1-7-2013

Can a media campaign change health service use in a population with stroke symptoms? Examination of the first Irish stroke awareness campaign.

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Citation

Mellon L, Hickey A, Doyle F, Dolan E, Williams D. Can a media campaign change health service use in a population with stroke symptoms? Examination of the first Irish stroke awareness campaign. Emergency Medicine Journal. 2013;31(7):536-540

Can a media campaign change health service use in a population with stroke symptoms? Examination of the first Irish stroke awareness campaign

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Word count: 2711

Key words: acute stroke, thrombolytic therapy, stroke symptoms, health education

Abstract

Background - Mass media campaigns for stroke awareness encourage the public to recognise stroke symptoms and respond to stroke in a timely manner. However, there is little evidence to suggest that media messages can influence behaviour following stroke onset. The FAST test is a common stroke recognition tool used in public education campaigns. We aimed to assess the impact of the F.A.S.T .campaign on health service utilisation in Ireland which has had no previous exposure to a F.A.S.T. media campaign.

Methods –An interrupted time series design was used to detect behaviour change following the introduction of the first Irish F.A.S.T. campaign in suspected presentations of stroke to two Emergency Departments (EDs), serving a population of approximately 580,000.

Results – There was a significant change in ED attendance with reported stroke symptoms following the introduction of the F.A.S.T. campaign ($\beta = 0.84$, 95% CI, 0.43-1.24; $p < 0.001$), although this was not sustained. ED presentation within 3.5 hours was associated with Emergency Medical Services activation (OR=3.1, $p< 0.001$) and self-referral to the ED (OR=2.67, $p< 0.001$).

Conclusions – This first Irish F.A.S.T. campaign had an initial impact on ED attendance with stroke symptoms. However, campaign effects were not sustained in the long-term. Results indicate that pre-hospital delay to access acute stroke services is a complex process with involvement of factors other than stroke knowledge and intention to call 911.

INTRODUCTION

Thrombolysis with tissue plasminogen activator (t-PA) within a 3-4.5 hour window following onset of ischaemic stroke is associated with improved patient outcome and reduction in disability[1]. The chances of a favourable outcome fall two-fold for every 90-minute delay in treatment of acute ischaemic stroke[2]. However, despite a large body of evidence supporting its efficacy, thrombolysis rates have remained consistently low in Ireland[3] and internationally[4]. Studies have sought to identify barriers to thrombolysis use, with patient delay in seeking medical attention highlighted as the main pre-hospital factor accounting for under utilisation of thrombolysis[5, 6]. In comparison to any other intervention (such as the use of stroke teams or faster emergency medical services triage)[7], reducing pre-hospital delay should increase eligibility for the use of thrombolytics and remains a significant challenge in acute stroke care.

Media campaigns are employed to increase stroke recognition and change health behaviour because of their capacity to reach large target audiences with behaviourally focused messages. Evidence supports the role of mass media in inducing changes in health services utilisation[8]. In a stroke context, media driven stoke awareness campaigns are commonly utilised to increase stroke knowledge and awareness. From a stroke service perspective, the principal outcome of increasing public stroke knowledge is to reduce pre-hospital delay. Evaluations of previous media driven stroke awareness campaigns have highlighted demonstrable campaign effects on knowledge[9, 10]. However, stroke awareness campaigns may only have a limited direct impact on behaviour in terms of reducing pre-hospital delay and increasing activation of Emergency Medical Services (EMS)[11]. This suggests that improved stroke knowledge is not consistently associated with intention to call

911, therefore a 'disconnect' may exist between the translation of symptom recognition into appropriate action during acute stroke onset[12].

A deficit in the knowledge of stroke within the Irish population, which suffers approximately 10,000 strokes per annum (one every 60 minutes) has been highlighted previously and the need for a stroke awareness campaign has been identified[13]. The Irish Heart Foundation in 2010 funded the Act F.A.S.T. (Face, Arm, Speech, Time) stroke awareness campaign, the first of its kind in Ireland[14]. The original F.A.S.T. message was created as a short, easy to remember mnemonic for stroke education in 1999, and is based on the Cincinnati Pre-Hospital Stroke Scale, developed for EMS personnel[15]. It highlights the common warning signs of stroke and outlines the correct behavioural response following stroke recognition: to call emergency services, and to do so immediately. The F.A.S.T. message is considered to be an appropriate message for stroke education given its brevity[16]. However, it has been criticised due to its inability to identify 100% of stroke patients and its poorer performance in the case of haemorrhagic stroke[17].

An intervention to change behaviour must have behaviour, or a measurable consequence of behaviour, as its endpoint[18]. We aimed to assess if exposure to this first national stroke awareness campaign using the F.A.S.T. message had an impact on health service utilisation, and if it was associated with target behaviours promoted by the media campaign, particularly EMS transportation and rapid action upon recognition of stroke symptoms.

