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ORIGINAL ARTICLE

Planning a campaign to fight stroke: an educational pilot project in La Spezia, Italy

Elisa Giorli[1,2] · E. Schirinzi[3,2] · R. Baldi[4] · A. Manironi[1,2] · E. Raggio[4] · N. Reale[2] · C. Gandolfo[2,5] · M. Del Sette[3,2]

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Abstract

Introduction Best medical treatments of ischemic stroke are admission to stroke unit, intravenous thrombolysis and, in selected cases, thrombectomy. Time from symptom onset to interventions is the best predictor of clinical outcome. In order to verify the effectiveness of an active education programme of awareness on the knowledge of stroke, we performed a local campaign "on the field".

Subjects and methods We selected 101 subjects from the general population who took part in the "stroke awareness campaign" organised by the Italian Association for the fight against stroke (A.L.I.Ce). Mean age was 59 years (50% female; 50% male); 55% of the sample reported a high level of education (> 8 years: high school or university degree). After a short multiple-choice questionnaire, we administered a face-to-face standard educational protocol (15 min). The efficacy of that educational intervention was then verified after a period of 12 months, by telephone interview.

Results There was improvement both in the definition of stroke (66% vs. 92%, $p < .001$) and in recognizing symptoms and signs (19% vs. 72%, $p < .001$). Knowledge of the importance of stroke unit in the acute treatment of stroke did not improve, as it was already high on baseline (92% vs. 97%, p: n.s.). The improvement was evident in particular in younger and higher educated people, without difference in gender. There was no difference based on risk factor profiles of participants.

Conclusions Our results suggest that a personalised education can improve knowledge on stroke symptoms and signs, independently of gender and personal risk factors. The results should be verified in larger and less selection population.

Keywords Awareness · Stroke · Information campaign · Educational project

Background

Best medical treatments of ischemic stroke are admission to stroke unit, intravenous (i.v.) thrombolysis and, in selected cases, intra-arterial thrombectomy [1]. In any case, time from symptom onset to intervention is the best predictor of clinical outcome; in particular, time window for i.v. thrombolysis is considered up to 4.5 h [2]. Nevertheless, still a small part of eligible patients are treated with rt-PA. Main barrier, in particular in Italian settings, is pre-hospital delay [3]. A study performed in California showed that increasing the rate of ischemic stroke patients who reach the Emergency Department earlier would hypothetically widen the number of thrombolysis much more than any other intervention, such as faster emergency medical services triage [4, 5]. It is unquestionable that the variability of time to hospitalisation is related to the patient or by-stander awareness of the clinical condition that will contribute to determine, to some extent, the therapeutic approach [6, 7].

In fact, social communication campaigns in the general population to educate on early symptoms recognition could lead to an increase of the amount of recanalisation therapies performed, but the really effectiveness on the clinical management of the patients is still unclear. Recent studies of stroke awareness campaigns worldwide, which included

✉ Elisa Giorli
elisa.giorli@me.com

1 Unit of Neurology, St. Andrea Hospital, La Spezia, Italy

2 A.L.I.Ce. Liguria, Associazione Lotta all'Ictus Cerebrale, Genoa, Italy

3 Unit of Neurology, E.O. Ospedali Galliera, Genoa, Italy

4 S.S.D. Epidemiology, St. Andrea Hospital, La Spezia, Italy

5 Department of Neuroscience, Ophthalmology and Genetics, University of Genoa, Genoa, Italy

interventional studies and web-based campaigns, highlighted that, if most interventions proved at least partially effective in increasing stroke awareness, this does not necessarily lead to a change in behaviour in case of stroke [8, 9].

A recent Italian study in a large population group aimed at assessing the role of an awareness campaign in reducing the onset to ED time of patients admitted because of stroke/TIA [9, 10].

