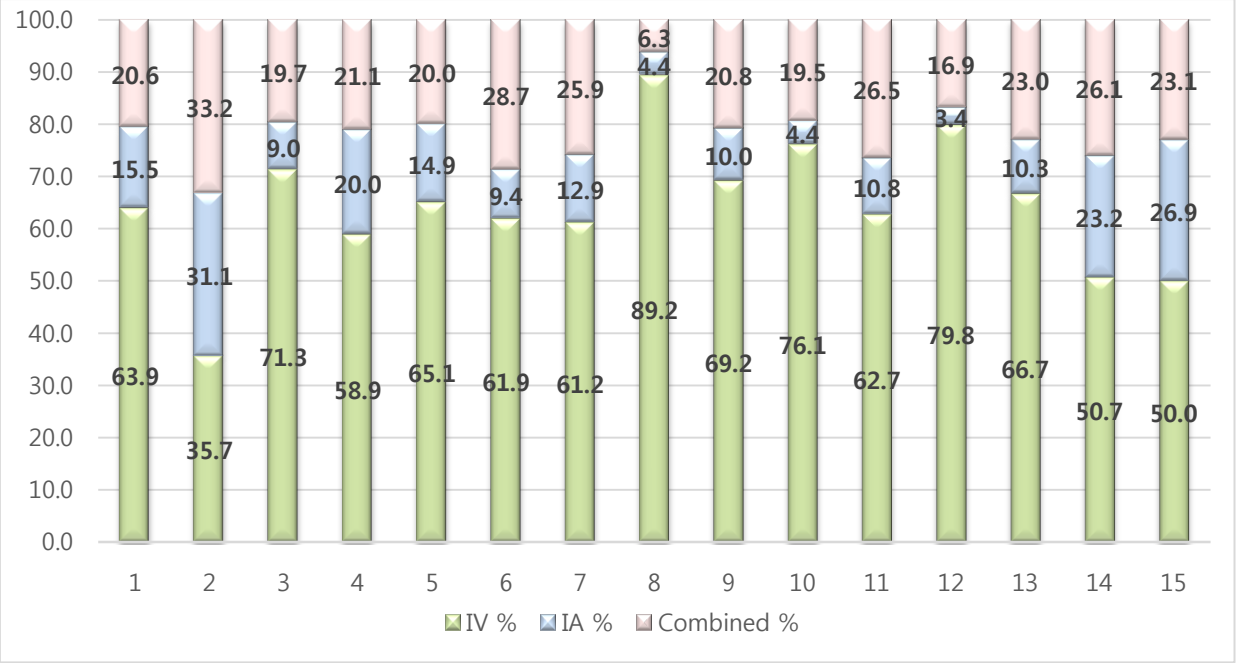

Figure 29. Discrepancy of revascularization modality among stroke centers

- Based on 20,955 cases from acute treatment database

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 at 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 system 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 the 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 within 3 weeks after 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 not 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 is defined as a death caused by any etiologies including etiologies other than stroke, acute myocardial infarction, or sudden death.

- The present outcome statistics is based on the database distributed on November 2014.

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

- From the Outcome database, mRS scores at 3 month after stroke were available in 20,813 (93%) cases and mRS score at 1 year in 14,094 (91%) cases. Functional independence (mRS score 0 or 1) was shown in 44% after 3 months and 50% after 1 year, while patients with catastrophic outcome were 7% and 11% after 3 months and 1 year, respectively. (Table 32 Distribution of mRS score at discharge and 3 month and 1 year after stroke and Table 35. mRS score matrix of discharge and 3 months after stroke and Table 36 mRS score matrix of 3 months and 1 year after stroke).

- According to the secular trend of mRS score at 3 month after stroke, cases with mRS score 0 or 1 showed a decreasing trend while cases with mRS score 2 increased. Secular trend of mRS score at 1 year after stroke was similar to the secular trend of mRS score at 3 month after stroke (Table 33, Figure 30 Secular trend of mRS score at 3 month after stroke and Table 34, Figure 31 Secular trend of mRS score at 1 year after stroke).

- Early neurological deterioration occurred in 4,190 (13%) cases, with most of the cases were stroke progression (n=2,906; 69%) (Figure 32 Frequencies of post-stroke events, Table 37 and Figure 33 Proportion of early neurological deteriorations (END) types within 3 weeks after stroke).

Prospective Capture of Vascular Events after Stroke Onset

- CRCS-5 implemented a systemic protocol for prospective capture of vascular events after stroke onset throughout all the participating centers. With the commencement of MOSAIC cohort, returning cases at 3 months or 1 year after stroke who admitted before MOSAIC cohort were subjected to the surveillance system. Registered data from the five centers which started to gather prospective outcomes (Eulji General Hospital, Seoul National University Bundang Hospital, Seoul Medical Center, Soonchunhyang University Hospital Seoul, Inje University Ilsan Paik Hospital) were also gathered together for the vascular event database. Through the above process, CRCS-5 database secured prospective vascular outcomes from a total of 22,893 cases.

- At 3 months after stroke, the event rates of vascular outcomes were as following; recurrent stroke 3.4%, myocardial infarction 0.2%, vascular death 2.9%, and all-cause death 6.6%. At 1 year after stroke, the event rates were as following; recurrent stroke 5.2%, myocardial infarction 0.4%, vascular death 3.6%, and all-cause death 11.1% (Table 38 Cumulative events rates of vascular events after stroke onset).

Table 32. Distribution of mRS score at discharge and 3 month and 1 year after stroke

mRS score	Discharge*		3 months†		1 year‡	
	n	%	n	%	n	%
0	5115	15.8	5022	22.4	4538	29.2
1	7116	22.0	4753	21.2	3123	20.1
2	6022	18.6	3511	15.7	2034	13.1
3	5280	16.3	2790	12.5	1681	10.8
4	4777	14.7	2172	9.7	1189	7.6
5	3154	9.7	1487	6.6	839	5.4
6	926	2.9	1078	4.8	690	4.4
Missing/Unknown	114	0.4	1572	7.0	1473	9.5
Available case	32410		22385		15567	

● Based on 32,504 ischemic stroke cases or outcome DB.
* From Apr 2008 to Nov 2014; † From Jan 2011 to Nov 2014; ‡ From Jan 2011 to Dec 2013

Table 33. Secular trend of mRS score at 3 month after stroke

	Number (%)					
	2009†	2010	2011	2012	2013	2014‡
mRS 0	20(29.9)	165(26.7)	1212(25.7)	1268(24.1)	1241(21.7)	1302(23.0)
mRS 1	19(28.4)	127(20.5)	1053(22.3)	1187(22.5)	1224(21.4)	1290(22.8)
mRS 2	4(6.0)	83(13.4)	701(14.9)	800(15.2)	1070(18.7)	940(16.6)
mRS 3	9(13.4)	68(11.0)	606(12.8)	704(13.4)	770(13.5)	710(12.6)
mRS 4	9(13.4)	51(8.2)	480(10.2)	529(10.0)	578(10.1)	585(10.4)
mRS 5	5(7.5)	61(9.9)	353(7.5)	347(6.6)	393(6.9)	396(7.0)
mRS 6	1(1.5)	64(10.3)	311(6.6)	433(8.2)	437(7.6)	426(7.5)

