



# Use of acupuncture therapy as a supplement to conventional medical treatments for acute ischaemic stroke patients in an academic medical centre in Korea

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Cerebral infarction;  
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## Summary

**Objectives:** Acupuncture has served as a major complementary and alternative therapy that supplements conventional medicine and is the subject of growing public interest. This study was conducted to estimate the usage rate of acupuncture as a supplemental treatment in acute ischaemic stroke patients and to identify factors associated with the choice to use this therapy. **Methods:** Using the registry of stroke patients admitted to an academic medical centre in Korea, the use of acupuncture therapy was recorded and analysed, along with the patients' socio-demographic characteristics, hospital access variables, risk factors for ischaemic stroke and clinical characteristics. The data were analysed using descriptive statistics, chi-square tests and multiple logistic regression analyses.

**Results:** Of 2167 patients, 18% received acupuncture therapy. The choice of acupuncture therapy was significantly associated with stroke severity as well as gender, age, geographical residence and previous history of stroke. After controlling for other significant factors, there was an approximately 3.4-fold greater usage in patients with moderately severe strokes (95% confidence interval (CI) = 2.5–4.6) and 4.1-fold greater usage in patients with severe strokes (95% CI = 2.7–6.4).

**Conclusions:** The findings provide a better understanding of patients' utilization of acupuncture therapy as a supplement to conventional medical treatments and of factors associated with the utilization of acupuncture in patients with acute ischemic stroke. Strategic implications of acupuncture therapy are suggested for both health-care providers and policy makers.

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Increasing attention has been paid to complementary and alternative medicine (CAM). Even in the United States, 74.6% of individuals of 18 years and older have used some form of CAM therapies, while 14.8% have sought care from a licensed or certified CAM practitioner.<sup>1</sup> From the provider

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perspective, a 2008 survey of US hospitals by Health Forum, a subsidiary of the American Hospital Association, found that more than 37% of responding hospitals indicated that they offer one or more alternative medicine therapies, such as acupuncture, homeopathy and massage therapy, compared with 26.5% in 2005.<sup>2</sup>

Acupuncture in particular has been a major part of health-care services in CAM. In the 2002 National Health Interview Survey sample, 4.1% of the respondents reported lifetime use of acupuncture and 1.1% (representing 2.13 million Americans) reported recent use.<sup>3</sup> Acupuncture is used extensively for various medical purposes in the prevention and treatment of disease; it is best known for the control of pain, but it can treat a wide variety of common and uncommon disorders. The World Health Organization (WHO) has stated that many disorders of the eye and mouth as well as of the respiratory, gastrointestinal, nervous and musculoskeletal systems can be treated by acupuncture.<sup>4</sup>

Traditional Korean medicine has developed unique medical theories and methods to treat diseases including neurological disorders such as stroke, epilepsy and Parkinson's disease.<sup>5</sup> Although ancient Korean and Chinese medicine held close relationships, Korea has continued to develop unique medicine of its own over the years and established types of acupuncture methods different from those of traditional Chinese medicine.<sup>6</sup> The main components of traditional Korean medicine consist of medicinal treatment, acupuncture and Sasang constitutional medicine. Traditional Korean medicine has provided benefits of the best quality by the herbal medicines such as Korean ginseng, the unique individualised acupuncture theories and the academic background in constitutional theories.<sup>5</sup>

In Korea, there are 14,818 Oriental medicine physicians, 11,334 Oriental health clinics, and 146 Oriental health hospitals to diagnose and treat patients with traditional Korean medicine.<sup>7</sup> Acupuncture therapy has been widely used by Oriental medicine physicians<sup>8</sup> and in 2008, the Korean national health insurance (NHI) spent 551.4 million USD (1USD = 1102.6 Korean Won) on acupuncture, which represents 1.74% of the total NHI medical expenses for that year (NHIC and HIRA, 2009).<sup>7</sup>

