Stroke and transient ischaemic attack awareness

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ABSTRACT

Objective: This study examined the knowledge of stroke warning signs and risk factors among the general public, including what they would do if they were to develop such symptoms.

Design, setting and participants: Population study of randomly selected members of the general public in Adelaide, South Australia. A simple survey assessed knowledge of stroke warning signs and gave four options for management. The survey was conducted on three separate occasions: before, immediately after and 3 months after the National Stroke Foundation's National Stroke Week in 2009.

Main outcome measures: The outcome measures were the public perception of risk factors and warning signs of stroke and what the members of the public would do if presented with a range of warning signs. They were also asked about their knowledge of the Face, Arms, Speech, Time (FAST) test.

Results: The three surveys were completed by 251 members of the public. Hypertension and smoking were recognised as risk factors for stroke by 71% and 53% of respondents respectively. Before National Stroke Week, slurred speech was identified by 51% and both slurred speech and upper limb sensory loss was identified by 62% as warning signs to provoke presentation to an emergency department (ED). Amaurosis, upper limb sensory loss, upper limb numbness and upper limb weakness were correctly identified individually as warning signs to attend an ED by fewer than one-third of respondents. There was no significant difference in the survey results following National Stroke Week.

Conclusions: Public awareness of the symptoms of stroke, and what to do about them, is limited. There was little improvement after the national week-long awareness campaign. The lack of public awareness about stroke warning signs must be addressed to reduce mortality and morbidity from stroke.

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Studies of acute intervention for stroke have shown that outcomes are more favourable if symptoms are recognised early. However, most people do not seek medical attention soon enough.[1-4] Many factors contribute to delays in seeking medical treatment for acute stroke, but one that can be addressed is the public lack of knowledge about symptoms, which often means a delay in seeking medical care.[5]

Fast access to acute medical services, particularly thrombolysis, is an important predictor of stroke outcome.[6-8] There has been much research and discussion recently about the need for urgent investigation and treatment of patients who present with symptoms of transient ischaemic attack (TIA) or stroke.[9,10]

To benefit from early intervention, the patient must first recognise the symptoms of TIA or stroke, then seek medical attention, and have appropriate investigations and then treatments in a suitable time frame. The inability of patients and bystanders to recognise the symptoms and signs of stroke and to quickly access the emergency medical system are the largest barriers to effective stroke therapy, in particular thrombolysis and carotid endarterectomy. Population-based studies demonstrate sub-optimal awareness of stroke risk factors and warning signs for stroke onset.[11,12] Contemporary Australian data on stroke awareness in the general population is scarce.[13,14]

In September 2009, the National Stroke Foundation organised National Stroke Week, to raise awareness of stroke and its early warning signs using the Face, Arms, Speech, Time (FAST) test. This has been designed as a simple tool for the general public to recognise and remember the signs of stroke, as well as emphasising that time is critical. It involves asking three simple questions:

- Face: check the patient's face. Has their mouth drooped?
- Arms: can they lift both arms?
- Speech: is their speech slurred? Do they understand you?
- Time: time is critical. If you see any of these signs, call 000 now!

The aims of our study were to investigate public awareness of the symptoms, signs and risk factors of TIA and stroke, and what people would do if they occurred. We also investigated whether public knowledge of the FAST test and levels of awareness improved after the Stroke Foundation's campaign.

METHODS

A simple survey was conducted in Adelaide, South Australia. After the appropriate council permits were obtained, medical and nursing students approached members of the public in a busy city shopping mall. Subjects were randomly selected, with interviewers selecting the first person passing through a nominated point after having finished the previous interview. The questions were asked during a one-to-one interview. The interviewer intervened only to clarify a question, if required. No attempt was made to prompt the respondent by suggesting answers directly. The Flinders Clinical Research Ethics Committee approved this study.

The survey included questions on demographics and self-reported health status, including risk factors for stroke. Respondents were asked which symptoms and signs from a given list (Box 2)[12] were warning signs of a stroke or TIA. A typical acute stroke presentation was then described to them (eg, "If you suddenly developed some weakness in your right arm and leg, what would you do?") and they were asked if they would:

a. see their GP the next day,
b. go to their GP that day
c. go to the emergency department (ED) immediately; or
d. other.

