

Advertising Strategies to Increase Public Knowledge of the Warning Signs of Stroke

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Background and Purpose—Public awareness of the warning signs of stroke is important. As part of an educational campaign using mass media, the Heart and Stroke Foundation of Ontario conducted public opinion polling in 4 communities to track the level of awareness of the warning signs of stroke and to determine the impact of different media strategies.

Methods—Telephone surveys were conducted among members of the general public in 1 control and 3 test communities before and after mass media campaigns. The main outcome measure used to determine effectiveness of the campaigns was the ability to name ≥ 2 warning signs of stroke.

Results—In communities exposed to television advertising, ability to name the warning signs of stroke increased significantly. There was no significant change in the community receiving print (newspaper) advertising, and the control community experienced a decrease. Television increased the knowledge of both men and women and of people with less than a secondary school education but not of those ≥ 65 years of age. Intermittent, low-level television advertising was as effective as continuous, high-level television advertising.

Conclusions—Results of this survey can be used to guide mass media-buying strategies for public health education. (*Stroke*. 2003;34:1965-1969.)

Key Words: behavioral symptoms ■ psychology ■ stroke

Public awareness of the warning signs of stroke may be a necessary,¹⁻⁴ although not sufficient,⁵ aspect of ensuring timely access to emergency care. Studies have suggested that poor recognition of the warning signs of stroke may be at least partially responsible for delays in seeking medical attention.⁶⁻⁸ A study conducted in greater Cincinnati⁹ found that $\approx 40\%$ of the public was unable to name even 1 warning sign of stroke, with the elderly being among the least knowledgeable. Educational campaigns have been conducted to improve public awareness of stroke,³ with at least 1 study, in King County, Washington,¹⁰ demonstrating significant increases in stroke knowledge.

In 1999, the Heart and Stroke Foundation of Ontario launched a 2-year, multifaceted mass media campaign. It was hypothesized that television would be a more effective channel for reaching some of the foundation's primary targets: men, seniors, and those in lower socioeconomic groups (as indicated by education or income). However, there were little or no data to guide the foundation's media-buying strategies. Therefore, the campaign was designed as a test using 4 independent, closed media markets in southern Ontario.

Materials and Methods

The intervention consisted of a 30-second, black-and-white television advertisement giving the warning signs of stroke (used in Kingston and London) and a print advertisement based on the television ad (used in Hamilton). In Kingston, continuous, high-level

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television advertising was conducted for a total of 7200 gross rating points (GRPs) at a cost of Can \$107 704. GRPs are the sum of all rating points achieved for a particular period of time—or, in the case of newspapers, its circulation—and/or schedule of commercials or spots. It is calculated by multiplying the rating of the show(s) in which the commercial was aired by the number of times it is shown (frequency).

In London, the advertising was shown on television intermittently for a total GRPs of 2480 and cost of Can \$153 204. (Because of discounts for large media buys, the intermittent campaign actually cost more than the intensive campaign.) In Hamilton, newspaper inserts were purchased for 1920 GRPs at a cost of Can \$88 625. Peterborough, the control community, did not receive any media intervention, aside from the Heart and Stroke Foundation Public Service Announcement (PSA), which was available to all media outlets across the province. Because air time and space for PSAs are not purchased, GRPs are typically low, and scheduling is erratic. The PSA can be said to be part of the "background noise" of the study.

Polling was conducted by an independent research house, the Institute for Social Research (ISR) at York University (Toronto). Trained institute interviewers, working from a script and using random-digit dialing and computer-assisted telephone interviewing technology, completed interviews with members of the public ≥ 45 years of age. All eligible telephone numbers received a minimum of 12 calls. Calls were scheduled during days, evenings, and weekends, and interviewers with second-language skills were used in situations in which language appeared to be a barrier to survey completion. Interviewers were not necessarily blinded to the stage of the

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TABLE 1. Awareness of Stroke Warning Signs Before and After Intervention

	Hamilton (Print)		London (Low-Level TV)		Kingston (High-Intensity TV)		Peterborough (Control)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Sample, n	309	392	397	412	403	405	405	410
Mean (SD) warning signs	1.25 (1.16)	1.17 (1.25)	1.27 (1.24)	1.47 (1.26)	1.32 (1.25)	1.66 (1.37)	1.38 (1.21)	1.10 (1.21)
Change, 1999 vs 2001 (<i>t</i> test), <i>P</i>	0.280		0.021		<0.001		0.001	
Can name ≥ 2 warning signs, %	41.7	40.8	38.8	49.6	40.4	54.1	43.7	35.9
Change, 1999 vs 2001 (χ^2), <i>P</i>	0.80		0.002		<0.001		0.022	
GRPs	1920		2480		7200		NA	

advertising campaign but were trained to work from the standardized script.