Stroke is an important disease because of its frequent and severe complications and sequelae, such as paralysis, speech and swallowing problems and depression. 'Paralysis following stroke' is explicitly specified in WHO's list of neurological and musculoskeletal disorders.<sup>4</sup> Many studies have been published that demonstrate a significant benefit of acupuncture therapy in stroke patients.<sup>9-13</sup> These studies indicate that patients receiving acupuncture recover more quickly, perform better in self-care, require less nursing and rehabilitation therapy and have lower health-care expenses, compared with patients not receiving acupuncture. In spite of the popularity of acupuncture for treating a range of neurological disorders, the evidence that supports its use is contradictory.<sup>14</sup>

Acupuncture therapy is commonly used for stroke patients in Oriental countries.<sup>4</sup> Specifically, Oriental medicine (consisting of acupuncture, herbal medicine, etc.) is considered to be one of the options available for the treatment and rehabilitation of stroke patients in Korea.<sup>15</sup>

There has been a great deal of research in the field of fusion medicine, which integrates traditional and modern medicine. Some hospitals and clinics provide Oriental medicine, which employs a spiritual and functional theory that observes life through holistic concepts of disease, in addition to Western medicine, which employs a systematic and objective theory with well-developed medical technology for specific diseases. This approach is consistent with a previous study that demonstrated the beneficial effects of acupuncture treatment combined with standard in-patient stroke rehabilitation on post-stroke motor recovery and physical function.<sup>16</sup> Although no significant differences in overall measures between treatment groups were found, a statistically significant benefit attributed to acupuncture was observed for the lower-extremity motor function subscale and the tub/shower transfer mobility subscale.

Therefore, this study aimed to estimate the usage rate of acupuncture as a supplement to conventional medical treatment in ischaemic stroke patients and to identify the factors associated with the use of the therapy.

## Materials and methods

### Subjects and setting

The subjects in our study were ischaemic stroke patients who had been admitted to the neurology wards of an acute care hospital in an academic medical centre in Seoul, Korea. The centre is a general medical institution equipped with both Western and Oriental medicine hospitals. Therefore, the setting of the centre provided an ideal environment to determine factors affecting access to Oriental medicine as a supplement to conventional Western medicine. In general, along with Western medical therapies, patients can voluntarily receive traditional Korean medicine services, such as acupuncture therapy, upon their request followed by physicians' permission.

Only in-patients admitted within 7 days after the onset of symptoms were considered. The patients were diagnosed based on their history, neurological tests, computed tomography, magnetic resonance imaging, magnetic resonance angiography and other neuroradiological results. Along with conventional medical treatment, Oriental medicine physicians visit stroke patients in neurology wards and provide acupuncture therapy 2 or 3 times per week, if they wish. Ambulatory stroke patients can visit the acupuncture therapy room and get the treatment there. There are seven acupuncture points: GV20, GB7, GB21, GB31, ST36, GB39 and LI11.

In total, 2167 patients admitted from September 2003 to March 2009 were included in the analysis. This sample size was considered sufficiently powerful to detect differences in proportions of acupuncture use among up to five groups of equal sizes. Assuming a type I error ( $\alpha$ ) of 0.05 in two-tailed chi-square tests, the sample of 2167 subjects produced 84% chance of detecting a 10% difference in the probability of using acupuncture therapy. The study was approved by the institutional review board of the centre.

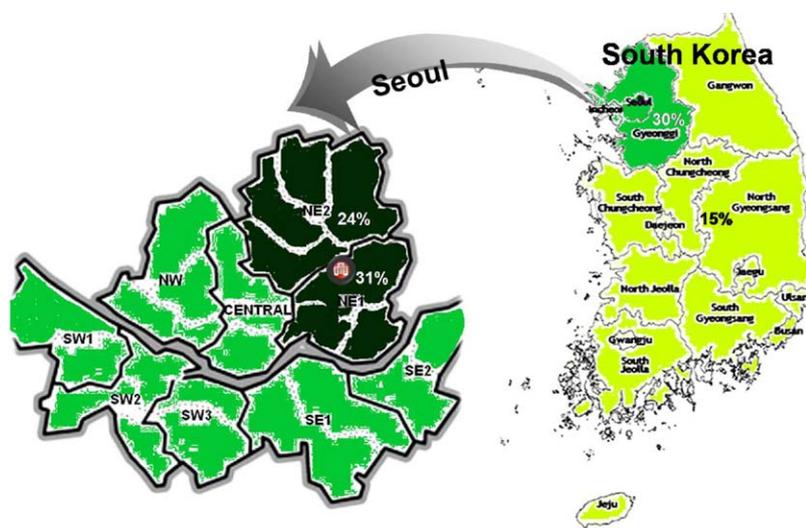


Figure 1 Catchment areas of the subject hospital in Seoul, Korea.