METHOD

The F.A.S.T. media message is widely used as a public stroke education message. The first Irish targeted public F.A.S.T. campaign for stroke was broadcast between May 2010 and June 2011, through national television and low level regional radio advertising. The campaign

used the Act F.A.S.T. message, using a voiceover with a local accent. There were three major waves of the media campaign during the study period with continuous television advertising for three week periods in May 2010, August 2010 and January 2011. The campaign was high volume with an average 73.4 gross rating points (GRP) for the study period. The GRP is a measurement of the size of the audience exposed to the particular media message. It is expressed as a percentage and is calculated by multiplying the reach of the campaign (the percentage of homes or persons viewing the campaign) times the frequency (the number of times it was aired). A higher GRP indicates greater population exposure to the media campaign.

Ethical approval was granted for a retrospective anonymous study of all ED attendances to two large teaching hospitals in north Dublin city for a one year period. The study hospitals serve a population of approximately 580,000 and both provide a routine thrombolysis service. All ED attendances were manually screened from ED registers to identify cases where the patient presented with symptoms of a stroke, or where they perceived their symptoms to be a stroke. Inter-hospital transfers from peripheral regional centres were excluded from screening process as information on initial symptom onset was not available. The following key words were used: slurred speech, facial droop, query stroke, collapse, numbness/weakness/power loss in arm/leg, dizziness, confusion, visual disturbance, previous stroke. Trained ED clerical personnel recorded the reason for attendance on the ED register, either from first hand patient information, EMS documentation or General Practitioner (GP) correspondence. Information on each stroke relevant presentation was extracted from ED case notes, including demographic details, time of symptom onset, mode of transport to hospital, symptoms, neuroimaging, thrombolysis administration, stroke confirmation and destination after discharge from ED. Diagnosis of ischaemic stroke, haemorrhagic stroke and Transient Ischaemic Attack (TIA) were confirmed using hospital

discharge codes. Time of symptom onset was recorded from ED notes. For patients with wake-up stroke, the time of symptom onset was taken as the time the patient was last seen well. Onset-to-door time (OTD) was defined as the time from symptom onset to time of ED presentation. Full data was not available for all ED presentations due to non-documentation during ED admission.

Statistical analysis

Descriptive statistics and χ^2 test for categorical variables were used to examine the association between patient characteristics and OTD, which was categorised into OTD ≤ 1 hour, OTD >1 to 3.5 hours, OTD >3.5 to 6 hours, OTD >6 to 24 hours, OTD >24 hours and unknown time of symptom onset. A predictive model of OTD ≤ 3.5 hours was developed by entering all factors into a univariate and multivariate model of logistic regression analysis. 3.5 hours was chosen as the thrombolysis eligibility window based on guidelines which recommend a realistic maximum of 60 minutes from ED presentation to thrombolysis administration [19, 20]. A p value < 0.05 was considered statistically significant. Data for wake-up stroke was not included in regression analysis due to unreliability of OTD time.

An interrupted time series design using a segmented poisson regression model was used to detect if there was a change in the number of ED attendances with stroke symptoms after the introduction of each wave of the F.A.S.T. campaign. The increase or decrease in slope of the trend after each wave of the campaign was also examined. This approach was also used to assess changes in both the level and trend (slope) of each behavioural indicator of campaign impact: 1) ambulance arrival and 2) presentation within the thrombolysis window (< 3.5 h), following introduction of each wave of the F.A.S.T. campaign. Data were tested for autocorrelation, and negative binomial regression was used where likelihood ratio tests indicated that the data were over-dispersed. All data analysis was conducted using Stata Release 11.0.

RESULTS

From March 1st 2010 to February 28th 2011 there were 870 ED admissions with reported stroke symptoms. Of these, 434 (49.8%) were confirmed stroke/TIA on clinical presentation, neuroimaging and discharge diagnosis. OTD times were available for 92.3% (803) of the sample. Fourteen cases were documented as awakening with symptoms, of which 10 had a stroke diagnosis. Figure 1 outlines diagnoses for the sample. The mean age (±SD) for the sample was 65.03 (±17.2).

