Enlightenment to the Citizen and the Education of Emergency Medical Services

JMAJ 54(1): 10–15, 2011

Kazumi KIMURA*1

Abstract

Stroke is a major cause of morbidity and mortality in Japan even with medical advances. The intravenous t-PA treatment, proven to be safe and effective for hyperacute cerebral infraction, has been approved under the national health insurance policy on October 11, 2005. The t-PA treatment, however, is applied only to about 2% of the patients because of its 3-hour time limit from the stroke onset. In order to increase number of the patients treated with t-PA, there are two crucial keys: 1) increasing public awareness about the knowledge of stroke and 2) education of emergency medical services. Namely, citizen needs to learn about the stroke symptoms at the stroke onset and be encouraged to call an ambulance immediately if they have these symptoms. Furthermore, paramedics need to construct a stroke bypass system for transporting stroke-suspected patients to stroke center. When those two sides mesh together, more stroke patients can be treated with intravenous t-PA within 3 hours of onset.

Key words Stroke, Pre-hospital care, Public enlightenment, Paramedics

Introduction

In Japan as well as other countries, the safety and effectiveness of intravenous thrombolytic therapy using tissue plasminogen activator (t-PA) (hereinafter referred to as intravenous t-PA) in treating cerebral infarction patients within 3 hours of stroke onset has been proven, and the therapy was approved as a stroke treatment under national health insurance policy on October 11, 2005. Treatment of cerebral infarction in the hyperacute phase has shifted dramatically from an "untreatable era" to a "treatable era." However, in the general picture, the number of patients treated with the intravenous t-PA therapy still remains small at only 2% approximately.

To apply the intravenous t-PA therapy, stroke patients should arrive within 3 hours (preferably 2 hours) from the stroke onset at stroke centers that can administer intravenous t-PA. To meet that challenge, 2 important keys are: 1) increasing public awareness, and 2) training paramedics of emergency medical services. Here, the background and importance of public education and paramedics training are discussed.

*1 Professor, Department of Stroke Medicine, Kawasaki Medical School, Okayama, Japan (kimurak@med.kawasaki-m.ac.jp).
This article is a revised English version of a paper originally published in the Journal of the Japan Medical Association (Vol.138, No.7, 2009, pages 1323–1327).

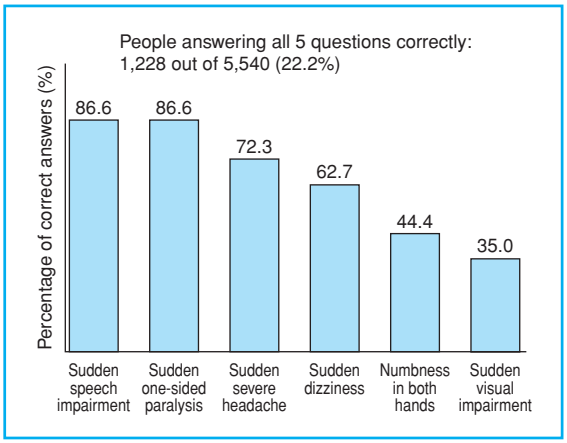

Fig. 1 The general public's level of awareness of stroke symptoms at the time of onset

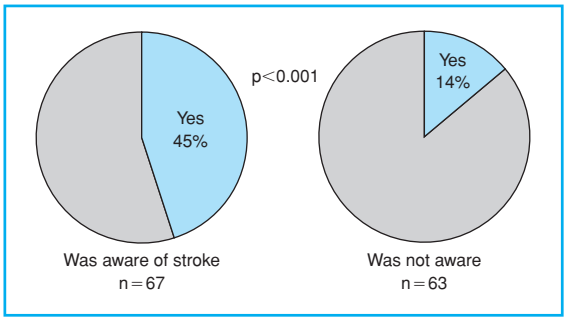

Fig. 2 Percentage of stroke patients transported to hospital within 2 hours of onset by whether or not the patient and/or the family was aware of stoke onset

Enlightenment of the General Public

The general public's knowledge on stroke

In fact, how much does the general public know about the disease of stroke? As far as I can remember, junior high school or high school education did not cover such topic. Japan Stroke Association conducted a questionnaire survey in 2006.[1] Some 11,000 residents in 3 cities of Japan (Akita City, Shizuoka City, Kure City; see the insert map) aged 40 to 74 years were selected at random and asked to answer multiple-choice questions about their knowledge on stroke symptoms, how to respond when oneself or someone else is having a stroke, and the information sources (return rate: 50.4%). According to the results of this survey, nearly 90% of respondents selected arm/leg motor paralysis and speech impairment as stroke symptoms. However, 70% selected severe headache, 60% selected dizziness, and only 40% selected visual impairment. These results clearly show that level of awareness for visual impairment in particular is low. Moreover, some 50% of respondents incorrectly selected "numbness in both hands" as a stroke symptom, indicating that many people do not realize the one-sided paralysis as a characteristic symptom of stroke (**Fig. 1**).