● Based on 32,504 ischemic stroke cases.
† From 2009; ‡ Until Nov 2014

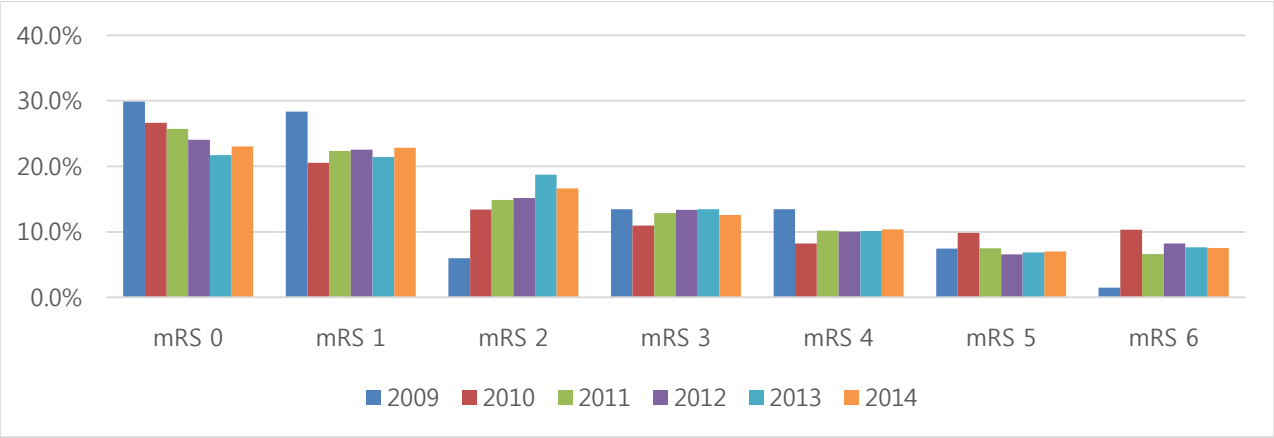

Figure 30. Secular trend of mRS score at 3 month after stroke

● Based on 32,504 ischemic stroke cases.
† From 2009; ‡ Until Nov 2014

Table 34. Secular trend of mRS score at 1 year after stroke

	Number (%)					
	2009†	2010	2011	2012	2013	2014‡
mRS 0	37(32.7)	821(34.5)	1445(32.0)	1619(31.3)	1475(27.8)	295(21.9)
mRS 1	22(19.5)	449(18.8)	967(21.4)	1049(20.3)	1108(20.9)	253(18.8)
mRS 2	10(8.8)	259(10.9)	568(12.6)	637(12.3)	830(15.6)	234(17.4)
mRS 3	14(12.4)	242(10.2)	506(11.2)	570(11.0)	605(11.4)	163(12.1)
mRS 4	9(8.0)	207(8.7)	350(7.8)	414(8.0)	425(8.0)	123(9.1)
mRS 5	11(9.7)	139(5.8)	241(5.3)	287(5.5)	311(5.9)	86(6.4)
mRS 6	10(8.8)	265(11.1)	438(9.7)	603(11.6)	555(10.5)	194(14.4)

● Based on 32,504 ischemic stroke cases.
† From 2009; ‡ Until Nov 2014

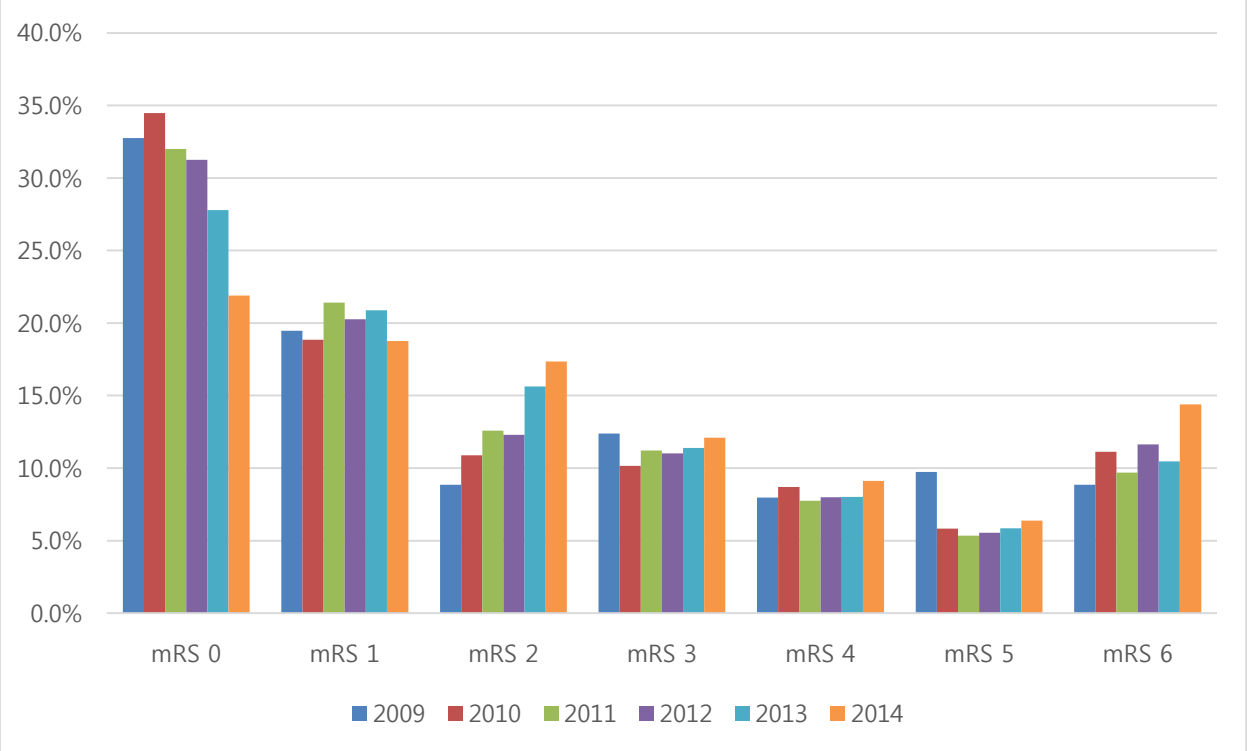

Figure 31. Secular trend of mRS score at 1 year after stroke

● Based on 32,504 ischemic stroke cases.
† From 2009; ‡ Until Nov 2014

Table 35. mRS score matrix of discharge and 3 months after stroke

		3 months							
		0	1	2	3	4	5	6	total
At discharge	0	2532	548	241	123	89	58	53	3644
		69.5%	15.0%	6.6%	3.4%	2.4%	1.6%	1.5%	
	1	1733	2457	373	130	49	21	44	4807
		36.1%	51.1%	7.8%	2.7%	1.0%	0.4%	0.9%	
	2	653	1264	1770	251	100	36	66	4140
		15.8%	30.5%	42.8%	6.1%	2.4%	0.9%	1.6%	
	3	219	481	912	1553	245	81	103	3594
		6.1%	13.4%	25.4%	43.2%	6.8%	2.3%	2.9%	
	4	59	123	270	677	1346	325	264	3064
		1.9%	4.0%	8.8%	22.1%	43.9%	10.6%	8.6%	
	5	10	24	33	132	402	1029	540	2170
		0.5%	1.1%	1.5%	6.1%	18.5%	47.4%	24.9%	
	6	0	0	0	0	0	0	556	556
		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
	TOTAL	5206	4897	3599	2866	2231	1550	1626	**21975**

- Based on 21,975 cases whose mRS scores at discharge and 3 months were available.