Respondents were also asked if they had heard of the FAST test and, if so, what the acronym stood for.

This survey was conducted on three separate occasions: before, immediately after, and 3 months after National Stroke Week.

All statistical analyses were performed using SPSS version 13 (SPSS Inc, Chicago, Ill, USA). Fisher exact and χ^2 tests were performed to compare differences in knowledge base between groups. Analysis of variance was used to look at the mean

1 Characteristics of the survey respondents*

Factor	Number
Proportion of women	143 (57%)
Proportion educated > 10 years full time	150 (60%)
Self-reported risk factors:	
Past smoker	98 (39%)
Current smoker	65 (26%)
History of heart disease	70 (28%)
Prior stroke	10 (4%)

* *n* (total respondents to the survey) = 251; mean age, 63.7 years; age range, 21–91 years. ◆

differences in numbers of correct answers between the three survey times.

RESULTS

A total of 251 members of the general public completed the survey (85, 83 and 83 respondents before, immediately after and 3 months after National Stroke Week, respectively) Box 1.

A summary of the respondents' knowledge of stroke warning signs and risk factors is presented in Box 2. Warning signs identified by at least 5% of the study sample are shown. The most commonly identified were slurred speech, dizziness, numbness and visual disturbances. However, with the exception of slurred speech (identified by 61%), fewer than half the population identified these established warning signs. Twelve percent of the respondents were not able to identify any warning signs for stroke.

Stroke risk factors identified by at least 5% of the three study samples are shown in Box 2. The most commonly identified were hypertension, smoking, obesity and high cholesterol. However, with the exception of hypertension (identified by 71%) and smoking (53%), fewer than half the population correctly identified established stroke risk factors.

The type of stroke symptoms presented to the respondents in the stroke scenario significantly affected their responses to the questions about what they would do if they developed weakness in their right arm and leg (Box 3). Slurred speech was the only single identified symptom resulting in > 50% of respondents saying they would attend the ED immediately. The identification of both slurred speech and limb sensory loss as stroke symptoms resulted in the greatest number saying they would attend the ED (62%). There were no significant differences in the results following National Stroke Week.

2 Correct identification of stroke warning signs and risk factors*

Stroke factor identified	Number identifying
Stroke warning signs	
Slurred speech	153 (61%)
Dizziness	105 (42%)
Numbness (any)	106 (42%)
Visual problems	102 (41%)
Weakness (any)	67 (27%)
Headache	51 (20%)
Difficulty understanding	39 (16%)
No response/don't know	30 (12%)
Stroke risk factors	
Hypertension	178 (71%)
Smoking	133 (53%)
Obesity	110 (44%)
High cholesterol	100 (40%)
Lack of exercise	58 (23%)
Family history of stroke	45 (18%)
Diabetes	39 (16%)
No response/don't know	15 (6%)

* *n* = 251. ◆

Before National Stroke Week, only 22% of the population had heard of FAST. This increased to 40% immediately after, and 39% at 3 months ($P < 0.05$). However, only 30% of people who had heard of FAST were able to describe what it meant, and only 7% could accurately describe all four components of the acronym 3 months after National Stroke Week (Box 4).

Analysis of the association between demographic factors and correct identification of stroke risk factors and warning signs (which we defined as accurate identification of two or more items) showed no significant associations. Subjects who had heart disease, or who had already had a stroke or a TIA, did not have a better knowledge of stroke warning signs. Good knowledge of FAST was not associated with an improvement in stroke knowledge (Box 5).

DISCUSSION

Early recognition of stroke symptoms and signs is key to early interventions and more favourable stroke outcomes. Major health organisations, including the National Stroke Foundation, have targeted public education, using television, newsprint, educational pamphlets and health seminars. Collecting baseline data about knowledge of stroke in a population can help these organisations to determine the effectiveness of their programs and target them appropriately. Despite educational campaigns, public knowledge of the signs, symptoms, and risk factors for stroke remains poor. Previous surveys of the general public suggest that up to 27% of adults can not name any signs or symptoms of stroke, and up to 25% can not identify any risk factors.[15,16]

Our survey found that knowledge of stroke warning signs was poor among South Australian adults despite an awareness campaign run by the National Stroke Foundation in September 2009. Slurred speech was the only warning sign identified by more than half the respondents. Notably, one in 10 could not identify any warning signs even when presented with a list of them.