With regard to actions to take at the time of stroke attack, 80% of respondents answered that they would call an ambulance. This indicates that many people are aware that a stroke is an emergency and the patients should be transported to hospital immediately.

Why does the public need to learn about stroke?

A questionnaire survey was conducted at Kawasaki Medical School Hospital (Kurashiki City, Okayama, Japan). The patients whose stroke onset was less than 7 days ago (130 in-patients) and their family were asked the initial reason for coming to the hospital. The result showed that the average time interval between the onset and the hospitalization was 7.5 hours, 30% of the patients came within 2 hours, and that 52% were aware they had stroke. The correlation between the time interval and the awareness showed that 77% of the patients who came to the hospital within 2 hours of onset were aware that their symptom was stroke, whereas of the patients who took longer than 2 hours, only 41% had realized their symptoms as stroke (**Fig. 2**). These results indicate that recognizing the symptoms of stroke at the time of onset prompts patients to come to hospital sooner. Hence, enlightening the general public about the knowledge of stroke is very important.

Enlightenment methods

It is known that repetitive stimulation is more effective and more likely to be remembered than one-time event. Also, the media to deliver the information, such as television commercials, must be taken into account.

According to the survey conducted by Japan Stroke Association, 70% of the general public

Fig. 3 A scene from the stroke prevention campaign broadcast by NHK Okayama Broadcasting Station (broadcasted on April 1, 2009, by NHK Japan Broadcasting Corporation)

Fig. 4 At a weekly stroke study meeting for patients and their families at Kawasaki Medical School Hospital (Okayama, Japan)

obtains information on stroke from television and 50% from newspapers,[3] indicating that use of the mass media would be effective. In contrast, relatively low percentages of respondents obtained their information from physicians or nurses (30% and 20%, respectively). It is important that we healthcare professionals educate outpatients on a routine basis—especially those with risk factors for stroke, such as hypertension, diabetes, hyperlipidemia, and atrial fibrillation—about the knowledge of stroke and what to do at the time of stroke onset.

Effects of public education on stroke

Under a project funded by 2008 Health and Labour Sciences Research Grants-in-Aid for Comprehensive Research on Life-Style Related Diseases Including Cardiovascular Diseases of Ministry of Health, Labour and Welfare of Japan, research was conducted as part of the "Japan transportation and early admission management for acute stroke patients study (J. TEAM)" (Research leader: the author, Kazumi Kimura; contributing researchers: Tomonori Okamura, Naomi Miyamatsu, and others).[1] Japan Stroke Association had conducted a questionnaire survey in 2006 on public's knowledge on stroke at 3 cities, Akita, Shizuoka, and Kure, and the secondary survey was followed by distributing flyers and brochures for about 2 years. The target area was divided into 3 classes based on the frequency of distribution; high intervention area, low intervention area, and control area. Then, another survey was conducted to investigate how much the knowledge about stroke had improved (secondary survey) in the research area relative to the intervention levels.

Multivariable logistic regression analysis was used to examine the influencing factors for all 5 correct symptoms of stroke. In Fiscal Year 2008, questionnaires were sent to the 5,509 respondents from the preliminary survey who had consented to participating in the secondary survey, and 3,860 responses were received (response rate: 70.1%). After excluding those who had correctly named all 5 stroke symptoms in the preliminary survey and incomplete responses, the data from 2, 789 respondents was analyzed. The results found that 561 respondents (20%) had identified all 5 symptoms for the first time. The secondary survey respondents were then divided into 6 groups depending on the level of intervention (distribution of flyers and brochures: control area (no distribution), low, or high) and whether or not respondents had seen newspaper advertisements (a nationwide newspaper advertising campaign as supported by Japan Advertising Council). Using the [controlled intervention area + no newspaper advertising] group as the control, the likelihood of answering all 5 stroke symptoms correctly was examined using the odds ratio. The results showed the odds ratio for a perfect answer increased in the order of the following: [low intervention area + no newspaper