Table 36. mRS score matrix of 3 months and 1 year after stroke

		1 year							
		0	1	2	3	4	5	6	total
3 months	0	3575	249	66	32	17	9	41	3989
		89.6%	6.2%	1.7%	0.8%	0.4%	0.2%	1.0%	
	1	1007	2390	196	69	25	12	46	3745
		26.9%	63.8%	5.2%	1.8%	0.7%	0.3%	1.2%	
	2	304	607	1555	191	49	31	49	2786
		10.9%	21.8%	55.8%	6.9%	1.8%	1.1%	1.8%	
	3	54	157	425	1288	160	47	110	2241
		2.4%	7.0%	19.0%	57.5%	7.1%	2.1%	4.9%	
	4	7	21	60	258	946	215	180	1687
		0.4%	1.2%	3.6%	15.3%	56.1%	12.7%	10.7%	
	5	3	3	6	31	117	630	316	1106
		0.3%	0.3%	0.5%	2.8%	10.6%	57.0%	28.6%	
	6	0	0	0	0	0	0	1071	1071
		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
	TOTAL	4950	3427	2309	1869	1314	943	1813	**16625**

- Based on 16,625 cases whose mRS scores at 3 months and 1 year were available.

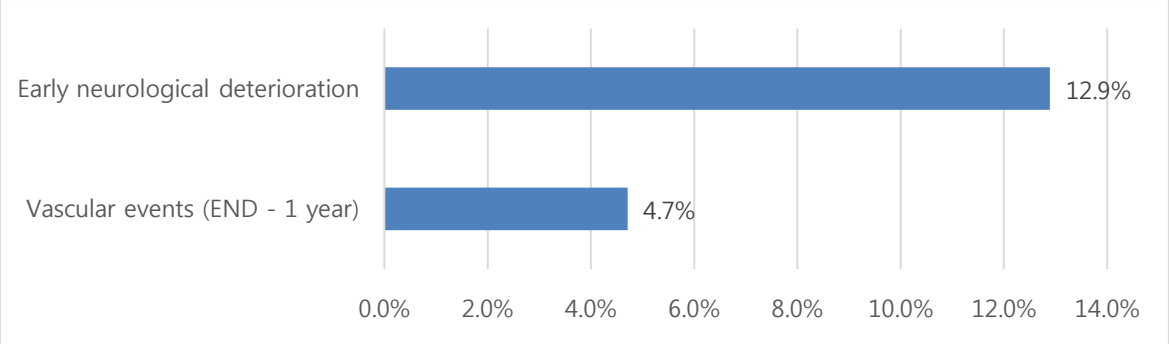

Figure 32. Frequencies of post-stroke events

- Based on 27,705 cases for MOSAIC study or outcome DB.

Table 37. Frequencies of early neurological deteriorations (END) occurred within 3 weeks after stroke

Type of early neurological deterioration	Frequency (n)	Percentage (%)
Stroke recurrence	388	9.3
Stroke progression	2906	69.4
Symptomatic hemorrhagic transformation	252	6.0
Other ENDs	232	5.5
Unknown	377	9.0
Missing	31	0.7
Total events	4186	

- Based on 27,705 cases for MOSAIC study or outcome DB.

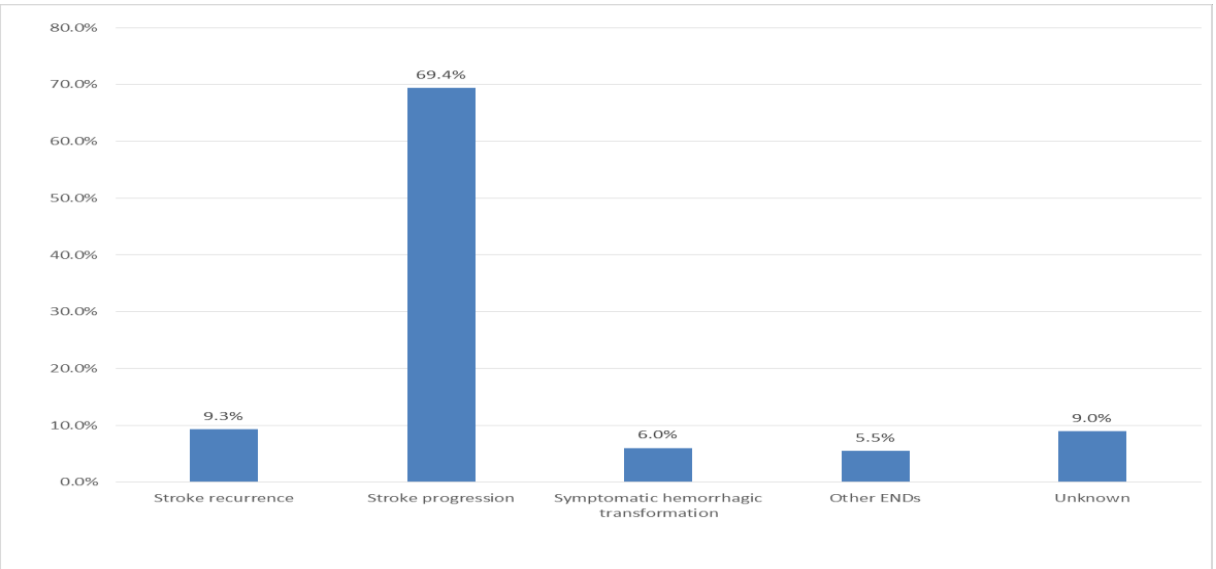

Figure 33. Proportion of early neurological deteriorations (END) types within 3 weeks after stroke

- Based on 27,705 cases for MOSAIC study or outcome DB.

Table 38. Cumulative events rates of vascular events after stroke onset*

Vascular events	7 days	30 days	3 months	1 year
Recurrent stroke	1.23%	2.28%	3.37%	5.24%
	22416	21718	20298	11758
Myocardial infarction	0.07%	0.12%	0.23%	0.40%
	21575	21155	19835	12716
Vascular Death	1.64%	2.46%	2.91%	3.57%
	21969	21327	20048	12720
Composite outcomes†	2.25%	3.81%	5.11%	7.50%
	24262	23124	21180	12835
All-cause death	2.10%	4.16%	6.63%	11.10%
	23559	22607	20849	12793