## Variables

### Socio-demographic characteristics

The patients' socio-demographic characteristics included gender, age, education, religion, job status, residence location and type of medical insurance. Variables, such as religion and job status, were coded as a binary yes/no. The residence location was classified into three groups relating to the catchment areas of the hospital: primary, secondary and other (Fig. 1). The primary catchment area was defined as the northeast regions of Seoul, close to the hospital. The secondary catchment area was defined as the remaining regions of Seoul and Gyeonggi province. The other area consisted of the remaining remote areas in Korea. The type of medical insurance was split, either NHI or medical aid (MA).

### Hospital access characteristics

Admission route, referral institution and the time from the onset of symptoms to arrival at the hospital were considered. Patients were admitted through either the emergency department or the outpatient department, and they either directly visited the hospital or were referred from another general hospital, a primary physician or an Oriental medicine institute. The time of stroke onset was defined as the time when the patient or observer first noticed neurological deficits, following the method used in Kwon et al.<sup>17</sup> The interval between the onset time and hospital arrival time was determined, and the patients were divided into three groups based upon arrival within 3 h, between 3 and 24 h and arrival after 24 h.

### Risk factors

Previous histories of stroke, transient ischaemic attack (TIA), hypertension, diabetes, hyperlipidaemia, smoking status and cardiac diseases were examined as potential risk factors. Hypertension was defined as a systolic pressure higher than 140 mmHg or a diastolic pressure higher

than 90 mmHg. Specifically, patients with a history of the diagnosis or treatment of hypertension, those with high blood pressure and left-ventricular hypertrophy as confirmed by electrocardiography or echocardiography, or those with continuous hypertension for up to 2 weeks after onset were considered to be at risk.

### Clinical characteristics

Each patient's stroke sub-type, severity and functional outcome at admission were assessed by certified neurologists. The classification of a patient's stroke sub-type was based on the Trial of Org 10172 in Acute Stroke Treatment (TOAST) criteria, which consist of five groups: large-artery atherosclerosis (LAA), small-vessel occlusion (SVO), cardioembolism (CE), other determined aetiology (OD) and undetermined aetiology (UD). The severity was evaluated by the National Institutes of Health Stroke Scale (NIHSS), and functional outcome was evaluated using the modified Rankin Scale (mRS).

### Statistical analysis

The data from the 2167 patients were descriptively analysed to assess the patients' socio-demographic, hospital access and clinical characteristics. Specifically, the frequencies of the categorical variables and the central tendencies of the continuous variables were assessed. To check for differences in acupuncture use with respect to different levels of patient characteristics, categorical bivariate analyses were conducted using chi-square tests. In addition, the factors that significantly influenced acupuncture use were identified through multiple logistic regression analyses. For this analysis, the dependent variable was dichotomous acupuncture use, and the independent variables were factors that were significant in the bivariate analyses. Hosmer–Lemeshow goodness-of-fit statistic was used to evaluate the fitness of a multiple logistic regression model.<sup>18</sup> All analyses were