In particular, mass media resulted expensive and generally short-lived; web-based campaigns tended to be effective only on selected subgroups (namely higher educated, health conscious, female subjects). Instead, it seems that community-based interventions may be an affordable instrument, able to target specific subgroups in an interactive, and thus more effective, way [11]. The focus message to be spread should be clear, easy to be remembered, and must include the indication "call an ambulance". One famous public stroke education message is the "SUDDEN" message, a list of 5 stroke warning signs created by the Brain Attack Coalition [12]. This list of symptoms is very complete (identifying 99.9% of strokes/TIAs) but it is quite long and may be difficult for the lay public to be remembered; thus, in an attempt to simplify the message, the acronym FAST ("Face", "Arm", "Speech", "Time") was created in 1999, based on the Cincinnati Pre-Hospital Stroke Scale [13]. The FAST message combines 3 common stroke warning signs into a single message and identify 88.9% of strokes/TIAs [14], FAST is the most commonly used educational message in English-speaking countries, and it is currently adopted by the American Stroke Association [15].

In an attempt to verify the efficacy of a personalised education on risk factors and warning signs of acute stroke based on FAST message, we organised a campaign on stroke awareness in the Italian province of La Spezia.

Objectives

The aim of this study was to verify the efficacy of a simple interactive educational pilot project on stroke awareness in a sample of general population in La Spezia, Italy. This may be the first step for planning broader community-based educational interventions.

Materials and methods

We included a sample of 101 subjects from the general population who took part in the "stroke awareness campaign" organised in March 2012 by the Neurology Unit of St. Andrea Hospital of La Spezia (Italy), in cooperation with the Italian Association for the fight against stroke (Associazione Lotta all'Ictus Cerebrale, A.L.I.Ce). Mean age was 59 years (range 21–86), equally distributed by sex (50% female; 50% male); 55% of the sample reported a high level of education (> 8 years: high school or university degree), 27% had attended school for 5 to 8 years and 18% had an education level of less than 5 years. Our stroke awareness campaign standard protocol included socio-demographic status collection, risk profile assessment through, medical interview, and a 10-min standard interview to assess personal knowledge on stroke. The survey instrument was a short multiple-choice questionnaire, featuring 3 of the 8 questions we used in previous studies [16] and concerning (1) definition of stroke, (2) symptoms and (3) best referral option in case of stroke (Tables 1, 2, and 3). The questionnaire was administered immediately before a subsequent educational standard protocol, done by expert personnel with the correct answers to the questionnaire and relative explanation (15 min each). The efficacy of that educational intervention was then verified after a period of 12 months, by a telephone interview performed by a trained physician (E.T.).

Statistical analysis

We conducted descriptive statistics on the study sample, as for the most relevant socio-demographic (sex, age and education) and clinic-anamnestic variables, self-reported or measured on the day of the survey (smoke, physical inactivity, overweight, dyslipidaemia, hypertension, atrial fibrillation, diabetes or fasting glucose impairment, personal or family history of stroke/TIA).

We carried out a comparison between prevalence of correct answers to questions before and after the educational intervention with a non-parametric test (Mc Nemar test for dependent samples) for different socio-demographic characteristics and risk profiles.

Results

Distribution of risk factors

We analysed the distribution of risk factors (Fig. 1), both self-reported and measured on the day of the evaluation by health professionals. The most frequent one was dyslipidaemia (47.5%), followed by age over 65 years (37.6%), family history of stroke/TIA (32.7%), high blood pressure (30.7%), physical inactivity (less than a 30-min walk twice a week) (27.7%) and overweight (body weight exceeding the expected of more than 10 kg) (27.7%). Smoke (9.9%), history of previous stroke/TIA (7.9%), diabetes or fasting impaired glucose (7.9%) and atrial fibrillation (6.9%) were less frequent risk factors.

We classified subjects in 4 groups on the basis of their risk profile: 0–1 risk factors (14%), 2–3 (47%), 4 or more (21%) (Fig. 2).