Hypertension was identified most frequently as a risk factor for stroke, followed by smoking and obesity. These findings were similar to those previously reported.[15] However, just over half recognised smoking as a

3 Respondents correctly identifying symptoms which should provoke urgent presentation to emergency department

	Time of survey interviews relative to NS Week			
Symptoms	Before (*n* = 85)	Immediately after (*n* = 83)	3 months after (*n* = 83)	ANOVA*
Slurred speech + upper limb sensory loss	53 (62%)	55 (66%)	50 (60%)	ns
Slurred speech	43 (51%)	49 (59%)	40 (48%)	ns
Amaurosis	26 (31%)	31 (37%)	23 (28%)	ns
Upper limb sensory loss	24 (28%)	20 (24%)	22 (27%)	ns
Upper limb numbness	22 (26%)	28 (34%)	25 (30%)	ns
Upper limb weakness	18 (21%)	29 (35%)	25 (30%)	ns

NS Week = National Stroke Week 2009. ANOVA = analysis of variance. ns = not significant. * $P > 0.05$. ◆

4 Respondents correctly describing components of FAST test

Number correctly described	Time of survey interviews relative to NS Week: Before (*n* = 14)	Immediately after (*n* = 19)	3 months after (*n* = 54)	ANOVA*
1	2 (14%)	4 (21%)	9 (17%)	ns
2	1 (7%)	2 (11%)	1 (2%)	ns
3	0 (0%)	1 (5%)	3 (6%)	ns
All 4	2 (14%)	2 (11%)	4 (7%)	ns
None	9 (64%)	10 (53%)	45 (83%)	ns

FAST = Face, Arms, Speech, Time. NS Week = National Stroke Week 2009. *n* = number who had heard of FAST test. ANOVA = analysis of variance. ns = not significant. * $P > 0.05$. ◆

risk factor, and all other risk factors were identified by fewer than 50% of respondents.

Mass media campaigns to improve public awareness of stroke warning signs have been found to be effective in improving knowledge of warning signs (though not of stroke risk factors),[11,12,17] particularly in younger age groups. These campaigns have been found to be less effective for those aged over 65 years.[11,17]

This study also highlights difficulties in measuring stroke awareness. It is probable that awareness is overestimated by the use of aided questions and underestimated by unaided questions. In fact, neither approach simulates the reality of needing to make a spontaneous connection between a stroke sign and a stroke. The aided question suggests the unlikely scenario in which a person having a stroke says, "My right arm feels weak. Do you think I'm having a stroke?" In contrast, the unaided question measures only knowledge that can be spontaneously recalled. Perhaps a "partially aided" question would more closely approximate the situation in which a person needs to recognise a potential stroke (eg, "A person tells you 'I've just noticed my arm feels numb.' What would you do? What do you think this person's problem is?").

Another potential drawback to the study was its limited response rate (we had a 20% non-response rate of people declining to participate) which may have been a source of selection bias. However, even if non-respondents had considerably greater knowledge of stroke than study participants, overall stroke awareness would still be low enough to warrant public health action. Non-response also might have biased the estimates for the predictors of stroke knowledge, but this seems unlikely because to be a confounder, non-response would have to be associated with both the predictor and stroke knowledge.

Given these limitations, we defined awareness by using results from an aided question, which makes the results more disappointing.

Knowledge of stroke warning signs showed very little improvement after the FAST campaign. Understanding that there are potential treatments that might help reverse the problem is a well known key determinant of patient behaviour. Within a population of 1.3 million, with widespread access to public media and the internet, it is not possible to track how many stroke educational messages were delivered, nor how many other health messages for other disease states competed for their attention at the same time. One potential explanation for the poor improvement in knowledge of stroke is that there may be a theoretical limit to how much knowledge the public can absorb from such educational campaigns. A more likely explanation for the apparently poor result is that the national and local stroke awareness campaigns were not targeted appropriately at the intended audience nor tested for efficacy before implementation. Clearly, scientific study of the effectiveness of stroke educational efforts at individual and aggregate levels is warranted.

Increased knowledge of acute stroke treatments may motivate the public to translate their knowledge into action and present for medical attention more quickly. This may be the highest yield approach to increasing rates of treatment of ischaemic stroke with thrombolysis or carotid endarterectomy.