Table 1 Kurashiki Prehospital Stroke Scale (KPSS)

	(Points)	
Level of consciousness		
Fully responsive	0	
Responsive when stimulated	1	
Completely unresponsive	2	
Impaired awareness		
Ask the patient their name		
Correct answer	0	
Incorrect answer	1	
Motor paralysis	Right	Left
Using words, gestures, or pantomime, instruct the patient to close their eyes and hold both their arms out straight with their palms facing downwards.	(Arms)	
Patient can hold both arms out parallel and hold them still.	0	0
Patient can lift arms but cannot hold them up and they droop.	1	1
Patient cannot lift arms up.	2	2
Using words, gestures, or pantomime, instruct the patient to close their eyes and lift both legs off the bed.	(Legs)	
Patient can hold both legs up parallel and hold them still.	0	0
Patient can lift legs but cannot hold them up and they droop.	1	1
Patient cannot lift legs up.	2	2
Speech		
Instruct the patient to repeatedly say, "The weather is fine today."		
Patient can speak clearly and accurately.	0	
Words are unclear (slurred) or abnormal.	1	
Patient does not respond or is silent, or speech is incoherent.	2	
Total (complete disabilities = 13 points)	/13	

advertising], [high intervention area + no newspaper advertising], [control area + newspaper advertising], [low intervention area + newspaper advertising], and [high intervention area + newspaper advertising] (0.78, 1.33, 1.36, 1.69, and 2.03, respectively).

These results clearly show that distributing flyers and brochures is as effective as providing information via the mass media, and that increasing the frequency of newspaper advertising and flyer/brochure distribution improves effectiveness even further.

Stroke prevention campaign conducted by NHK (Japan Broadcasting Corporation) Okayama

Since April 2009, the Okayama branch of NHK, the largest and the most influential broadcasting station in Japan, Japan Stroke Association, and J.TEAM conducted a stroke prevention campaign for the entire year of 2009 (April 2009 through March 2010) (**Fig. 3**). It broadcasted stroke information and related stories on every Wednesday night in its local news.

To investigate the effectiveness of the campaign using television, the questionnaire survey will be conducted by telephones to about 1,000 residents in Okayama City where TV campaign was conducted, and the outcomes of "before" and "after" the campaign will be compared using Kure City as the control where television campaign was not conducted.

Other educational activities

In Kawasaki Medical School Hospital, an in-hospital study meeting is held every Thursday for stroke patients and their families by physicians (stroke and rehabilitation), nurses, paramedics, and dietarians (**Fig. 4**) to explain about medication and rehabilitation.

The municipal government, Kurashiki City, is also making active efforts to deliver the knowledge on stroke to the public, such as holding mini-study sessions and presenting the stroke information on the city magazines. Such governmental educating-leaning opportunities on stroke

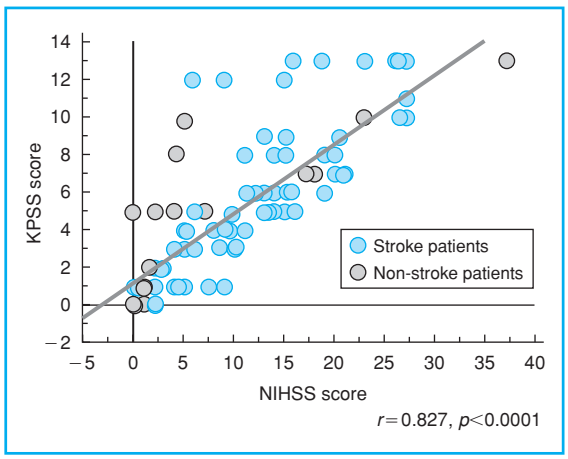

Fig. 5 Correlation between KPSS and NIHSS scores

Fig. 6 At a stroke seminar held jointly with Kurashiki City Fire Department (Okayama, Japan)

as well as other illness, such as heart disease and cancer, should be very beneficial for citizen.

Education of Emergency Services (Paramedics)

Emergency service of paramedics is responsible to make appropriate observation and judgment on the conditions of patients, provide proper treatment, and transport patients to the high quality medical institution. For successful intravenous t-PA therapy, the decisions of paramedics at the emergency scenes are extremely crucial. When stroke is suspected, the patient must be transferred promptly to a stroke center specialized in stroke treatment that can administer t-PA. If the paramedics mistakenly judge that a patient is not having stroke and transport him to a hospital without advanced medical equipment such as CT or MRI, then the patient would not be diagnosed properly resulting in inappropriate treatment. Thus, training the paramedics is extremely important for the early stage of stroke treatment, so that they will triage and transport the patients in the best way.