Table 1 Stroke awareness by risk profile

	Low knowledge		Good knowledge		Total	
	Before	After	Before	After	Before	After
No risk/low risk	5	1	9	13	14	14
	35.7%	7.1%	64.3%	92.9%	100.0%	100.0%
Medium risk (2 or 3 factors)	13	2	35	46	48	48
	27.1%	4.2%	72.9%	95.8%	100. .0%	100.0%
High risk (more than 4 factors)	9	3	12	18	21	21
	42.9%	14.3%	57.1%	85.7%	100.0%	100.0%
Missing	4	1	3	6	7	7
	57.1%	14.3%	42.9%	85.7%	100.0%	100.0%
Total	31	7	59	83	90	90
	34.4%	7.8%	65.6%	92.2%	100.0%	100.0%

No statistically significant differences in risk profiles

The distribution by age group showed that people over 65 years of age have more likely a high-risk profile (71%) while no significant differences were found between sexes.

Stroke awareness before and after the educational intervention

We collected data on both assessments (before and after educational intervention) on 90 subjects; the results are summarised in Fig. 3.

Question one: definition of stroke

When asked to recognise the definition of stroke before the educational intervention, 66% of the sample correctly answered that it is an acute disease of the brain, 23% stated that it is a kind of cardiac infarction, 11% that it is a chronic-degenerative disease of older age; during the educational training, people learned what stroke is, and after 8–12 months, most of the subjects (92%) still remembered the correct definition and the difference in knowledge between before and after the intervention was statistically significant ($p < 0.001$).

Question two: signs and symptoms

When asked to recognise stroke signs and symptoms out of a list of 6, the subjects that were able to indicate at least 2 of them at baseline were only 56%, and increased up to 96% after the educational intervention; the percentage of those who could identify all the correct signs and symptoms passed from 19% (pre-training) to 72% (post-training) (statistically significant differences, $p < 0.001$). Symptoms list consisted of 3 correct ("sudden trouble speaking or understanding" "mouth droop", "sudden weakness of a leg or an arm on one side of

Table 2 Symptoms awareness by risk profile

	Low knowledge*		Good knowledge*		Total	
	Before	After	Before	Before	After	Before
No risk/low risk	12	2	2	12	14	14
	85.7%	14.3%	14.3%	85.7%	100.0%	100.0%
Medium risk (2 or 3 factors)	35	13	13	35	48	48
	72.9%	27.1%	27.1%	72.9%	100.0%	100.0%
High risk (more than 4 factors)	19	7	2	14	21	21
	90.5%	33.3%	9.5%	66.7%	100.0%	100.0%
Missing	7	3	0	4	7	7
	100.0%	42.9%	0.0%	57.1%	100,0%	100.0%
Total	73	25	17	65	90	90
	81.1%	27.8%	18.9%	72.2%	100.0%	100.0%

*Low knowledge: knows less than 3 symptoms; good knowledge: knows all symptoms knowledge = no statistically significant differences in risk profiles

Table 3 Correct behaviour by risk profile

	Incorrect		Correct*		Total	
	Before	After	Before	After	Before	After
No risk/low risk	0	0	14	14	14	14
	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%
Medium risk (2 or 3 factors)	4	2	44	46	48	48
	8.3%	4.2%	91.7%	95.8%	100.0%	100.0%
High risk (more than 4 factors)	3	1	18	20	21	21
	14.3%	4.8%	85.7%	95.2%	100.0%	100.0%
Missing	0	0	7	7	7	7
	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%
Total	7	3	83	87	90	90
	7.8%	3.3%	92.2%	96.7%	100.0%	100.0%

No statistically significant differences in risk profiles

*Correct behaviour = call 118 within 4:30 h

the body") and 3 incorrect ("chest oppression or tightness", "fatigue of both legs", "nausea and stomach-ache with headache").