- Based on 22,893 cases for the prospective outcome capture surveillance data

*By Kaplan-Meier analysis

†Stroke Recurrence or MI or Vascular death

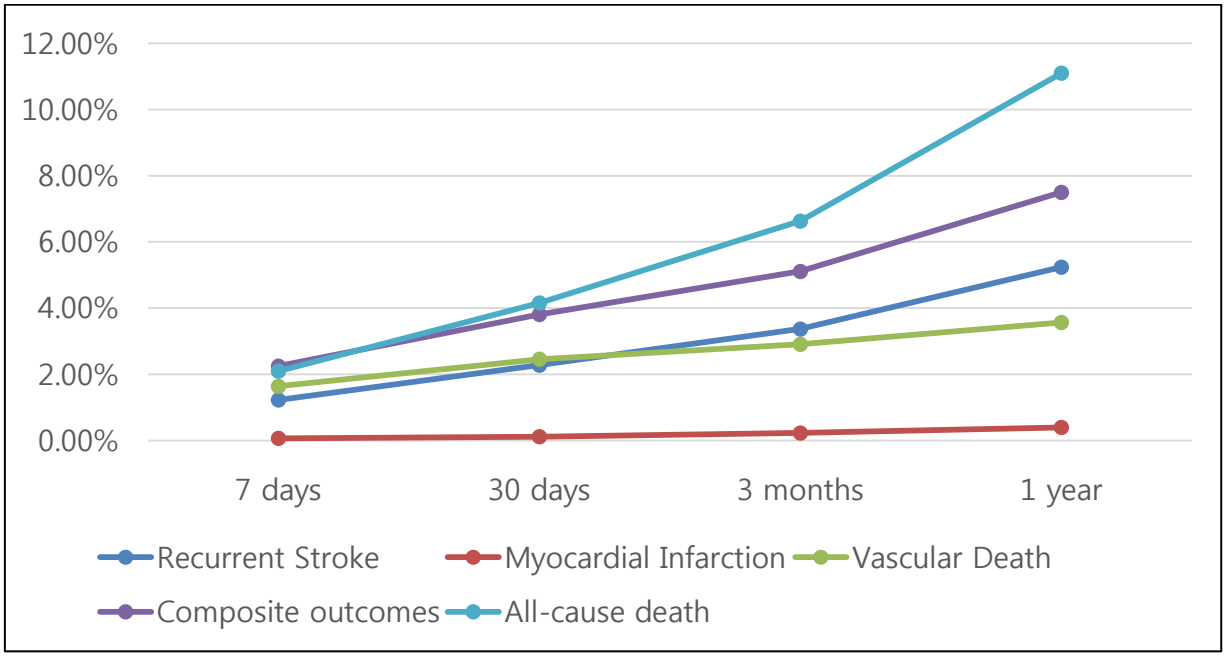

Figure 34. Cumulative events rate of vascular events after stroke onset

- Based on 22,893 cases for the prospective outcome capture surveillance data

Selected Subgroup Statistics of CRCS-5

Subgroup statistics according to sex

- From a total of 32,504 registered acute ischemic stroke cases, male was 18,938 (58%) and female was 13,566 (42%) (Table 39 Subgroup statistics according to sex).
- Age was older in male patients; 71.3± 12.3 year-old in female and 65.0± 12.6 year-old in male cases.
- For vascular risk factors, 41% of male cases reported to smoke currently, whereas only 5% of female cases were current smokers.
- 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 1,643 (5%) and extreme-old age group (≥ 80 year-old) was 5,685 (17%) (Table 40 Subgroup statistics according to age).
- Noticeable difference was shown 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 (8%) and cryptogenic stroke (undetermined–negative, 3%).
- Overall, there was a disparity in medications use among age-groups, showing larger proportion of cases using aspirin in younger patients and higher ratio of patients using warfarin in older patients, while the modalities of revascularization treatment were not so different.

Subgroup statistics according to center

- In most of the centers, large artery atherosclerosis composed the largest proportion of cases, except 3 centers (center #1, #3 and #13) where small vessel occlusion (center #1) and cardioembolism (center #3 and #13) were reported as the most frequent mechanism of ischemic stroke (Table 41 Subgroup statics according to center and Figure 31 TOAST classification according to center).

- Cases with unclear stroke etiology, which were classified as undetermined 2 or more (from 0.6% to 6.9%), undetermined-negative (from 0.0% to 7.3%) and cases with incomplete work-ups (from 0.0% to 11.7%) were highly variable among centers.

- Aspirin was the most preferred medication used at admission in all centers (from 47.3% to 90.1%) followed by clopidogrel. Usage of clopidogrel (from 9.8% to 76.4%), heparin (from 0.3% to 13.8%) and warfarin (from 1.7% to 20.6%) at admission showed wide disparities among centers. At discharge, aspirin (from 56.1% to 81.7%) was still the mostly prescribed medication followed by clopidogrel (from 19.4% to 57.9%) and warfarin (from 12.5% to 28.5%) (Table 41 Subgroup statics according to center, Figure 36 Admission medication according to center and Figure 37 Discharge medication according to center).

- Patients with functional independence (mRS score 0 or 1) ranged from 28.2% to 47.9% at discharge and from 36.6% to 63.8% at 3-month. Catastrophic consequences (mRS score 5 or 6) were reported in 7.0% to 17.9% at discharge, and in 5.9% to 17.0% at 3-month after stroke (Table 41 Subgroup statics according to center, Figure 38 mRS-score at discharge according to center and Figure 39 mRS-score at 3-month according to center).

Table 39. Subgroup statistics according to sex

	Female	[n=13566]	Male	[n=18938]
	n	%	n	%
Age*	71.28	±12.26 †	65.04	±12.61 †
Vascular Risk Factors				
Hypertension*	9695	71.5	12109	63.9
Diabetes	4379	32.3	6217	32.8
Dyslipidemia*	4170	30.7	5313	28.1
Current Smoking*	735	5.4	7778	41.1
Atrial Fibrillation*	3239	23.9	3321	17.5
TOAST classification*				
Large Artery Atherosclerosis	4739	34.9	7107	37.5
Small Vessel Occlusion	2209	16.3	3209	16.9
Cardioembolism	2656	19.6	3044	16.1
Other Determined Etiology	260	1.9	342	1.8
Undetermined-2 or more	249	1.8	349	1.8
Negative	234	1.7	370	2.0
Incomplete work-ups	237	1.7	341	1.8
Stroke Characteristics				
Onset to arrival time (hour)	42.72	±162.11 †	44.92	±252.35 †
	14.05	[3.9-43.7] ‡	12.8	[3.5-41.5] ‡
NIHSS score at admission*	6.63	±6.72 †	5.52	±5.02 †
	4.0	[2.0-10.0] ‡	3.0	[1.0-7.0] ‡
NHISS score ≥10 point*	3538	26.1	3667	19.4
Revascularization treatment				
Thrombolytic treatment	1755	12.9	2488	13.1
IV thrombolysis	1038	7.7	1568	8.3
IA thrombolysis	296	2.2	385	2.0
Combined IV and IA Thrombolysis	421	3.1	535	2.8
Admission medication				
Aspirin	10862	80.1	15516	81.9
Clopidogrel*	3988	29.4	6248	33.0
Heparin	836	6.2	1088	5.7
Warfarin*	1190	8.8	1402	7.4
Discharge medication				
Aspirin*	8986	66.2	13493	71.2
Clopidogrel*	4424	32.6	7055	37.3
Warfarin*	2617	19.3	3180	16.8
Consequences of stroke				
NIHSS score at discharge*	5.86	±8.16 †	4.5	±6.89 †
	3.0	[1.0-7.0] ‡	2.0	[1.0-5.0] ‡

mRS score at discharge*				
0	1930	14.2	3185	16.8
1	2508	18.5	4608	24.3
2	2253	16.6	3769	19.9
3	2317	17.1	2963	15.6
4	2351	17.3	2426	12.8
5	1647	12.1	1507	8.0
6	499	3.7	427	2.3
missing	7	0.1	13	0.1
mRS score at 3 month*				
0	1861	13.7	3346	17.7
1	1697	12.5	3202	16.9
2	1365	10.1	2234	11.8
3	1346	9.9	1521	8.0
4	1169	8.6	1063	5.6
5	882	6.5	671	3.5
6	1037	7.6	1009	5.3
missing	25	0.2	32	0.2

- Based on 32,504 ischemic stroke cases.