**Table 1** Acupuncture use by patient socio-demographic characteristics.

	Frequency (%)			Group comparison	
	All	No use	Acupuncture use	Chi-square	p-Value
Total	2167 (100.0)	1773 (81.8)	394 (18.2)		
Gender				4.94	0.0263
Female	871 (40.2)	693 (79.6)	178 (20.4)		
Male	1295 (59.8)	1079 (83.3)	216 (16.7)		
Age (mean, SD)	(64.7, 11.6)	(65.0, 11.9)	(63.3, 10.0)	19.96	0.0002
–54	391 (18.0)	315 (80.6)	76 (19.4)		
55–64	604 (27.9)	481 (79.6)	123 (20.4)		
65–74	757 (34.9)	606 (80.1)	151 (20.0)		
75+	415 (19.2)	371 (89.4)	44 (10.6)		
Education				2.43	0.4879
Elementary	679 (43.7)	572 (84.2)	107 (15.8)		
Middle school	279 (18.0)	229 (82.1)	50 (17.9)		
High school	416 (26.8)	336 (80.8)	80 (19.2)		
College	179 (11.5)	146 (81.6)	33 (18.4)		
Religion				0.00	0.9645
Yes	939 (56.9)	776 (82.6)	163 (17.4)		
No	712 (43.1)	589 (82.7)	123 (17.3)		
Work status				5.42	0.0199
Employed	630 (37.6)	502 (79.7)	128 (20.3)		
Not employed	1047 (62.4)	881 (84.2)	166 (15.9)		
Residence				24.91	<0.0001
Primary catchment area	1187 (54.9)	1002 (84.4)	185 (15.6)		
Secondary catchment area	660 (30.5)	539 (81.7)	121 (18.3)		
Other location	317 (14.7)	229 (72.2)	88 (27.8)		
Medical insurance				2.90	0.0884
NHI	2073 (96.2)	1688 (81.4)	385 (18.6)		
Medical aid	81 (3.8)	72 (88.9)	9 (11.1)		

NHI indicates National Health Insurance.

performed using the Statistical Analysis System version 9.2 software package.

## Results

### Acupuncture use by patients' socio-demographic characteristics

Of the 2167 patients, 394 (18.2%) used acupuncture therapy during their hospitalisations in the neurology wards of the hospital. Table 1 lists the differences in acupuncture use among patient groups with different socio-demographic characteristics. The use of acupuncture was significantly different according to age and residence at the 0.01 level and according to gender and work status at the 0.05 level. There was also a borderline significant difference according to medical insurance type ( $0.05 < p < 0.1$ ). No significant differences according to the patients' education level or religion were detected.

Female patients tended to use acupuncture more than males (20% vs. 17%), patients of 75 years or older used acupuncture less frequently than younger patients (11% vs. 20%) and patients who were currently employed tended to use it more than those who were not employed (20% vs. 16%). The usage rate of acupuncture by patients from remote areas was particularly high in comparison with patients

from the primary and secondary catchment areas (28% vs. 16–18%). Patients with MA tended to use less acupuncture than those with NHI (11% vs. 19%).

### Acupuncture use according to patients' hospital access and clinical characteristics

Differences in acupuncture use among patient groups with different hospital access and clinical characteristics are listed in Table 2. The usage of acupuncture was significantly higher in patients referred from general hospitals, in first-time stroke patients, in patients with LAA or other-determined types, in patients with moderate and severe strokes and in patients with unfavourable functional status at the 0.01 significance level. No significant differences were found with respect to patients' admission route, arrival hours or any of the other risk factors for ischaemic stroke.

Referred patients, especially from other general hospitals, tended to use acupuncture more than patients who made direct visits (29% vs. 15%). The usage rates of acupuncture by patients with LAA and other-determined types were high (21% and 26%, respectively), compared with the other types (14–18%). More severe stroke was related to a higher rate of acupuncture use, severe and moderately severe stroke patients had usage rates of 31% and 30%, respectively, whereas mild stroke patients had a rate of only 11%. Patients with unfavourable functional status also tended to