Question three: best referral option in case of stroke

Even before the training, 92% stated that in case of stroke they would call the emergency service (118) or directly go to the emergency department. After the educational intervention, the percentage of correct answers reached 97% (non-statistically significant difference, because of the high level of knowledge at baseline). A stable 3% answered that one should call the general practitioner, while the 4% who would stay in bed reduced to zero in the post-training period.

By crossing answers to question 2 (symptoms awareness) and 3 (best referral option), it comes out that 100% of those who could recognise the three correct symptoms of stroke in the list before the training, correctly answered that in case of stroke they would call the emergency service.

Even before the educational intervention who recognise all stroke symptoms, correctly knows what to do in case of stroke.

Stroke awareness by socio-demographic characteristics

We divided our sample into three groups, according to their education level: low (≤ 5 years of school), medium (> 5 and ≤ 8 years) and high (> 8 years). The educational intervention significantly increased symptoms awareness in every group. As for the definition of stroke, there was a significant improvement of answers only in subjects with higher or medium education, leading to a statistically significant difference among different levels of education in the post-training assessment (Fig. 4).

Age

We divided the sample into two groups based on age: under 65 years of age and over 65. At baseline, there

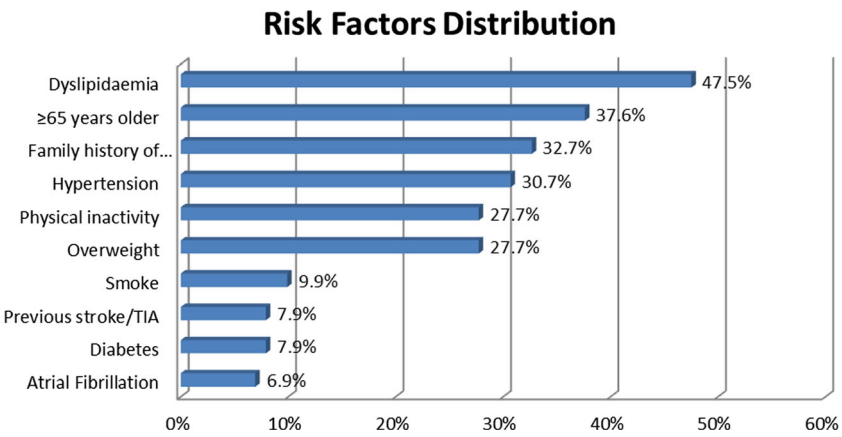


Fig. 1 Risk factors distribution

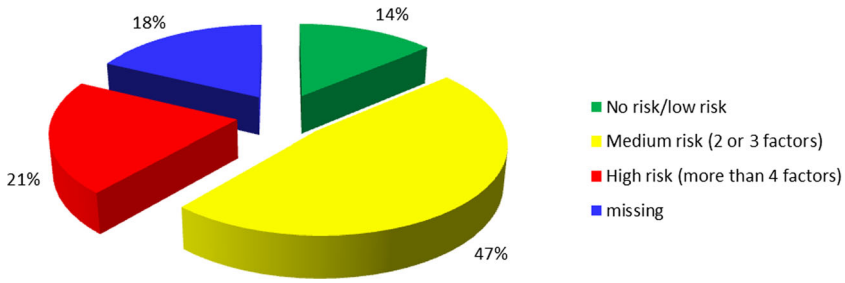


Fig. 2 Risk factor profile distribution

was a statistically significant difference in correct answers at questions about the most proper behaviour in case of stroke between younger (98%) and older (81%). The educational intervention had an impact on stroke knowledge and symptoms awareness in both people under and over 65 years of age. After the FAST training, the younger group reached better results in symptoms recognising, with a statistically significant difference with the older group (Fig. 5).

Sex

In both females and males, there was a statistically significant increase of stroke definition and symptoms knowledge after the educational intervention. There were no gender differences in stroke awareness before the educational intervention or in learning and retaining information after it.

