Delivering Knowledge of Stroke to Parents Through Their Children Using a Manga for Stroke Education in Elementary School

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Background: School-based intervention would be promising to spread stroke knowledge widely. This study aimed to clarify the effectiveness of our new educational aids that were developed for elementary school children to impart information about stroke to children and their parents in 2 different ways: with or without stroke lessons by a neurologist. *Methods:* We enrolled 562 children (aged 11 to 12 years) and their parents (n = 485). The students were divided into 2 groups: 323 received a lesson on stroke by a stroke neurologist without watching an animated cartoon (Group I), and 239 watched an animated cartoon without the lesson (Group II). All of the children took the manga home, and talked about stroke with their parents. Questionnaires on stroke knowledge were administered at baseline (BL), immediately after the lesson (IL), and 3 months (3M) after the lesson. *Results:* There were significant increases in the adjusted mean scores for risk factors as well as stroke symptoms at 3M in both groups compared with BL scores, although the children in Group I scored significantly better than those in Group II at IL and 3M ($P < .05$). In both children and parents, the correct answer rates of the FAST mnemonic at 3M were around 90%, with no significant differences between groups. *Conclusions:* Stroke education for elementary school children using our educational aids provided knowledge of stroke symptoms to the children as well as their parents even without lessons on stroke, although a better understanding of stroke was obtained from lessons led by stroke neurologists. **Key Words:** Stroke education—elementary school children—FAST—manga.

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Recently, several randomized trials showed that early thrombectomy plus alteplase for ischemic strokes with proximal cerebral arterial occlusion compared with alteplase alone was effective and safe.[1-5] The importance of a maximum reduction in time from stroke onset to hospital arrival in the treatment of stroke is being emphasized more than ever. Stroke education, including the awareness of stroke symptoms, not only facilitates action promptly upon observing stroke symptoms but also helps prevent cardiovascular diseases. Although school-based education pertaining to stroke may help prevent lifestyle-related diseases including stroke, the optimum age to expect education to be effective has not been clarified. Previously, we developed educational materials that include

a manga (comic book), an animated cartoon, and an original online education system for junior high school students (aged 13 to 15 years),[6,7] and demonstrated that lessons on stroke conducted by neurologists specializing in stroke or public health employees using our teaching materials can provide knowledge of stroke to parents through their children.[8,9] For the next step, we examined whether lessons on stroke using these educational materials could be effective for elementary school children (aged 11 to 12 years). Although these materials were feasible for elementary school children, their retention of the information was worse than that of junior high school students.[10] Therefore, we developed new educational materials for elementary school children so that they could understand the information on stroke more easily.

Lessons on stroke for elementary school children using our education materials created by neurologists specializing in stroke should be effective for providing information on stroke in the same manner as the education provided to junior high school students in our previous studies.[8,9] To spread such knowledge widely, it is essential to confirm the effectiveness of lessons on stroke that do not include lectures by neurologists. The purpose of this study was to clarify whether stroke education for elementary school children using our new educational materials can deliver information on stroke to the children as well as to their parents in 2 different ways, with or without lessons from a neurologist.

Methods

Participants and Study Design

This study was conducted at 6 public elementary schools in Suita City (pop. 350,000) of Osaka Prefecture, Japan, from May 2014 to September 2014. Participants (aged 11 to 12 years) were divided into 2 groups: 1 class received a 45-minute lesson conducted by a neurologist specializing in stroke (Group I) and the other class watched an animated cartoon and read a manga (comic book) without lessons from a neurologist (Group II). In Group I, the neurologist provided a lesson on stroke risk factors, symptoms, and the FAST mnemonic derived from the Cincinnati Prehospital Stroke Scale: F, facial numbness or weakness; A, arm or leg numbness or weakness; S, speech slurred or difficulty speaking or understanding; and T, time to call an ambulance.[11] Children in Group I did not watch an animated cartoon nor read the manga during the stroke lesson. For stroke education, Group II children received no neurologist-led lessons, but watched a 10-minute animated cartoon and read the manga for 10 minutes to acquire information on stroke in the classroom. At the close of the lesson in both groups, all children were given the manga, a magnetic poster, and a questionnaire for their parents to complete. The teachers instructed the children to take the materials home, talk about stroke with their parents, show their parents the manga, and place the magnetic poster on the refrigerator to share with their families. An educational poster was displayed in each classroom after the stroke lesson.

Enrolled in the present study were 562 students (Group I, 323; Group II, 239) and 485 parents (Group I, 275; Group II, 210). This study was approved by our institutional review board and is registered with the UMIN clinical trial (ID: UMIN000018245 R000020984).

Educational Materials on Stroke

To educate elementary school children on stroke signs and symptoms, we developed new educational materials, including a manga and an animated cartoon that uses the FAST mnemonic (Fig 1, A).[11] Stroke symptoms other than those in FAST, such as severe headache, visual impairment, and dizziness, were also included in the manga. We also prepared a poster measuring 600×400 mm and a magnetic poster measuring 150×105 mm that were printed with the FAST message: "On observing facial droop, arm weakness, and speech disturbance, check the time and call the ambulance" (Fig 1, B).

The stories in the manga and the animated cartoon referred to *Alice's Adventures in Wonderland* written by Lewis Carroll. A white rabbit with a pocket watch advises Alisa, the heroine in this story, to call an ambulance quickly on observing her grandfather's stroke symptoms. The quick action of the patient's family allowed the grandfather to successfully avoid stroke.

Assessment of Education Programs

For assessment, a multiple-choice and closed-type questionnaire on stroke was prepared (Table 1). The 12 items for stroke signs included 6 symptoms of stroke and 6 incorrect or atypical symptoms. The 14 items for risk factors consisted of 7 risk factors for stroke and 7 incorrect or atypical risk factors. In calculating scores, 1 point was given if the participant chose a correct answer or did not choose an incorrect answer. Therefore, the scores of questionnaires on stroke symptoms and risk factors ranged from 0 to 12 and 0 to 14, respectively. Questionnaires for children and their parents were administered at baseline (BL), immediately after the lessons (IL), and at 3 months after the lessons (3M). For BL assessment, questionnaire sheets were given to children and their parents within 2 weeks before the lesson. The meaning of the FAST mnemonic was also tested by a single-choice test at IL and 3M. Questionnaires completed by parents were taken to school by their children where teachers collected them.

Analyses of Data

Statistical analyses were performed using JMP 8 (SAS Institute Inc. Cary, NC) or STATA software, version 13.0