* There is a statistically significant difference between groups by Student's t-test or chi-square test of Fisher's exact test (p-value=0.05)

†±SD
‡ MEDIAN[IQR]

Table 40. Subgroup statistics according to age

	Age < 45 [n=1643]		45 ≤ Age ≤ 79 [n=25176]		Age ≥80 [n=5685]	
	n	%	n	%	n	%
Male*						
Female	480	29.2	9559	38.0	3527	62.0
Male	1163	70.8	15617	62.0	2158	38.0
Vascular Risk Factors						
Hypertension*	582	35.4	16965	67.4	4257	74.9
Diabetes*	233	14.2	8839	35.1	1524	26.8
Dyslipidemia*	370	22.5	7693	30.6	1420	25.0
Current Smoking*	796	48.4	7173	28.5	544	9.6
Atrial Fibrillation*	54	3.3	4620	18.4	1886	33.2
TOAST classification*						
Large Artery Atherosclerosis	539	32.8	9253	36.8	2054	36.1
Small Vessel Occulusion	284	17.3	4398	17.5	736	12.9
Cardioembolism	177	10.8	4104	16.3	1419	25.0
Other Determined Etiology	130	7.9	411	1.6	61	1.1
Undetermined-2 or more	35	2.1	435	1.7	128	2.3
Negative	51	3.1	472	1.9	81	1.4
Incomplete work-ups	34	2.1	459	1.8	85	1.5
Stroke Characteristics						
Onset to arrival time (hour)	48.2	±149.2†	44.4	±178.7†	40.9	±356.3†
	12.8	[3.1-46.2] ‡	13.4	[3.7-42.5] ‡	13.5	[3.8-41.0] ‡
NIHSS score at admission*	4.1	±5.2†	5.6	±6.1†	8.3	±7.3†
	2	[1.0-5.0] ‡	3	[1.0-7.0] ‡	6	[3.0-13.0] ‡
NHISS score ≥10 point*	204	12.4	4998	19.9	2003	35.2
Revascularization treatment						
Thrombolytic treatment	199	12.1	3312	13.2	732	12.9
IV thrombolysis	133	8.1	2000	7.9	473	8.3
IA thrombolysis	33	2.0	539	2.1	109	1.9
Combined IV and IA Thrombolysis	33	2.0	773	3.1	150	2.6

Admission medication						
Aspirin*	1393	84.8	20542	81.6	4443	78.2
Clopidogrel*	392	23.9	8182	32.5	1662	29.2
Heparin*	83	5.1	1448	5.8	393	6.9
Warfarin*	73	4.4	1933	7.7	586	10.3
Discharge medication						
Aspirin*	1274	77.5	17696	70.3	3509	61.7
Clopidogrel*	485	29.5	9148	36.3	1846	32.5
Warfarin*	201	12.2	4398	17.5	1198	21.1
Consequences of stroke						
NIHSS score at discharge*	2.8	±5.1†	4.6	±7.0†	8	±9.3†
	1.0	[0.0-3.0] ‡	2.0	[1.0-5.0] ‡	4.0	[2.0-11.0] ‡
mRS score at discharge*						
0	454	27.6	4175	16.6	486	8.5
1	481	29.3	5946	23.6	689	12.1
2	299	18.2	4930	19.6	793	13.9
3	183	11.1	4033	16.0	1064	18.7
4	135	8.2	3349	13.3	1293	22.7
5	68	4.1	2057	8.2	1029	18.1
6	18	1.1	605	2.4	303	5.3
missing	1	0.1	16	0.1	3	0.1
mRS score at 3 month*						
0	505	30.7	4269	17.0	433	7.6
1	280	17.0	4132	16.4	487	8.6
2	169	10.3	2967	11.8	463	8.1
3	84	5.1	2110	8.4	673	11.8
4	41	2.5	1528	6.1	663	11.7
5	16	1.0	974	3.9	563	9.9
6	31	1.9	1247	5.0	768	13.5
missing	2	0.1	40	0.2	15	0.3

- Based on 32,504 ischemic stroke cases.

* There is a statistically significant difference between groups by ANOVA test or chi-square test of Fisher's exact test (p-value=0.05)

†±SD

‡ MEDIAN[IQR]

Table 41. Subgroup statistics according to center

	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
TOAST classification																														
Large Artery Atherosclerosis	98	32.2	738	52.5	739	34.2	470	44.4	1093	37.9	1643	44.7	374	42.6	451	46.5	1737	59.6	332	48.3	574	38.8	2440	58.9	258	33.9	339	61.2	560	38.0
Small Vessel Occulusion	111	36.5	142	10.1	492	22.8	376	35.5	666	23.1	751	20.4	281	32.0	303	31.3	454	15.6	180	26.2	519	35.1	287	6.9	191	25.1	79	14.3	586	39.8
Cardioembolism	61	20.1	414	29.5	756	35.0	142	13.4	777	27.0	830	22.6	182	20.7	139	14.3	545	18.7	90	13.1	346	23.4	775	18.7	269	35.3	111	20.0	263	17.8
Other Determined Etiology	13	4.3	16	1.1	47	2.2	9	0.9	70	2.4	118	3.2	24	2.7	44	4.5	59	2.0	68	9.9	18	1.2	46	1.1	29	3.8	12	2.2	29	2.0
Undetermined-2 or more	21	6.9	70	5.0	70	3.2	29	2.7	105	3.6	62	1.7	12	1.4	22	2.3	33	1.1	18	2.6	9	0.6	103	2.5	10	1.3	13	2.4	21	1.4
Negative	0	0.0	6	0.4	41	1.9	28	2.7	165	5.7	267	7.3	4	0.5	2	0.2	81	2.8	0	0.0	5	0.3	3	0.1	0	0.0	0	0.0	2	0.1
Incomplete work-ups	0	0.0	20	1.4	13	0.6	4	0.4	7	0.2	4	0.1	2	0.2	8	0.8	7	0.2	0	0.0	9	0.6	486	11.7	5	0.7	0	0.0	13	0.9
Admission medication																														
Aspirin	156	47.3	1747	85.6	2535	84.7	925	86.4	2744	71.3	4420	88.1	927	80.0	1086	78.2	3718	90.1	599	85.0	1568	75.0	3285	78.6	501	64.2	441	77.1	1726	78.2
Clopidogrel	81	24.5	651	31.9	394	13.2	384	35.9	1029	26.7	1751	34.9	328	28.3	275	19.8	3153	76.4	211	29.9	620	29.7	626	15.0	241	30.9	56	9.8	436	19.8
Heparin	1	0.3	136	6.7	351	11.7	67	6.3	532	13.8	108	2.2	126	10.9	110	7.9	208	5.0	37	5.2	115	5.5	59	1.4	13	1.7	48	8.4	13	0.6
Warfarin	8	2.4	110	5.4	123	4.1	71	6.6	267	6.9	322	6.4	78	6.7	85	6.1	409	9.9	75	10.6	294	14.1	505	12.1	161	20.6	10	1.7	74	3.4
Discharge medication																														
Aspirin	200	60.6	1318	64.6	2445	81.7	789	73.7	2436	63.3	3807	75.9	750	64.7	904	65.1	3336	80.8	549	77.9	1231	58.9	2543	60.9	467	59.9	321	56.1	1383	62.7
Clopidogrel	133	40.3	667	32.7	793	26.5	438	40.9	1230	32.0	2030	40.5	357	30.8	547	39.4	2392	57.9	241	34.2	677	32.4	812	19.4	224	28.7	201	35.1	737	33.4
Warfarin	45	13.6	314	15.4	598	20.0	134	12.5	786	20.4	897	17.9	200	17.3	245	17.6	737	17.9	90	12.8	432	20.7	662	15.8	222	28.5	105	18.4	330	15.0
Consequences of stroke																														
mRS score at discharge																														
0	68	21.4	364	17.8	509	17.0	179	16.8	463	12.1	1059	21.1	147	12.7	212	15.3	394	9.6	91	13.1	400	19.2	592	14.2	122	15.7	96	16.9	419	19.1
1	84	26.4	456	22.4	702	23.5	314	29.4	840	21.9	938	18.7	275	23.8	245	17.7	767	18.6	208	30.0	588	28.2	751	18.0	238	30.6	176	31.0	534	24.3
2	59	18.6	315	15.4	704	23.6	92	8.6	582	15.2	926	18.5	231	20.0	344	24.8	750	18.2	125	18.0	355	17.0	817	19.6	112	14.4	164	28.9	446	20.3
3	36	11.3	328	16.1	382	12.8	217	20.3	630	16.4	819	16.4	170	14.7	210	15.2	1168	28.4	98	14.1	210	10.1	630	15.1	78	10.0	55	9.7	249	11.3
4	44	13.8	337	16.5	384	12.9	137	12.8	821	21.4	674	13.5	207	17.9	170	12.3	654	15.9	91	13.1	212	10.2	634	15.2	103	13.3	37	6.5	272	12.4
5	22	6.9	155	7.6	223	7.5	115	10.8	345	9.0	511	10.2	85	7.4	156	11.3	294	7.1	60	8.7	253	12.1	644	15.5	87	11.2	27	4.8	177	8.1
6	5	1.6	83	4.1	84	2.8	13	1.2	161	4.2	81	1.6	41	3.5	47	3.4	88	2.1	21	3.0	67	3.2	100	2.4	37	4.8	13	2.3	85	3.9
Missing	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	2	0.0	1	0.1	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	14	0.6
mRS score at 3 month																														
0	112	37.2	342	28.6	382	21.1	178	17.6	369	16.9	1168	34.7	163	20.1	201	23.3	479	20.0	29	29.3	446	31.7	608	15.4	164	23.3	70	27.5	496	41.9
1	60	19.9	276	23.1	431	23.9	353	34.9	640	29.4	684	20.3	165	20.4	132	15.3	436	18.2	24	24.2	325	23.1	840	21.2	195	27.7	78	30.6	260	21.9
2	46	15.3	154	12.9	398	22.0	104	10.3	368	16.9	532	15.8	125	15.4	186	21.6	435	18.1	11	11.1	183	13.0	807	20.4	82	11.6	56	22.0	112	9.5
3	16	5.3	139	11.6	203	11.2	201	19.9	252	11.6	367	10.9	126	15.6	133	15.4	496	20.7	15	15.2	124	8.8	567	14.3	103	14.6	26	10.2	99	8.4
4	24	8.0	112	9.4	189	10.5	88	8.7	291	13.3	272	8.1	147	18.1	92	10.7	258	10.8	12	12.1	115	8.2	454	11.5	85	12.1	9	3.5	84	7.1
5	18	6.0	110	9.2	115	6.4	56	5.5	118	5.4	210	6.2	49	6.0	78	9.1	138	5.8	3	3.0	151	10.7	372	9.4	52	7.4	5	2.0	78	6.6
6	24	8.0	61	5.1	89	4.9	30	3.0	117	5.4	129	3.8	33	4.1	39	4.5	154	6.4	5	5.1	59	4.2	301	7.6	17	2.4	10	3.9	52	4.4
Missing	1	0.3	1	0.1	0	0.0	1	0.1	25	1.1	2	0.1	2	0.2	0	0.0	4	0.2	0	0.0	6	0.4	4	0.1	6	0.9	1	0.4	4	0.3