Stroke awareness by risk profile

We evaluated by means of Mc Nemar test the effect of educational intervention on disease knowledge, symptoms awareness and behaviour by risk profiles (low, medium, high).

People with intermediate risk profile show a statistically significant improvement in stroke awareness. In all risk profiles, there was a statistically significant increase in symptoms awareness after the intervention. No significant improvement was shown in behaviour for any risk profile.

There was no overall statistically significant difference by risk profile. All these results are summarised in Fig. 6.

Discussion

In the current literature, it appears that awareness of stroke symptoms and treatment does generate an active behavioural change, in several populations. Nevertheless, positive intervention effects were reported in the majority of studies, yet the methodological weakness in several studies limited the generalisability of the observed effects. In fact, reporting of specific intervention design was suboptimal and impeded the identification of key intervention components for reducing patients' delay. The parallel delivery of public and professional interventions further limited the identification of successful intervention components [17].

Our study demonstrated that an educational intervention could improve the identification of early stroke symptoms and the intention to call an emergency number. In our sample, the knowledge of stroke symptoms was improved by the educational intervention.

Stroke knowledge in the general population is generally low; the small sample with high educational level proposed in this study is not so much representative of the general population. Thus, one limitation of our study might be the high

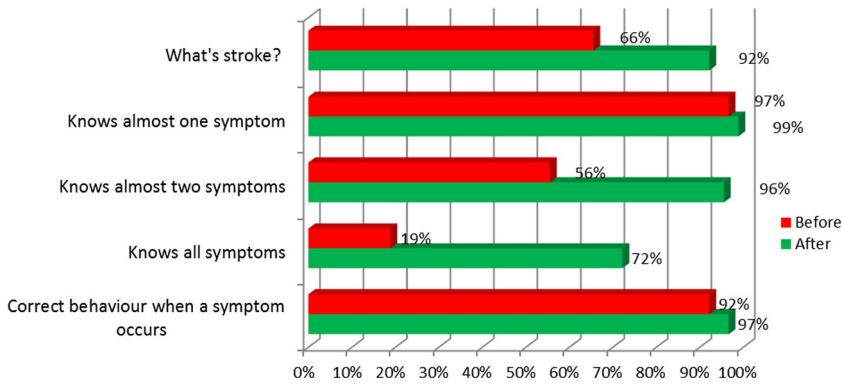


Fig. 3 Stroke awareness before and after the educational intervention

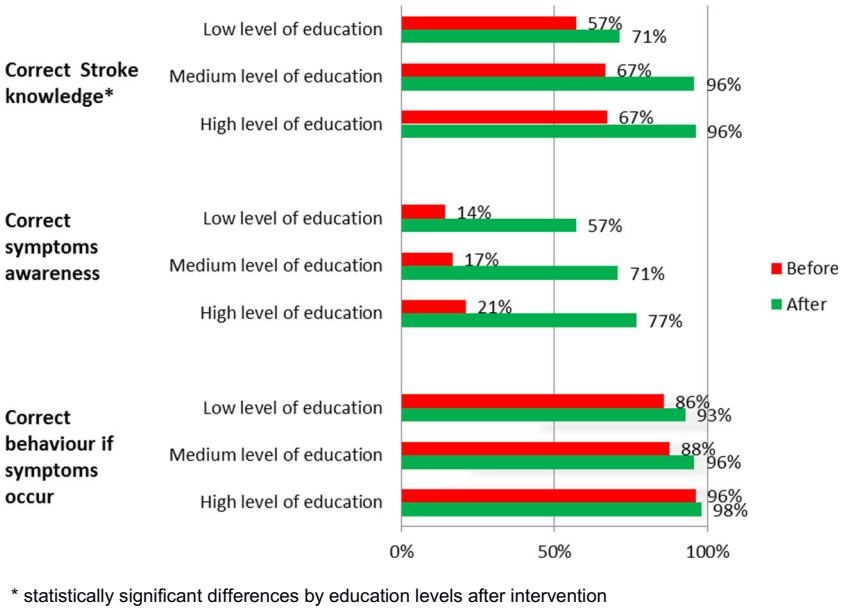


Fig. 4 Stroke awareness by education before and after the educational intervention. *Statistically significant differences by education levels after intervention

