

Stroke Education Using an Animated Cartoon and a Manga for Junior High School Students

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Background: We investigated whether junior high school students could be educated regarding stroke with an animated cartoon and a Manga that we produced for the purpose of dissemination of this knowledge. *Methods:* We produced a 10-minute animated cartoon and a Manga that provided information regarding stroke risk factors, stroke signs and symptoms, and awareness to immediately contact emergent medical service (EMS) on identification of stroke signs and symptoms. From December 2011 to March 2012, 493 students in 15 classes of the first grade (age 12-13 years) of 3 junior high schools were enrolled in the study. Each subject watched the animated cartoon and read the Manga; this was referred to as “training.” Lessons about stroke were not given. Questionnaires on stroke knowledge were evaluated at baseline, immediately after the training, and 3 months after the training. *Results:* The proportion of correct answers given immediately after the training was higher for all questions, except those related to arrhythmia, compared with baseline. Percentage of correct answers given at 3 months was higher than that at baseline in questions related to facial palsy (75% versus 33%), speech disturbance (91% versus 60%), hemiplegia (79% versus 52%), numbness of 1 side (58% versus 51%), calling for EMS (90% versus 85%), alcohol intake (96% versus 72%), and smoking (69% versus 54%). At 3 months after the training, 56% of students answered the FAST (facial droop, arm weakness, speech disturbance, time to call for EMS) mnemonic correctly. *Conclusions:* Stroke education using these teaching aids of the animated cartoon and the Manga improved stroke knowledge in junior high school students. **Key Words:** School-based training—stroke education—FAST—Manga.

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Introduction

Although stroke mortality has dramatically declined to the fourth leading cause of death in Japan, the number of stroke survivors has been increasing along with a rapid increase in the elderly population for the past 25 years. Disability of stroke survivors produces a great burden to society and individual patients and their families.

The advantage of using acute thrombolytic therapy with intravenous recombinant tissue plasminogen activator (rt-PA), also known as alteplase, for reducing stroke morbidity and mortality is well known.^{1,2} However, the actual rates of rt-PA treatment were reported to be as low as 3%-5%,³⁻⁵ mostly because of the lack of knowledge regarding stroke and of the delay in transport to a

hospital after onset of stroke.⁴ On September 2008, the European Co-operative Acute Stroke Study III extended the treatment time of rt-PA from 3 to 4.5 hours after the onset of symptoms in patients with acute ischemic stroke.⁶ However, few patients with acute ischemic stroke can receive rt-PA in the extended time window.⁷ The most important factor limiting the use of acute ischemic stroke therapy with rt-PA is the transit time to the hospital.⁸ Wein et al⁹ reported that only 4.3% of stroke patients called the emergent medical service (EMS) by themselves, and the remaining 95.7% of calls were made by family member, paid caregiver, coworkers, or others. Therefore, knowledge of stroke is important for individuals, family members, and the general population.

Many researchers have reported that public education using mass media or EMS instructors improved public awareness of stroke for adults.¹⁰⁻¹⁵ However, there were only a few studies of stroke education for juveniles.¹⁶⁻¹⁸ We developed a stroke education system performed by stroke neurologists for junior high school students.¹⁹ In our study, we showed that our education system was beneficial for the students' parents/guardians and the students themselves. As the next step, we investigated whether junior high school students could acquire the knowledge taught only by teaching materials such as an animated cartoon and a Manga that we produced for the purpose of wide dissemination of this knowledge. The aim of this study was to evaluate the effectiveness of an animated cartoon and a Manga in providing information about stroke risk factors, stroke signs and symptoms, and to train junior high school students to call for EMS immediately on identification of stroke signs and symptoms.

Methods

Stroke Education Items

We produced a Manga (148 × 210 mm; Fig 1) and a 10-minute animated cartoon (Fig 2), providing instructions on stroke signs and symptoms, stroke risk factors, and awareness to immediately contact the EMS on identification of stroke signs and symptoms. For identifying stroke signs and symptoms, we used the "FAST" criteria derived from the Cincinnati Prehospital Stroke Scale: F, face numbness or weakness; A, arm numbness or weakness; and S, speech slurred or difficulty speaking or understanding.²⁰ Other stroke symptoms besides "FAST" such as severe headache, visual impairment, and dizziness were also included in the Manga.

The Manga and the animated cartoon involved 3 stories. The first one was a case of acute ischemic stroke treated successfully with hyperacute thrombolytic therapy. The remaining 2 stories were cases of transient ischemic attack: a case of successful prevention of stroke with the appropriate action of the patient's family and the other was a case of suffering from a completed stroke

with delayed hospital admission because of the lack of stroke symptom knowledge.

Subjects and Study Design

This study was exempted approval from the institutional review board based on our domestic guidelines because only anonymous and untraceable data sets were used. We enrolled 493 students in 15 classes of the first grade of 3 private junior high schools (age 12-13 years) from December 2011 to March 2012. The students had no teacher-led lessons but watched the 10-minute animated cartoon and read the Manga for stroke education for 10 minutes in the class.

For assessments, questionnaires on stroke knowledge (a total of 12 items for stroke signs and 10 items for risk factors) were attempted by all the students before (baseline), immediately after, and 3 months after the training. All data were collected without personal identifiers. The questionnaire comprised multiple-choice and closed-ended questions that assessed the knowledge of stroke signs and risk factors. The 12 items for stroke signs included 6 on symptoms of stroke ("headache," "facial weakness," "vision loss," "speech disturbance," "numbness on 1 side of the body," and "weakness on 1 side on body") and 6 atypical symptoms ("chest pain," "dyspnea," "weakness on 4 limbs," "abdominal pain," "edema in feet," and "joint pain"). The 10 items for risk factors consisted of 7 stroke risk factors ("alcohol intake every day," "smoking," "hypertension," "dyslipidemia," "hyperglycemia," "obesity," and "arrhythmia") and 3 atypical risk factors ("constipation," "urinary frequency," and "stiffness of neck"). Furthermore, knowledge of adequate action at the onset of stroke onset and the meaning of the FAST mnemonic, such as each word of F, A, S, and T, were also examined by a single choice test.

Statistical analyses were performed using JMP7.0 (SAS Institute, Inc., Cary, NC). Data are presented as frequencies (%). Data were compared among the 3 groups of results with the Fisher exact test, namely baseline, immediately after, and 3 months after the training. A value of *P* less than .05 was considered to indicate a significant difference.

Results

Because a few students were absent from school on occasions, the number of questionnaires collected at immediately after and 3 months after the training was 491 (99%) and 480 (97%), respectively. The results of the questionnaires on stroke knowledge are shown in Table 1. In the questionnaires on stroke signs and symptoms, the proportions of correct answer in all questions except headache and numbness on 1 side were higher at immediately after the training than at baseline, and this difference remained until 3 months after the training except for answers related to vision loss. At 3 months, the correct

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