- Based on 32,504 ischemic stroke cases.

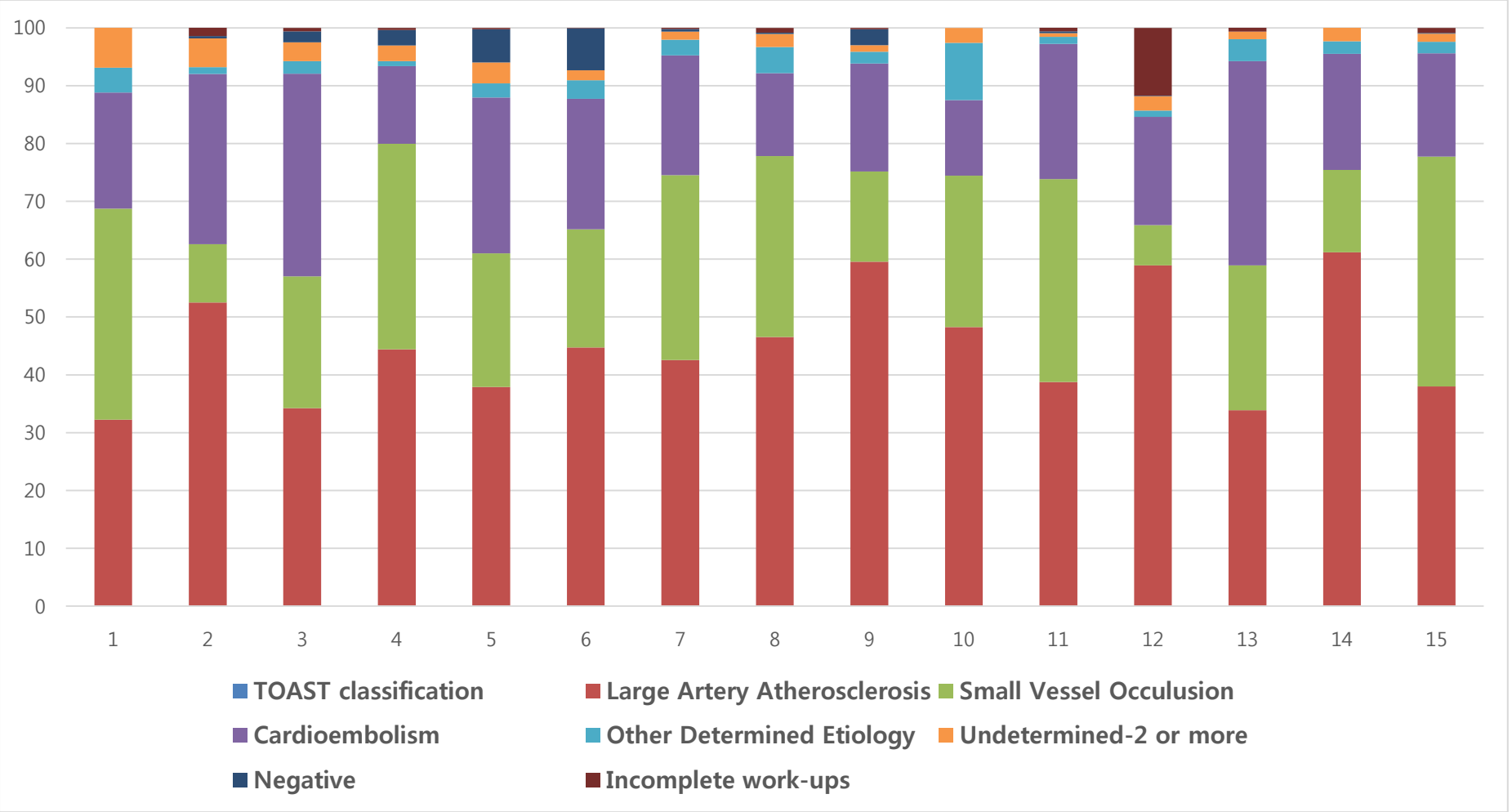

Figure 35. TOAST classification according to center

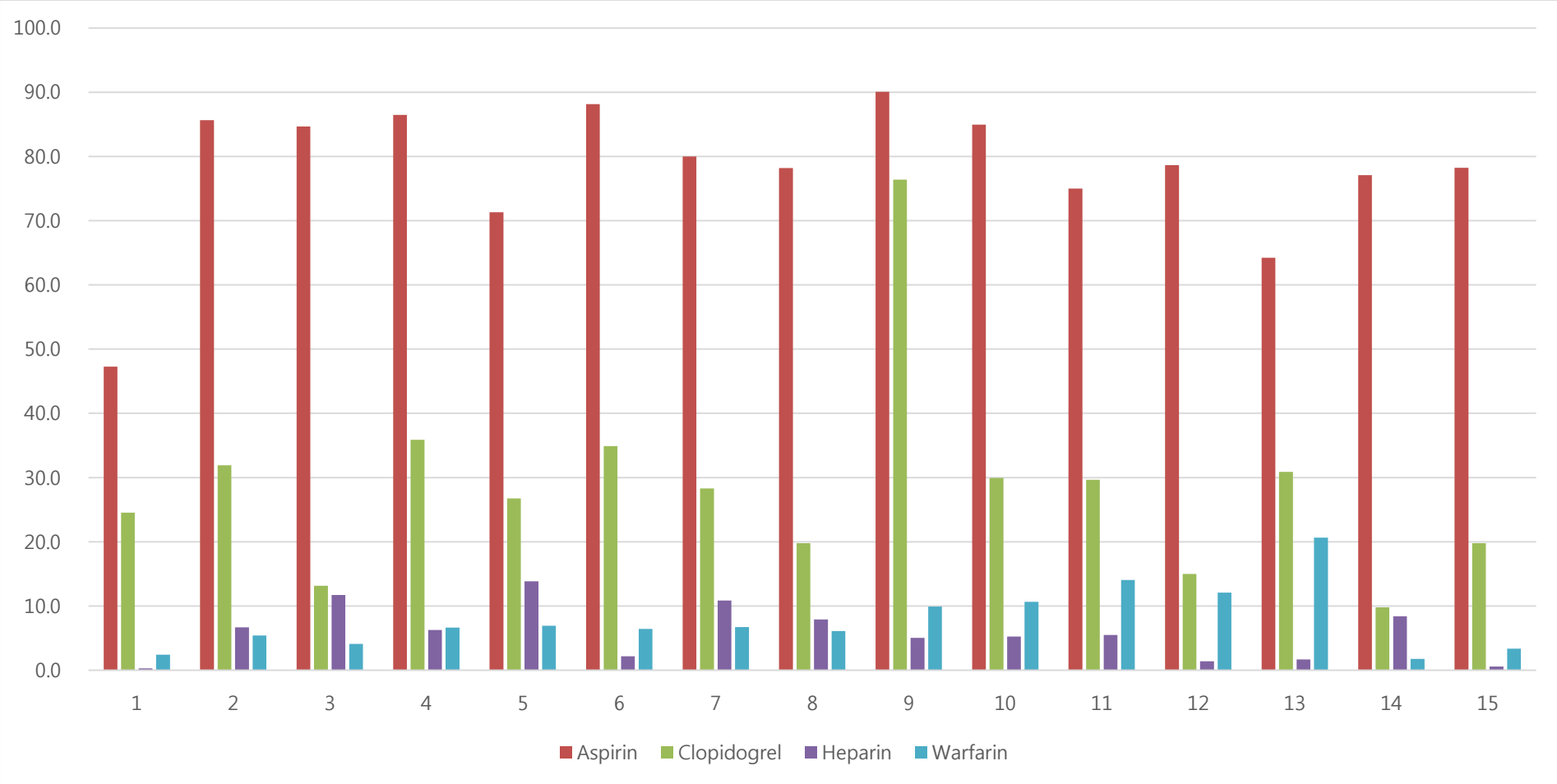