educational level and the relatively young age that could mask age and gender differences. Another limitation of our study is the fact that enrollment was on voluntary base; thus, the intervention was limited to selected people, highly motivated, not representative of the general population. However, we could appreciate a statistically significant difference both for stroke definition and for symptoms awareness by educational level, independently of sex. In previous papers, the most relevant impact in treatment was achieved in small trials with dedicated training of health workers [18] and probably a large educational programme of the population starting in the school age [19]. In our study, the short-term impact to analyse a perspective behavioural response was applied and, as opposed to several campaigns using television, newspaper and radio, we designed an educational training "face to face", allowing to shape the message for each subject, with the hypothesis of increasing the efficacy. Many educational interventions have been limited to adult population, but younger focused intervention might be useful for teaching young people to help older ones.

Mass media interventions have been implemented to improve emergency response to stroke, given the emergence of

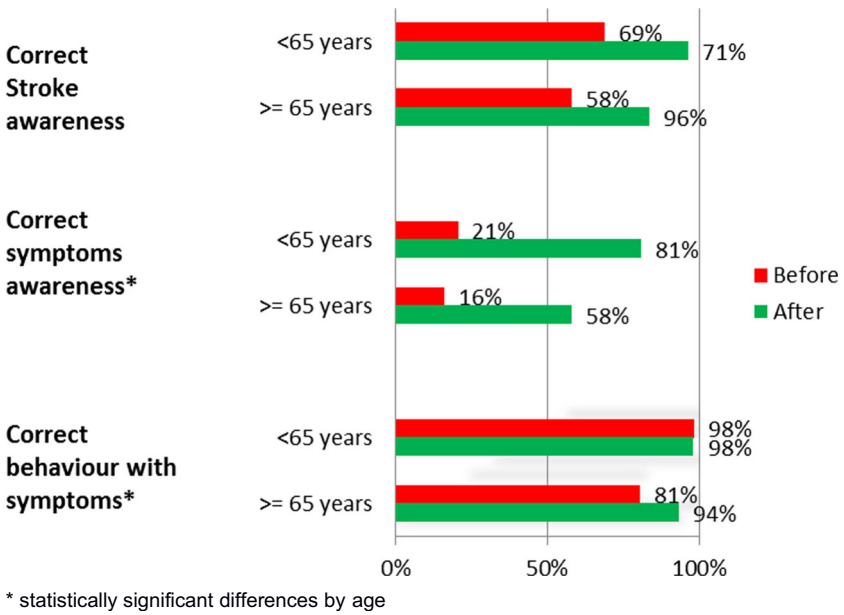
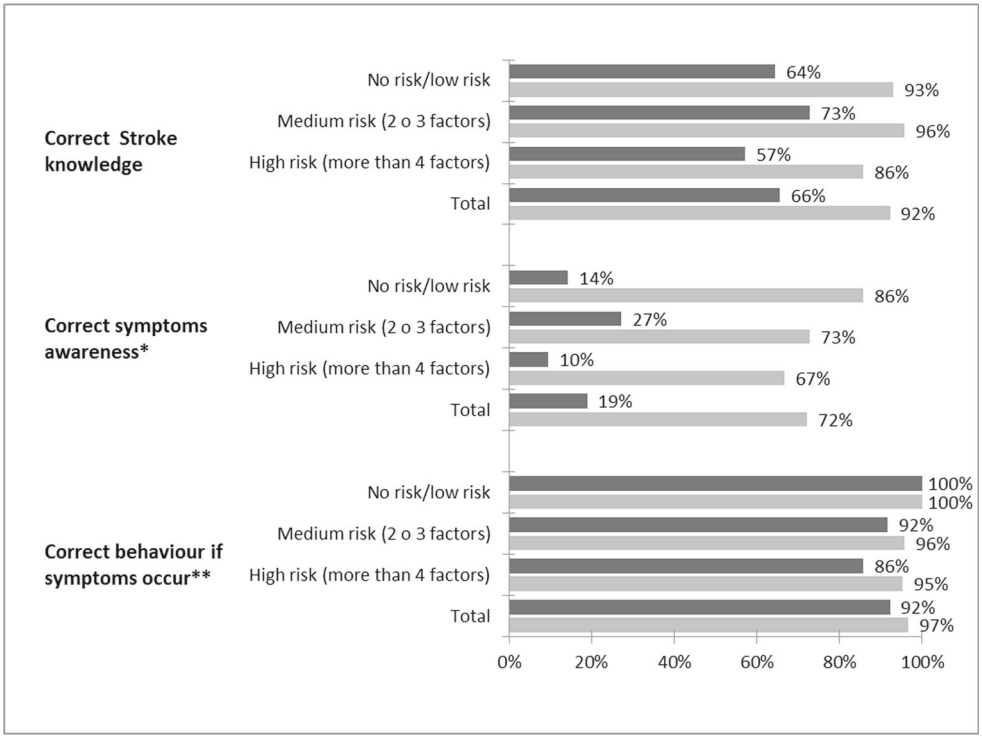