**Table 2** Acupuncture use by patient hospital access and clinical characteristics.

	Frequency (%)			Group comparison	
	All	No use	Acupuncture use	Chi-square	p-Value
Total	2167 (100.0)	1773 (81.8)	394 (18.2)		
Admission route				0.32	0.2504
Emergency room	1566 (72.5)	1272 (81.2)	94 (18.8)		
Outpatient department	595 (27.5)	496 (83.4)	99 (16.6)		
Refer from				41.28	<0.0001
Direct visit	1281 (63.2)	1090 (85.1)	191 (14.9)		
General hospital	439 (21.7)	313 (71.3)	126 (28.7)		
Primary physician	163 (8.1)	132 (81.0)	31 (19.0)		
Oriental medicine institute	143 (7.1)	116 (81.1)	27 (18.9)		
Arrival hour after symptom onset (mean, SD)	(82.32, 596.01)	(84.25, 649.16)	(73.64, 240.04)	2.14	0.3436
0–3 h	363 (16.8)	293 (80.7)	70 (19.3)		
3–24 h	687 (31.7)	553 (80.5)	134 (19.5)		
24+ h	1117 (51.6)	927 (83.0)	190 (17.0)		
Risk factor					
Previous history of stroke (yes)	427 (19.7)	378 (88.5)	49 (11.5)	16.08	<0.0001
Previous history of stroke (no)	1740 (80.3)	1395 (80.2)	345 (19.8)		
TIA (yes)	58 (2.7)	46 (79.3)	12 (20.7)	0.25	0.6157
TIA (no)	2109 (97.3)	1727 (81.9)	382 (18.1)		
Hypertension (yes)	1484 (68.5)	1217 (82.0)	267 (18.0)	0.11	0.7355
Hypertension (no)	683 (31.5)	556 (81.4)	127 (18.6)		
Diabetes (yes)	738 (34.1)	605 (82.0)	133 (18.0)	0.02	0.8895
Diabetes (no)	1429 (65.9)	1173 (81.6)	264 (18.4)		
Hyperlipidemia (yes)	730 (33.7)	600 (82.2)	130 (17.8)	0.10	0.7479
Hyperlipidemia (no)	1437 (66.3)	1173 (81.6)	264 (18.4)		
Smoking (yes)	743 (34.3)	621 (83.6)	122 (16.4)	2.36	0.1245
Smoking (no)	1424 (65.7)	1152 (80.9)	272 (19.1)		
Heart disease (yes)	398 (18.4)	315 (79.2)	83 (20.9)	2.34	0.1260
Heart disease (no)	1769 (81.6)	1458 (82.4)	311 (17.6)		
Sub-type (TOAST)					
LAA	762 (35.2)	600 (78.7)	162 (21.3)	13.75	0.0081
SVO	719 (33.2)	616 (85.7)	103 (14.3)		
CE	197 (9.1)	161 (81.7)	36 (18.3)		
Other-determined	38 (1.8)	28 (73.7)	10 (26.3)		
Undetermined	451 (20.8)	368 (81.6)	83 (18.4)		
NIHSS at admission (mean, SD)	(5.89, 5.61)	(5.36, 5.50)	(8.29, 5.51)	116.69	<0.0001
Mild (0–5)	1362 (63.4)	1207 (88.6)	155 (11.4)		
Moderate (6–13)	549 (25.6)	387 (70.5)	162 (29.5)		
Severe (14–42)	237 (11.0)	163 (68.8)	74 (31.2)		
mRS at admission (mean, SD)	(2.51, 1.44)	(2.33, 1.42)	(3.29, 1.27)	82.77	<0.0001
Favorable (0–1)	637 (30.0)	595 (93.4)	42 (6.6)		
Unfavorable (2–6)	1485 (70.0)	1140 (76.8)	345 (23.2)		

TIA indicates transient ischemic attack; LAA, large artery atherosclerosis; SVO, small vessel occlusion; CE, cardioembolism; NIHSS, National Institute of Health Stroke Scale; mRS, modified Rankin Scale.

use acupuncture more than those with favourable status (23% vs. 7%).

### Factors associated with acupuncture use

The results of the multiple logistic regression model with dichotomous use of acupuncture as the dependent variable are presented in Table 3. The functional status evaluated by mRS was the only variable excluded in the model because

of its high correlation with stroke severity ( $r=0.743$ ;  $p<0.0001$ ). The model identified initial severity, gender, age, recurrence and residence location as significant predictors at the 0.01 significance level (Hosmer–Lemeshow goodness-of-fit  $\chi^2=11.89$ ,  $df=8$ ,  $p=0.1158$ ).