The author and colleagues cooperated with Kurashiki City Fire Department since May 2005 and have devised and implemented a prehospital stroke scale called Kurashiki Prehospital Stroke Scale (KPSS) (**Table 1**).[4] The characteristic of KPSS is that a paramedic can perform a KPSS evaluation on site and determine the severity of neurological damage using a numerical scale. The highest score, 13 points, indicates the most severe damage. A strong correlation has been found between the KPSS scores determined by paramedics and NIHSS (National Institutes of Health Stroke Scale) evaluation results performed by physicians at the receiving hospitals ($r=0.827$, $p<0.001$) (**Fig. 5**). If emergency service notifies a hospital that "a suspected stroke patient has a KPSS score of 10 points" via the stroke hotline from the scene, the medical staff at the receiving hospital will suspect that the patient's condition is serious and can respond and prepare for the best treatment.

In 2007, Japanese Society for Emergency Medicine presented the compilation of the immediate stroke life support (ISLS) guideline and the prehospital stroke life support (PSLS) guideline. The ISLS guideline shows the early stroke treatment for hospital staff, whereas the PSLS guideline aims to standardize the observation and treatment for stroke patients by emergency service.[5] KPSS is discussed in both guidelines.

My colleagues and I also conducted a national survey of fire departments (which are in charge of dispatching ambulances in Japan) concerning systems for transporting stroke patients.[6] The percentage of fire departments implementing prehospital stroke scales was 15% overall, clearly showing that it has yet to spread widely. Moreover, although there is a need to spread PSLS including KPSS, only 20% of fire department headquarters in Japan actually implemented PSLS training sessions in this past year. One of

the reasons for not implementing PSLS training was lack of coordination with medical institutions. When there is little cooperation between fire departments and medical institutions, it is important to develop a relationship, so that medical specialists could share the knowledge and encourage the paramedics to hold training courses. In other words, communication between fire departments and medical institutions in each community is vital in Japan (**Fig. 6**).

Conclusion

This paper discussed the importance of public education and paramedic education on prehospital care for stroke. A system of stroke care differs greatly depending on the region, and the specific system which meets its local need is essential. As medical specialists, it is important to facilitate and take a part in activities that increase the public awareness and train paramedics to foster communication. These two key elements, the public awareness and trained paramedics, will support the improvement of stroke care, along with establishment of the medical transport system and stroke-specialized care units in Japan. I sincerely hope that prehospital care for stroke patients in Japan improves further.

References

1. Okamura T, Miyamatsu N. Survey of the general public's knowledge about stroke, campaign, and results. Japan Transportation and Early Admission Management for Acute Stroke Patients Study (J. TEAM). (Research leader: K Kimura). Project funded by 2008 Health and Labour Sciences Research Grants-in-Aid for Comprehensive Research on Life-Style Related Diseases including Cardiovascular Diseases of Ministry of Health, Labour and Welfare of Japan. 2009 Mar. (in Japanese)
2. Iguchi Y, Wada K, Shibazaki K, et al. First impression at stroke onset plays an important role in early hospital arrival. Intern Med. 2006;45:447–451.
3. Nakayama H, Miyamatsu N, Okamura T. Enlightenment of the general public and patients about stroke. ER Magazine. 2009; 6:202–207. (in Japanese)
4. Kimura K, Inoue T, Iguchi Y, et al. Kurashiki prehospital stroke scale. Cerebrovasc Dis. 2008;25:189–191.
5. Japanese Society for Emergency Medicine (editor-in-chief). PSLS Course Guidebook: Standardization of the observation and treatment of stroke by emergency service workers. Tokyo: Herusu Shuppan; 2007. (in Japanese)
6. Miyamatsu N, Okamura T, Aruga T. Survey of emergency transportation systems for patients in the early stages of stroke onset. Japan Transportation and Early Admission Management for Acute Stroke Patients Study (J. TEAM). (Research leader: K Kimura). Project funded by 2008 Health and Labour Sciences Research Grants-in-Aid for Comprehensive Research on Life-Style Related Diseases including Cardiovascular Diseases of Ministry of Health, Labour and Welfare of Japan. 2009 Mar. (in Japanese)