INSERT FIGURE 1 HERE

Three hundred sixty seven (42%) of 870 ED presentations with stroke symptoms were within the thrombolysis eligibility window (≤ 3.5 hours). Of cases with an OTD time, 115 (14.3%) arrived within 1 hour, 252 (31.3%) presented >1-3.5 hours, 95 (11.8%) presented >3.5-6 hours, 140 (17.4%) >6-24 hours and 201 cases (25%) arriving more than 24 hours after symptom onset. Of those with a confirmed stroke diagnosis and a documented OTD time, 52% (141) presented within 3.5 hours. The thrombolysis rate for the sample was 8.7%. Arrival via ambulance accounted for 55.1% of all ED presentations. Of all ED presentations, 716 (82.3%) reporting stroke symptoms required hospital admission. The most common symptom reported for all ED presentations was speech disturbance, reported in 431 cases (50%). Unilateral weakness was reported in 46% of cases, followed by facial droop (37%). Sample characteristics for patients with a documented OTD time are presented in Table 1 by OTD.

Table 1. Patient characteristics according to Onset-to-Door (OTD) time

	Onset-to-door time					
Characteristic	**0-1 h**	**>1-3.5 h**	**>3.5-6 h**	**>6-24 h**	**>24 h**	***P* value**
Demographic						
Age (N=802)	65(±15.77)	68.72(±16.65)	64.61(±18.05)	64.49(±17.93)	60.14(±16.8)8	<0.001
Gender (Female) (N=800)	55 (48)	133 (53)	55 (58)	90 (64)	115 (57)	0.15
Mode of arrival (N=803)						<0.001
Ambulance	93 (81)	178 (71)	48 (51)	61 (44)	55 (27)	
Private Transport	22 (19)	74 (29)	47 (49)	79 (56)	146 (73)	
Referral type (N=789)						<0.001
Self-presentation	114 (99)	202 (80)	73 (77)	89 (64)	113 (57)	
GP	0 (0)	30 (12)	14 (15)	41 (30)	85 (42)	
Nursing home	1 (1)	13 (5)	4 (4)	8 (6)	2 (1)	
Diagnosis (N=803)						<0.001
Stroke	49 (42)	92 (37)	32 (34)	50 (35)	36 (18)	
TIA	17 (15)	48 (19)	13 (14)	24 (17)	35 (17)	
Neurology non-stroke	33 (29)	78 (31)	31 (32)	41 (30)	94 (47)	
Medical admission	16 (14)	34 (13)	19 (20)	25 (18)	36 (18)	

Continuous variables are presented as mean ±SD
Categorical variables presented as absolute values with percentages n (%)

Factors related to OTD ≤ 3.5 hours.

Univariate logistic regression analysis is presented in Table 2. Age (p< 0.001), ambulance arrival (p<0.001), self-referred presentations (p<0.001) and stroke diagnosis (p=0.001) were significant predictors of OTD ≤ 3.5 hours at the univariate level of analysis. There was no significant association with gender (p=0.12), weekend presentation (p=0.06) and exposure to the F.A.S.T. campaign (p=0.21). A multivariate model of OTD ≤ 3.5 hours revealed a significant association for ambulance arrival (p<0.001) and self-referred presentations (p<0.001).

Table 2. Factors associated with OTD <3.5h in univariate and multivariate logistic regression (N=803)

	Univariate analysis		Multivariate analysis	
	OR (95% CI)	***P* Value**	**OR (95% CI)**	***P* Value**
Age	1.01 (1.01-1.02)	<0.001	1 (0.99-1.01)	0.23
Gender	0.71 (0.54-0.92)	0.12	0.77 (0.57-1.03)	0.08
ED Arrival via ambulance	3.97 (2.69-5.32)	<0.001	3.1 (2.23-4.23)	<0.001
Self-referral	3.36 (2.38-4.76)	<0.001	2.67 (1.84-3.88)	<0.001
Stroke diagnosis	1.61 (1.21-2.14)	0.001	1.07 (0.78-1.48)	0.65
Weekend presentation	1.35 (0.99-1.85)	0.06	1.10 (0.79-1.54)	0.57
Exposure to F.A.S.T. Campaign	0.83 (0.62-1.10)	0.21	0.93 (0.60-1.45)	0.76

Interrupted Time Series Analysis

Prior to campaign initiation there was an average weekly admission rate of 11 patients with reported stroke-like symptoms. There was a significant moderate level trend for ED activity following initiation of the first wave of the F.A.S.T. campaign ($\beta = 0.84$, 95% CI, 0.43 to 1.24; $p < 0.001$) and a significant change in the slope following wave 1 ($\beta = -.079$, 95% CI, -0.14 to -0.01, $p < .05$), with a drop in ED activity following withdrawal of the advertising (Figure 2). During Wave 1 of the campaign the average weekly admission rate increased to 31.3 patients per week, with a post-campaign period rate of 19.6 patients per week. There was no evidence of level trend or slope effect for Wave 2 and Wave 3 of the campaign. Two separate poisson regression models were fitted for campaign effect on number of ED arrivals

via ambulance arrivals and presentation inside the thrombolysis window. In both behavioural indicants, the model did not detect significant changes in the level and trend of presentation (data not shown).