The initial severity variable had the most significant effect on acupuncture use. The odds ratios for the patients in the moderate and severe groups were 3.38 (95% confidence interval (CI)=2.46–4.63) and 4.13 (95% CI=2.67–6.38), respectively; thus, the relative odds of

**Table 3** Logistic regression results for factors associated with CAM use.

Variable	Parameter (reference in parenthesis)	Wald Chi-square test				Odds Ratio	95% Confidence interval	
		Estimate	SE	Chi-square	Pr > ChiSq		Estimate	Lower limit
Gender	(Male)							
	Female	0.48	0.15	10.59	0.0011	1.62	1.21	2.17
Age	(~54)							
	55–64	0.03	0.21	0.02	0.8953	1.03	0.68	1.56
	65–74	0.08	0.21	0.14	0.7091	1.08	0.71	1.64
	75~	-0.80	0.27	8.69	0.0032	0.45	0.26	0.77
Work status	(Not employed)							
	Employed	0.25	0.16	2.47	0.1164	1.29	0.94	1.77
Residence	(Primary)							
	Secondary	0.18	0.17	1.16	0.2812	1.20	0.86	1.67
	Other regions	0.55	0.21	7.08	0.0078	1.74	1.16	2.61
Medical insurance	(NHI)							
	Medical aid	-0.62	0.45	1.87	0.1710	0.54	0.22	1.31
Refer from	(Direct visit)							
	Referred	0.22	0.15	2.09	0.1482	1.25	0.92	1.69
Recurrence	(First-time)							
	Recurrent	-1.09	0.23	23.09	<0.0001	0.34	0.22	0.52
Sub-type	(LAA)							
	SVO	0.15	0.19	0.62	0.4301	1.17	0.80	1.70
	CE	0.03	0.21	0.02	0.8900	1.03	0.68	1.56
	OD	0.03	0.27	0.02	0.8989	1.04	0.61	1.75
	UD	0.49	0.54	0.84	0.3580	1.64	0.57	4.68
NIHSS at admission	(Mild; 0–5)							
	Moderate; 6–13	1.22	0.16	57.08	<0.0001	3.38	2.46	4.63
	Severe; 14–42	1.42	0.22	40.72	<0.0001	4.13	2.67	6.38

Hosmer–Lemeshow goodness-of-fit  $\chi^2 = 11.89$ ,  $df = 8$  ( $p = 0.1158$ ). SVO, small vessel occlusion; CE, cardioembolism; OD, other determined aetiology; UD, undetermined aetiology; NIHSS, National Institute of Health Stroke Scale.

acupuncture use increased by 3.4 and 4.1 times, respectively, for the moderate and severe groups in comparison to the mild group.

The odds ratio for female gender was 1.62 (95% CI = 1.21–2.17); the odds of acupuncture use were 1.6 times higher for females than for males. The odds ratio for the oldest age group was significantly decreased to 0.45 (95% CI = 0.26–0.77); thus the odds of acupuncture use in patients older than 75 years were only less than half that in patients of other ages.

The odds ratio for the recurrent patients was 0.34 (95% CI = 0.22–0.52); the odds of acupuncture use in recurrent patients were less than half that in first-time stroke patients. The odds ratios for the patients from the secondary catchment area and the other areas were 1.20 (95% CI = 0.86–1.67) and 1.74 (95% CI = 1.16–2.61), respectively; thus, the odds of acupuncture use in patients from the other areas were 1.7 times higher than that in patients from the primary catchment area.

## Discussion

Of all the subjects in the study, 18.2% used acupuncture therapy along with conventional Western medicine during their hospital stay. This high level of use was thought to result

from the hospital being part of an academic medical centre that included the Oriental hospital of the first university to be established in Korea, an association that was well recognised among patients with a high preference for Oriental medicine.

The results of the multiple logistic regression indicating that patients from the remote areas had a higher usage rate than those from the neighbouring areas, were also thought to be related to this fact. Higher use of acupuncture was also observed in patients referred from general hospitals. This finding was explained in the same context as residence location because 47% were referred from general hospitals among patients from remote areas. Only 12% and 27% were referred from general hospitals in primary and secondary catchment areas, respectively. Most patients who specifically chose the hospital preferred its characteristic co-operation between the Oriental and Western medicine services, and this preference was thought to influence the decision to use acupuncture. These results suggest that the need for CAM treatments, such as acupuncture, is high among acute ischaemic stroke patients and that there might be much unmet need. Effective measures to increase the accessibility of CAM as a supplement to conventional treatments are necessary for the future.