For the warning signs of stroke, respondents were asked the following question: "Can you tell me what warning signs or symptoms people might experience when they have a stroke?" The question was open ended, with responses being coded into preexisting categories. The 5 categories used to capture the warning signs reflect those used by the Heart and Stroke Foundation¹¹ in all of its stroke communications: weakness, paralysis, or numbness, typically on one side of the body; trouble speaking or understanding speech; unusual or severe headache; dizziness, lightheadedness, or falls; and vision problems. Although essential in the medical definition of stroke, respondents were not required to specify "sudden." Interviewers were given a number of alternative wordings for the warning signs (eg, for hemiplegia accepted responses included "weakness," "numbness," "losing feeling," and "paralysis"). Responses not conforming to the provided list were coded as "other" and recorded verbatim.

Respondents were prompted to give a maximum of 5 responses. In analysis, duplicate responses were identified to prevent double counting of correct responses. For example, a respondent who gave the answer "weakness in your arm or leg" for 1 response and "paralysis" for another was counted as having identified 1 correct warning sign (weakness, numbness, or paralysis), not 2. The ability to recognize ≥ 2 of the warning signs of stroke was used as a main outcome measure for the study.

Other questions in the survey included age, sex, highest level of education, annual household income, and other health and personal characteristics. It should be noted that sample size calculations were based on the main outcome measures of knowledge of ≥ 2 warning signs of stroke. Quota sampling was used to ensure that there would be equal representation by sex and at least a third of the respondents would be ≥ 65 years of age.

Surveys were conducted before launch of the media strategies (preintervention, September 1999) and 3 months after cessation of all advertising (postintervention, September to November 2001). Approximately 400 people were interviewed in each community, with separate and independent samples used for the baseline and end point. Results were analyzed by respondent age (45 to 64 versus ≥ 65 years; 0.03% missing responses), sex (no missing responses), and education (less than a high school education, completed high school, some college or technical school, or some university; 0.1% missing responses). Socioeconomic status as determined by income was not analyzed because of the high proportion of nonresponses for income (24.7%).

Results

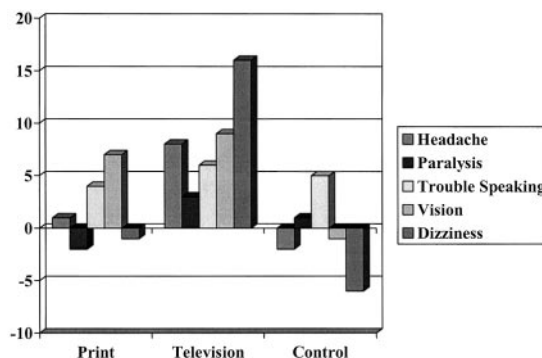
At baseline, there were no significant differences between the 4 communities in the distribution of respondents by age [χ^2 (3 *df*)=5.59, *P*=0.134], education [χ^2 (9 *df*)=8.86, *P*=0.450], or the ability to name ≥ 2 warning signs of stroke [χ^2 (3 *df*)=2.14, *P*=0.535]. At follow-up, there were statistical differences between the 4 communities in the ability to name

2 warning signs [χ^2 (3 *df*)=33.48, *P*=0.000], education [χ^2 (9 *df*)=20.32, *P*=0.016], and age [χ^2 (3 *df*)=7.86, *P*=0.049]. Analysis showed that the distribution of respondents by education and age group changed significantly before to after intervention only in Kingston [χ^2 (3 *df*)=11.83, *P*=0.008 for education; χ^2 (1 *df*)=14.72, *P*<0.001 for age). In both cases, the demographic variables made small but statistically significant contributions to variance in the number of warning signs named after intervention in Kingston (for education, r^2 =0.062, *P*<0.001; for age group, r^2 =0.015, *P*<0.001).