INSERT FIGURE 2 HERE

DISCUSSION

This study illustrated the limited efficacy of media campaigns in translating knowledge and intention into appropriate action. Previous research has similarly reported that media campaigns for stroke awareness have been related to increased understanding of stroke symptoms, but no sustained lowering of response times or mortality rates have been demonstrated[12]. The F.A.S.T. message outlines two correct behavioural responses when stroke occurs; to call 911/999 for EMS assistance, and to do so immediately. In our analyses, there was no change in hospital ED activity trends for either behaviour, and campaign exposure was not associated with presentation within the thrombolytic window. It may be the case that even though individuals did carry out the correct action by telephoning for an ambulance, there was still a time delay hence the campaign had little impact on overall emergency response.

An intervention to change behaviour, such as a media campaign, must have behaviour, or a measurable consequence of behaviour, as its endpoint. Few studies such as ours have addressed the direct impact of a media campaign on hospital activity, the most clinically relevant indicator of campaign efficacy. It is difficult to identify a direct relationship between a media campaign and individual ED presentations, although a population level change in service utilisation for stroke may indicate appropriate behaviour change. From an acute stroke treatment perspective, both behaviours promoted by the campaign, EMS transportation and rapid action, need to occur in order to increase the speed

of ED presentation and maximise the potential for thrombolysis. Perhaps there is a poor public awareness of the time dependency for stroke. Research on stroke awareness in Ireland reported that 90% of patients were aware of drug treatments available for stroke, although only 1% could specifically name thrombolysis or clot-busting drugs, and over 75% of the sample were unable to name emergency treatments that may reduce the effect and extent of stroke[21]. It may be that patients recognise that there is a need for fast reaction in the case of stroke onset, but do not understand why this need for speed is so essential. Additional media campaigns should convey that treatments for stroke are time dependent and perhaps stress the 'time is brain' imperative in order to reinforce the need for rapid action in combination with EMS activation.

Our findings suggest that pre-hospital delay is a complex issue, with other factors in addition to stroke knowledge interacting with the decision-making process during stroke onset. Previous studies have highlighted influential factors such as perception of the seriousness of the situation, embarrassment at calling EMS, bystander intervention and perceived control over the situation[22]. Understanding the complex decision making process during an acute event is crucial for developing effective interventions to reduce time to hospital arrival. Community initiatives for stroke awareness may facilitate sustained behaviour changes by minimising barriers to health services, providing appropriate cues to action and addressing misconceptions and fear surrounding stroke onset and treatments [23]. A recent Irish study demonstrated that a community based educational intervention improved stroke knowledge, but also provided a forum to engage at-risk groups in discussion around stroke management and treatment [24]. This type of intervention may be more effective than mass media campaigns at promoting appropriate help-seeking behaviour and translation of knowledge to action.

Our study had some limitations. The baseline period with no F.A.S.T. exposure and the time period following the campaign were short, limiting the level of meaningful comparison between campaign waves. Distance from the ED was not noted, which may have affected delay time. Other factors that may contribute to pre-hospital delay times were not recorded in this study due to non-standardised documentation in ED notes. Stroke severity, symptom related impairment, location at onset of symptoms and bystander intervention have been found to influence delay times in previous studies[25].

CONCLUSIONS

In this analysis we have demonstrated that the first Irish F.A.S.T. campaign had an initial impact on ED attendance with stroke symptoms, but no sustained impact. Activation of EMS services and self-referral were associated with faster presentation during stroke onset. The evaluation of campaign efficacy using behavioural end-points such as thrombolysis rates, OTA reduction rates or increased EMS calls results in accurate estimation of the clinical significance of the campaign in terms of its effect on morbidity and mortality of stroke patients. Future campaigns need to emphasise to the public the availability of thrombolytic treatments, stressing the 'time is brain' response to stroke.

Acknowledgements

The authors thank Dr. Aidan Gleeson, Dr. Peadar Gilligan, Dr. Patricia Houlihan, Ms. Joan McCormack, Beaumont Hospital and Dr. Joe McKeever, Dr. Emily O' Connor, Dr. Mick Molloy, Connolly Hospital for access to data. The authors thank Magdalena Bastiansen, Ronan Murphy, Ciana Maher and Delong Zeng for assistance with data collection. The authors also thank Professor Kathleen Bennett for statistical advice.

Source of Funding

L Mellon is an HRB PhD Scholar in Health Services Research funded by the HRB in Ireland under Grant no. PhD/2007/16.

Competing Interests

None

Figure legends

Figure 1

Classification of ED presentations by diagnosis

Figure 2

ED activity trends over the F.A.S.T. campaign period

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