Fig. 5 Stroke awareness by age before and after the educational intervention. *Statistically significant differences by age



^ Black: before intervention; Grey: after the intervention
* Less than 3 symptoms knowledge= low knowledge; all symptoms knowledge = Good knowledge
** Correct behaviour=Call 118 within 4:30 h

Fig. 6 Stroke knowledge, symptoms awareness and behaviour by risk profile. Black: before intervention; grey: after the intervention. *Less than 3 symptoms knowledge = low knowledge; all symptoms knowledge = good knowledge. **Correct behaviour = call 118 within 4:30 h

effective acute treatments. Campaigns aimed at the public may raise awareness of symptoms/signs of stroke, but have limited impact on behaviour. Campaigns aimed at both public and professionals may have more impact on professionals than the public [20]. So, health literacy strategies should be supported and improved [21] by politicians and media campaign. Our data are in line with the other recent National or International stroke prevention campaigns. Nishijima et al., in Japan, analysed the data by 1144 patients admitted to hospital for ischemic stroke, 544 before and 600 during an intervention of an educational televisive campaign. They confirmed the potential effect of reducing pre-hospital delay in the intervention group, yet the rate of r-TPA treatment was unchanged [22]. Nevertheless, it should be noticed that arriving on time to best medical care (such as screening for disphagia, and early rehabilitation, early secondary prevention) could changes clinical outcome not only in patients candidate to tPA.

In 2015, a telephone interview among 1000 Italian adults concerning risk factors, warning signs, proper reactions and therapeutic options, underlied a suboptimal stroke knowledge, correlated with educational level degree and previous family experience [23].

In addition, an attempt in Italy of e-learning strategy by a "stroke app" (ICTUS 3R) for electronic devices as a smart educational strategy has proven to be particularly appreciated by young individuals aged 25–44 years [24, 25].

Strength of our study is an interventional design, with a face-to-face education and a follow-up interview to verify the duration of the effect of the education itself.

In Italy, there are, also, still many differences in stroke care by region. A more extended campaign of direct sensibilisation could be useful not only to improve knowledge of the general population but also to alert decision-makers, in order to reduce unfair differential treatment of stroke in different Italian areas. Our small sample may have influenced statistical power, and the results should be verified in larger samples. In conclusion, disclosure campaigns on larger numbers of people are necessary to verify the results obtained.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Financial disclosure No author has a financial relationship with the company who manufactures any product or equipment discussed in this manuscript.

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