Figure 36. Admission medication according to center

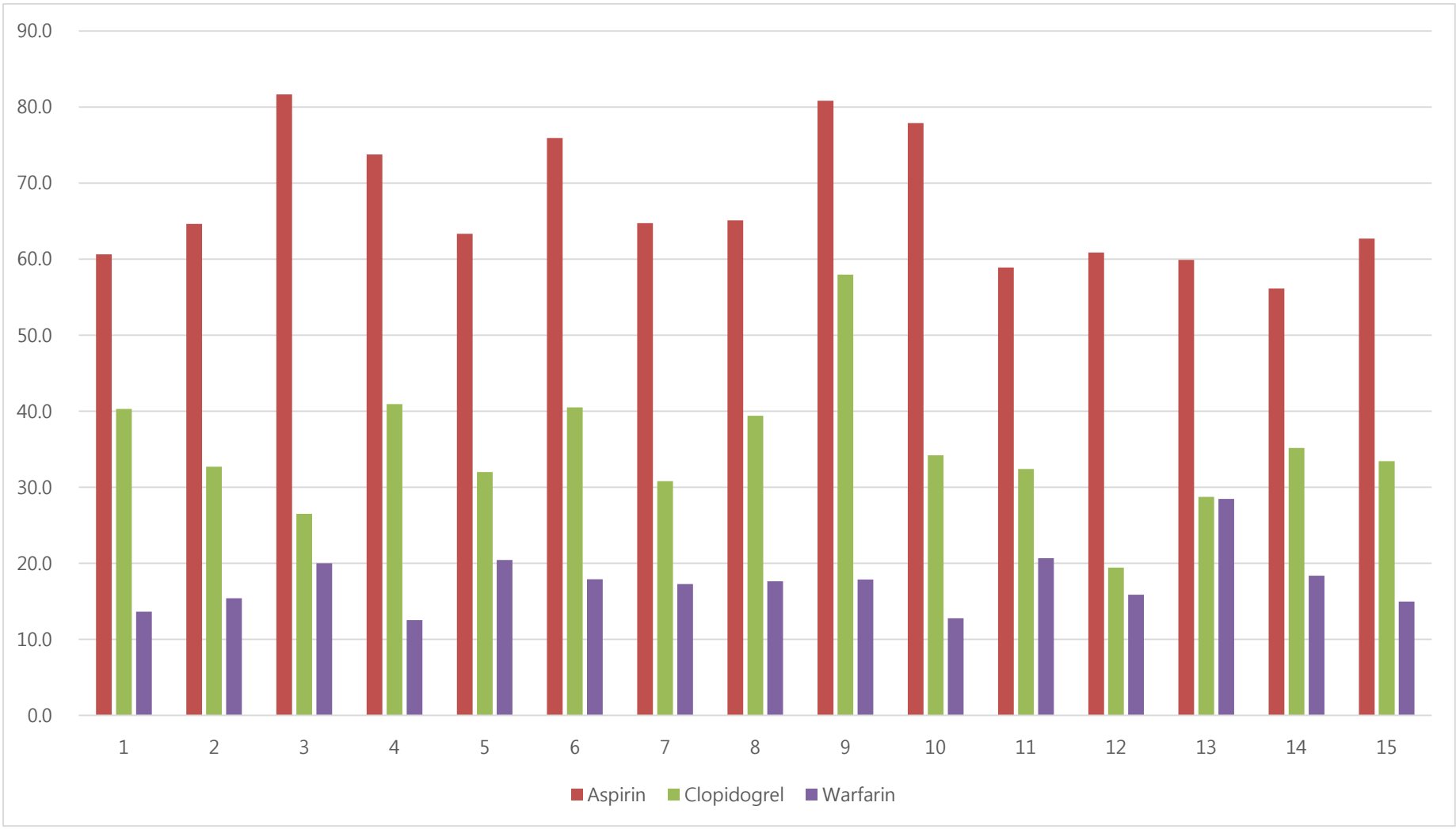

Figure 37. Discharge medication according to center