As can be seen in Table 1, the mean number of warning signs named and the ability to name ≥ 2 warning signs of stroke changed significantly before to after intervention in London and Kingston (the television communities) but not in Hamilton (print). The number of GRPs per percentage-point change in ability to name ≥ 2 warning signs of stroke was 229.6 in London and 525.5 in Kingston. In Peterborough, the control community, there were decreases in both the mean number of warning signs named and the proportion who could name ≥ 2 warning signs.

The Figure shows the percentage-point change in ability to name the individual warning signs of stroke by media strategy. Both the print and control communities had inconsistent changes, with increases in the naming of some warning signs but decreases in others. In the 2 communities receiving television advertising, there were increases for all 5 warning signs, with 4 of the 5 being statistically significant.

At baseline, significantly more women than men were able to name ≥ 2 warnings signs of stroke [42% versus 29%; χ^2 (1 *df*)=28.42; *P*<0.001]. Women exposed to television adver-



Percentage-point change in knowledge of ≥ 2 warning signs of stroke by media strategy.

TABLE 2. Knowledge of ≥ 2 Warning Signs of Stroke by Education Before and After Intervention

Level of Education	Television, %		Print, %		Control, %	
	Pre*	Post*	Pre*	Post*	Pre*	Post*
<Secondary school	20.6	31.0†	22.3	33.6	30.0	19.8
Secondary school	37.3	49.1†	46.0	42.0	45.4	35.3
College or technical	50.3	59.9	51.9	46.8	50.0	52.6
University	55.5	64.7	53.8	48.1	55.8	40.0†

*At preintervention and/or postintervention, the difference between education groups was statistically significant ($P < 0.001$).

†Within education level, change in preintervention to postintervention testing was statistically significant ($P < 0.05$).

tising had a statistically significant increase in the proportion who could name ≥ 2 warning signs [from 45% in 1999% to 58% in 2001; χ^2 (1 *df*)=17.89; $P < 0.001$], but there was no significant change in those exposed to print advertising [50% versus 47%; χ^2 (1 *df*)=0.28; $P = 0.599$]. Men also demonstrated a significant increase among those exposed to television advertising [33% versus 42%; χ^2 (1 *df*)=5.61; $P = 0.018$] but not print advertising [30% versus 34%; χ^2 (1 *df*)=0.57; $P = 0.450$]. At follow-up, women remained more knowledgeable about the warning signs of stroke than men [51% versus 37%; χ^2 (1 *df*)=31.31; $P = 0.000$].

Analysis by age showed that at baseline significantly more respondents 45 to 64 years of age were able to name ≥ 2 warning signs of stroke compared with those ≥ 65 years of age [40% versus 32%; χ^2 (1 *df*)=9.72; $P = 0.002$]. Within the communities receiving television advertising, there was a significant increase for the younger age group [from 44% in 1999% to 59% in 2001; χ^2 (1 *df*)=19.79; $P = 0.000$] but not for those ≥ 65 years of age [35% to 40%; χ^2 (1 *df*)=2.01; $P = 0.157$]. Print advertising did not significantly increase the ability to name ≥ 2 warning signs of stroke among either the younger or older age group [for the younger age group, knowledge dropped from 46% to 42%, χ^2 (1 *df*)=1.02, $P = 0.314$; for the older age group, it increased insignificantly from 36% to 40%, χ^2 (1 *df*)=0.57, $P = 0.452$]. At follow-up, the younger age group remained more knowledgeable than the seniors [50% versus 38%; χ^2 (1 *df*)=10.85; $P = 0.000$].

As shown in Table 2, the ability to name ≥ 2 warning signs of stroke increased significantly by level of education at both preintervention and postintervention testing, with the exception of postintervention testing in the print community. Significant increases in awareness between before and after intervention occurred only among those in the television communities with a high school education or less. A significant decrease in awareness occurred before to after intervention among those with university education in the control community.

Discussion

This study confirms the effectiveness of television advertising in increasing public awareness of a health issue.^{12,13} However, unlike some previous studies,¹⁴ this trial looked at the effectiveness of different media, including different media-buying strategies, and the impact on specific popula-

tion subsets. It has been noted that "planning and making efficient media purchases requires sophistication"¹⁵ if it is to be not only effective but also cost-effective.