5 Respondents who were/were not aware of FAST correctly identifying symptoms which should provoke urgent presentation to emergency department

	Aware of FAST (*n* = 87)	Not aware of FAST (*n* = 164)	ANOVA
Amaurosis	32 (37%)	52 (32%)	ns
Upper limb weakness	38 (44%)	62 (38%)	ns
Upper limb sensory loss	48 (55%)	71 (43%)	ns
Upper limb numbness	47 (54%)	73 (45%)	ns
Slurred speech	57 (66%)	88 (54%)	ns
Slurred speech + upper limb sensory loss	70 (80%)	123 (75%)	ns

FAST = Face, Arms, Speech, Time. ANOVA = analysis of variance. ns = not significant. $P > 0.05$. ◆

COMPETING INTERESTS

None identified.

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REFERENCES

1 Del Zoppo GJ, Higashida RT, Furlan AJ, et al. PROACT: a phase II randomized trial of recombinant pro-urokinase by direct arterial delivery in acute middle cerebral artery stroke. PROACT Investigators. Prolyse in Acute Cerebral Thromboembolism. *Stroke* 1998; 29: 4-11.
2 Donnan GA, Davis SM, Chambers BR, et al. Streptokinase for acute ischemic stroke with relationship to time of administration: Australian Streptokinase (ASK) Trial Study Group. *JAMA* 1996; 276: 961-966.
3 Hacke W, Kaste M, Fieschi C, et al. Intravenous thrombolysis with recombinant tissue plasminogen activator for acute hemispheric stroke. The European Cooperative Acute Stroke Study (ECASS). *JAMA* 1995; 274: 1017-1025.
4 National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. Tissue plasminogen activator for acute ischemic stroke. *N Engl J Med* 1995; 333: 1581-1587.

5 Alberts MJ. tPA in acute ischemic stroke: United States experience and issues for the future. *Neurology* 1998; 51(3 Suppl 3): S53-S55.
6 Kaste M, Thomassen L, Grond M, et al. Thrombolysis for acute ischemic stroke: a consensus statement of the 3rd Karolinska Stroke Update, October 30–31, 2000. *Stroke* 2001; 32: 2717-2718.
7 Grond M. Clinical thrombolysis in stroke. *Thromb Res* 2001; 103(Suppl 1): S135-S142.
8 Pancioli AM, Broderick J, Kothari R, et al. Public perception of stroke warning signs and knowledge of potential risk factors. *JAMA* 1998; 279: 1288-1292.
9 Ehsan O, Paravastu S, da Silva A. Optimising the timing of carotid surgery using a carotid risk scoring system. *Eur J Vasc Endovasc Surg* 2008; 36: 390-394.
10 Rothwell PM, Eliasziw M, Gutnikov SA, et al. Endarterectomy for symptomatic carotid stenosis in relation to clinical subgroups and timing of surgery. *Lancet* 2004; 363: 915-924.
11 Reeves MJ, Hogan JG, Rafferty AP. Knowledge of stroke risk factors and warning signs among Michigan adults. *Neurology* 2002; 59: 1547-1552.
12 Schneider AT, Pancioli AP, Khoury JC, et al. Trends in community knowledge of the warning signs and risk factors for stroke. *JAMA* 2003; 289: 343-346.
13 Bray JE, O'Connell B, Gilligan A, et al. Is FAST stroke smart? Do the content and language used in awareness campaigns describe the experience of stroke symptoms? *Int J Stroke* 2010; 5: 440-446.
14 Sug Yoon S, Heller RF, Levi C, et al. Knowledge of stroke risk factors, warning symptoms, and treatment among an Australian urban population. *Stroke* 2001; 32: 1926-1930.
15 Pancioli AM, Broderick J, Kothari R, et al. Public perception of stroke warning signs and knowledge of potential risk factors. *JAMA* 1998; 279: 1288-1292.
16 Hickey A, O'Hanlon A, McGee H, et al. Stroke awareness in the general population: knowledge of stroke risk factors and warning signs in older adults. *BMC Geriatr* 2009; 9: 35.
17 Silver FL, Rubini F, Black D, Hodgson CS. Advertising strategies to increase public knowledge of the warning signs of stroke. *Stroke* 2003; 34: 1965-1968.

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