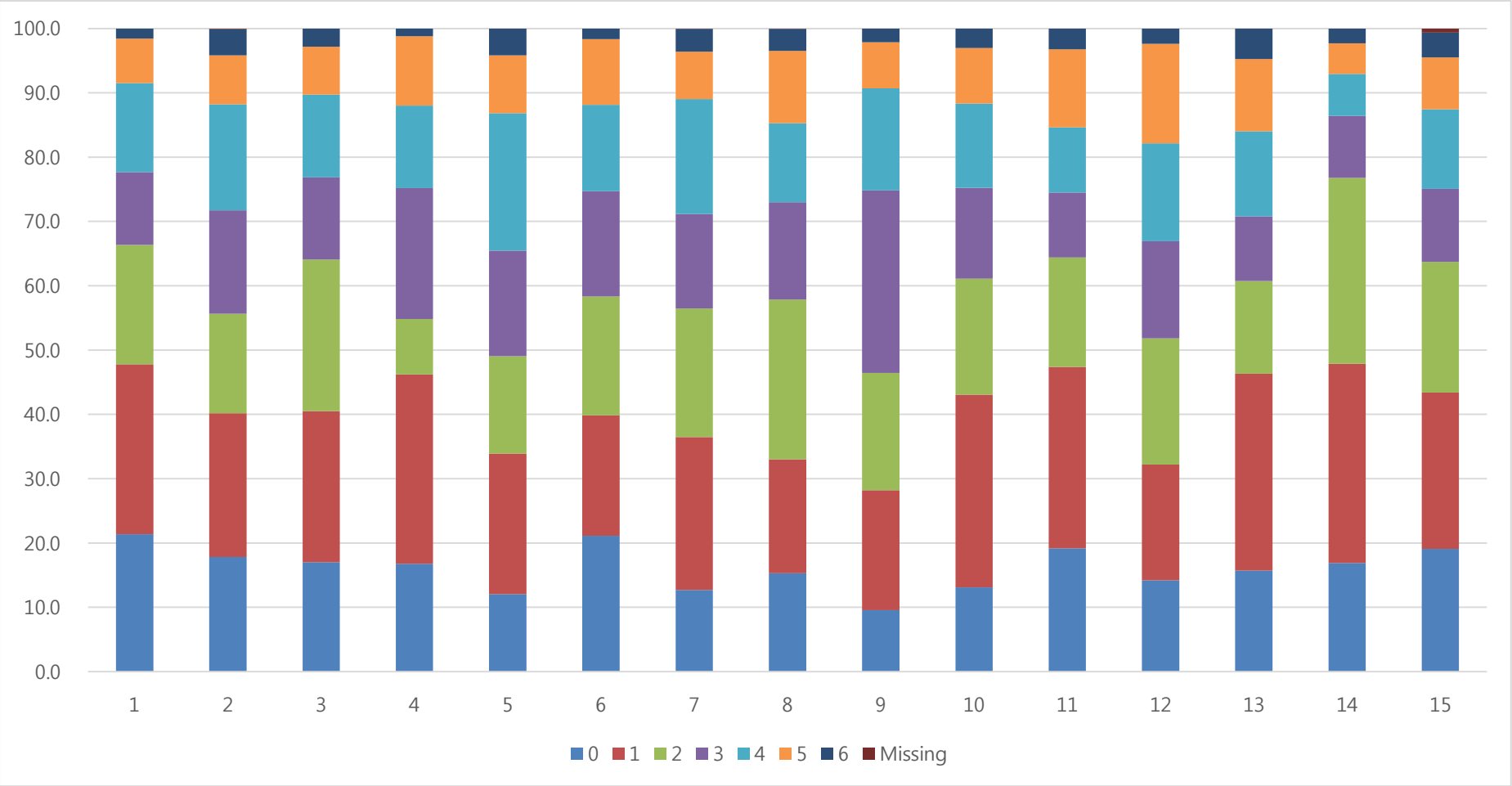

Figure 38. mRS-score at discharge according to center

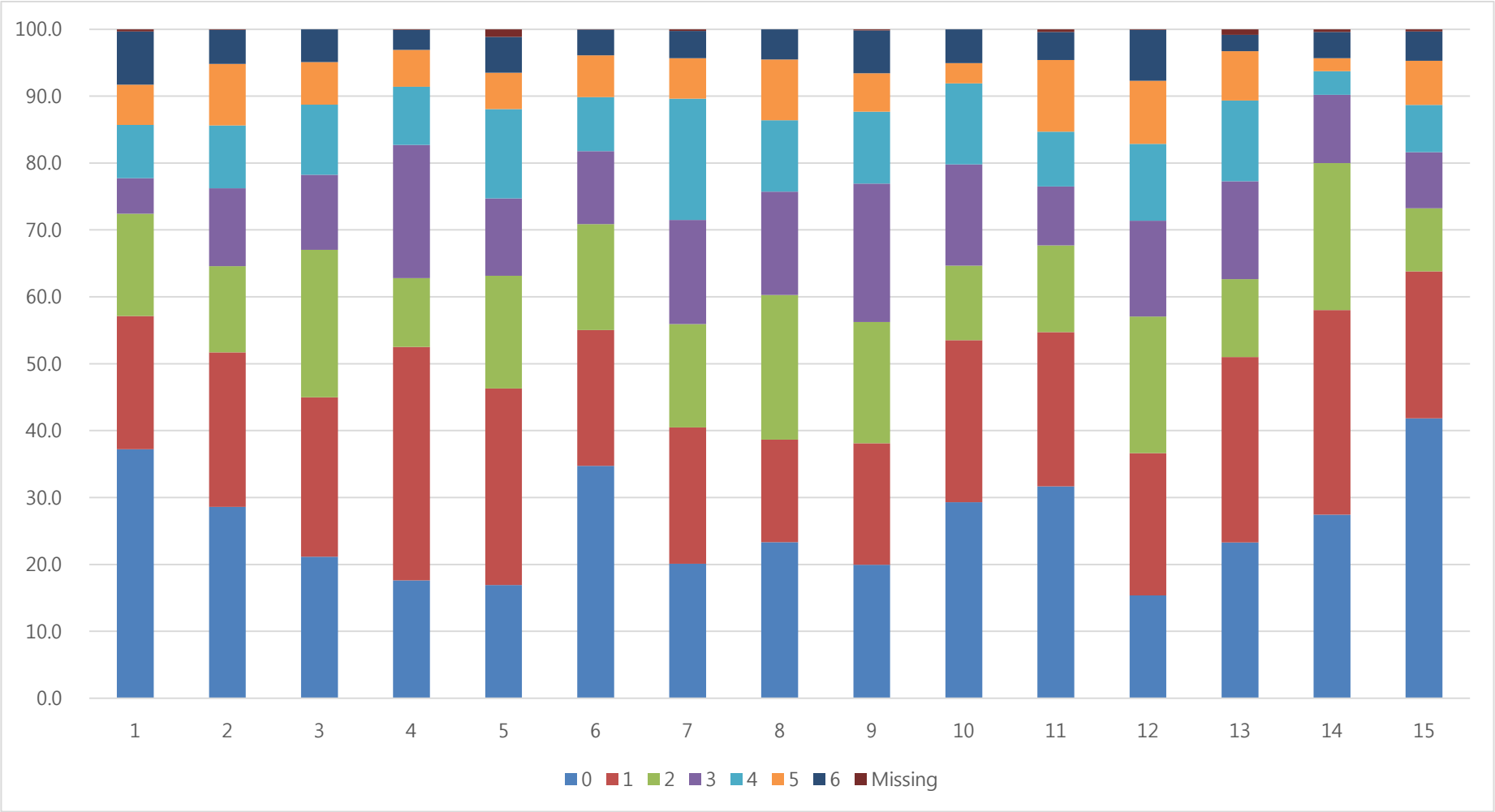

Figure 39. mRS-score at 3-month according to center