Although the dollar cost of print advertising appeared to be the lowest of the 3 interventions, it was not associated with any significant change in the ability to name the warning signs of stroke. Television advertising increased the mean number of stroke warning signs named, the percent who could name ≥ 2 warning signs, and the percent naming 4 of the 5 warning signs. Among the 2 television-based strategies, because of the discounts available for large airtime purchases, the intensive campaign turned out to be less expensive than the intermittent approach. However, the intermittent, low-level approach was the most effective in terms of the numbers of GRPs required to produce a percentage-point change in knowledge. In other words, intensive television advertising may not be necessary to increase public knowledge of the warning signs of stroke.

Television advertising is often promoted because of its ability to reach across demographic groups such as sex, age, and education. In this test, television was effective in increasing knowledge among men and those with a high school education or less but not among seniors. Because seniors are, as a result of their age, at increased risk of stroke, this was a particularly disturbing finding and one the Heart and Stroke Foundation would like to explore further. For example, it could be that the creative execution of the advertisement (a black-and-white advertisement with no voiceover) was not appropriate for seniors.

Weaknesses of the study include those typical of phone surveys (eg, only people with telephones are eligible to participate). It is possible that variation between interviewers could have occurred; however, this is unlikely because interviewers were subjected to the same training and worked from a standardized script. Because the sample size calculation was based on the primary outcome (being able to name ≥ 2 warning signs of stroke), the study had insufficient power to produce reliable estimates of the effect of personal or health characteristics (eg, history of stroke or prevalence of stroke risk factors) on stroke knowledge.^{16,17} Socioeconomic status was not specifically analyzed, and the findings for the effect of educational status must be interpreted with caution. The finding that knowledge of the warning signs of stroke decreased in the control community was unexpected and

remains unexplained. Finally, although the study shows that it is possible to increase the public's awareness of the warning signs of stroke, it is unknown whether this will translate into a change in behavior and more timely access to emergency stroke care.

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Editorial Comment

Advertising Strategies to Increase the Public Knowledge of the Warning Signs of Stroke

Several studies have clearly demonstrated the public's general lack of knowledge of stroke risk factors and symptoms.¹⁻⁶ This is particularly true among the elderly,^{3,4} the portion of the population at highest risk.⁷ The current study is consistent with these and other previous reports. At the baseline assessment carried out in 4 communities in Ontario, Canada, less than half (39% to 44%) of those surveyed were able to name at least 2 stroke warning signs; knowledge was poorest among those over age 65 years (only 35% were able to name 2 or more warning signs). How can this situation be changed?

The study by Silver and colleagues is unique in that it directly compares 3 different strategies aimed at improving the public's stroke-related knowledge. Three months after the cessation of advertising, there was no significant change in public knowledge of stroke warning symptoms following a print media campaign and significant improvements after both low- and high-intensity television campaigns. These results suggest that as a single intervention, advertising dollars are more effectively spent on television-based campaigns. However, several important points need to be

stressed. First, even the television-based advertisements resulted in no significant change in knowledge among the highest risk group (ie, those over age 65). Although knowledge improved after the television campaign in those with lesser degrees of education, this group's knowledge still lagged behind that of more educated individuals. Even among the most educated, a substantial proportion (35%) still could not name 2 stroke symptoms after the advertising was completed. The overall impact of the television media programs was modest (the mean number of named warning signs increasing from 1.27 to 1.47 with low-level and from 1.32 to 1.66 with high-level advertising). Because the data were not collected, it is uncertain whether there might be differences in the effectiveness of the various strategies in different race-ethnic groups. Future studies may need to vary the content of the advertisements to target different high-risk populations.

Most importantly, it is uncertain whether improved knowledge will translate into larger proportions of patients seeking timely and appropriate acute and preventive stroke care. Unfortunately, improving general public knowledge in isolation is unlikely to be sufficient.² As reflected in the strategies

used by business, including the pharmaceutical industry, a sustained multilevel campaign incorporating a variety of techniques will be required. This will need to be coupled with changes in the stroke healthcare infrastructure and with provider education.⁸ Additional studies of the type reported by Silver and colleagues will be needed to help provide a rational basis for the development of the most effective and most cost-effective public educational strategies.

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