The factor with the most significant odds ratio was the NIHSS classification at admission. The odds of use for the

moderate and severe groups were 3.4 and 4.1 times higher, respectively, than those of the mild group. Because of a general perception that acupuncture is helpful for treating the sequelae of strokes, the association between greater severity and a higher usage rate was thought to result from the greater concerns about sequelae in patients experiencing severe symptoms, such as paralysis and motor weakness.<sup>15,19</sup>

The TOAST sub-type was found to be a significant factor in the univariate analysis but not in the multivariate analysis. Although the symptoms and the severity according to sub-type affected the patients' choices, the choices were also related to the severity and consequently, no significance was found in the multivariate analysis. For example, the finding that patients with the LAA sub-type showed more use of acupuncture could be explained by the correlation between stroke sub-type and severity. The LAA sub-type is associated with higher severity; thus patients with higher severity tend to receive more acupuncture therapies.

The usage rate of acupuncture was lower in the subjects covered by MA, but the difference was not significant. Because the patients covered by MA had generally more difficult economic circumstances, their use of medical services tended to be low. However, the medical cost of acupuncture therapy was, on average, USD 107 per patient undergoing acupuncture therapy, or only 2% of the total in-patient charges; hence, it was not thought to be a significant variable.

The usage rate of acupuncture therapy was significantly lower in recurrent stroke patients than in first-time patients. Although the severity of recurrent strokes is greater than first-time strokes,<sup>20</sup> it has been reported that there is a significant difference in the duration of hospitalisation and medical costs between the two groups.<sup>20–22</sup> In the present study, the average NIHSS score at admission was higher in the recurrent patients (7.2 vs. 5.6,  $p < 0.0001$ ), but their usage rate of acupuncture therapy was lower (11.5% vs. 19.8%,  $p < 0.0001$ ). Although a direct comparison with previous studies is difficult, the lower usage rate of recurrent stroke patients is different from the general pattern of medical resource use by stroke patients. Patients with first-time stroke might tend to treat more actively than patients with recurrent stroke. However, this concern needs to be further explored in future studies.

The finding that the usage rate of acupuncture was higher in females is consistent with previous studies analysing the use of general CAM and acupuncture.<sup>3,23,24</sup> The finding that the use was highest in patients aged 55–64 years and low in those over 75 years is also consistent with previous studies.<sup>3,24</sup> The present study found no significant difference in the use of acupuncture by educational background or religion, and this result is different from the findings of other studies, which have reported that the usage rate is high in patients with low educational status<sup>24</sup> or high educational status<sup>3</sup> and in patients who are religious.<sup>23,24</sup> This discrepancy is thought to result from differences in subjects, such as patients with specific diseases versus the general population, and from differences in study parameters, including the difference between acupuncture therapy and total CAM.

As this study investigated only one hospital, the results of this study are difficult to generalise. In particular, considering that the subjects of this study had a high preference for Oriental medicine, the results may not represent the overall

situation in Korea. However, it was difficult to find a setting to collect enough cases that used acupuncture therapy along with conventional Western treatments; hence, the hospital used in this study was a suitable setting.

Lastly, the research model in this study can be further developed including more factors and their interaction variables. More factors might be economic factors, such as family income, assets, and outcomes of acupuncture therapy. Economic factors were not directly considered in this study and were supplemented by examining the type of medical insurance and employment. Additional studies including the outcomes and surveys on the background of the choice of additional acupuncture are needed. In addition, interactions between patients' residence location and other factors, such as insurance type, referral status and stroke severity, and so on need to be further investigated for policy implications.

## Conclusion

Attention to and use of CAM have increased as part of a desire to treat diseases in which conventional Western medicine does not show sufficient therapeutic effects. The present study revealed that many acute ischaemic stroke patients used acupuncture along with conventional medical treatment, because of not only the medically defined needs of the neurologists but rather the perceived needs of the patients and guardians. It was particularly important that higher stroke severity at admission, in addition to demographic factors such as age and gender, was associated with a higher usage rate of acupuncture. This finding was thought to result from stroke patients with higher severity having more worries about sequelae and higher expectations of the benefits of acupuncture. In addition, the higher usage rate of patients from remote areas was also meaningful.

## Disclosure statement

No competing financial interests exist.

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