

Impact of the national public 'FAST' campaigns

Craig Gordon, Rebecca Bell, Annemarei Ranta

ABSTRACT

AIM: To report the impact of the New Zealand FAST campaigns on behaviour change and public awareness.

METHODS: The Ministry of Health funded three consecutive three-month national FAST campaigns in 2016, 2017 and 2018. Formal pre- and post-campaign evaluations were conducted in 2017 and 2018 using UMR Research Limited's nationally representative omnibus surveys of New Zealand adults aged over 18 with boosters for Māori and Pasifika respondents. St John Ambulance provided data on ambulance callouts for suspected and paramedic 'confirmed' strokes before, during and following campaigns.

RESULTS: Before the 2017 campaign, 71.7% (774/1,079) identified speech and/or arm weakness as a stroke sign compared with 75.9% (943/1,242) after the 2018 campaign ($p=0.022$). 'Time critical' awareness increased from 8.1% (87/1,079) before to 31.7% (394/1,242) after ($p<0.0001$). Māori and Pasifika rates showed similar patterns. Average daily ambulance calls for suspected stroke increased from 21.5 to 25.7 ($p<0.01$) and for paramedic confirmed stroke from 6.0 to 7.2 ($p<0.02$). Between the pre-2017 and post-2018 campaigns the thrombolysis rates increased from 8.1% to 9.7% ($p<0.02$). Stroke awareness dropped slightly between the 2017 post- and 2018 pre-campaign evaluations.

CONCLUSION: The New Zealand stroke public campaigns were associated with a rise in stroke symptom recognition, time-critical awareness, ambulance stroke notifications and thrombolysis rates. The uncontrolled nature of this study necessitates consideration of other potential contributing factors when interpreting results. Ongoing campaigns for continual reinforcement appear important.

Stroke is the third most common cause of death worldwide and the most common cause of long-term adult disability in high-income countries.¹ In New Zealand it is estimated that 50,000 people live with stroke and 9,000 have a stroke each year with an annual cost of \$750 million.² A substantial proportion of people living with stroke suffer long-term disability, often requiring institutional care.³ Stroke disproportionately affects Māori and Pasifika people and at a younger age.⁴ Reducing the burden of stroke, with a focus on high-risk populations, is thus a key goal to improve health outcomes in New Zealand.

Several interventions reduce post-stroke disability. In particular, achieving cerebral reperfusion with intravenous thrombolysis and endovascular stroke clot retrieval (SCR) can dramatically improve patient outcomes often reversing stroke symptoms completely,^{5,6} but require rapid intervention to achieve the desired treatment

benefit. Every minute that is lost results in the permanent loss of 1.9 million brain cells, and every 15 minutes of reduction in treatment delay results in a greater chance of independence and being discharged to home rather than institutionalised care.⁷ If delays of more than a few hours are incurred patients may have reached the point of 'no return' where too many brain cells have died to make reperfusion therapies viable. In addition, the risk of major bleeding complications steadily rises as brain tissue becomes less and less stable, eventually reaching the point where it becomes not only futile, but in fact unsafe to treat with thrombolysis.

It is therefore critical to get patients to hospital quickly. To achieve this, the person with stroke or a bystander have to recognise that a stroke has occurred and appreciate the time sensitive nature of the situation. However, there are challenges to this recognition. For example, strokes

are generally painless and symptoms can be subtle. Furthermore, people often think ‘they will sleep it off,’ or take a ‘wait and see’ approach. This results in late presentations that mean many people are missing out on these key, time-sensitive interventions.⁸

To complicate things further, all reperfusion therapies require secondary hospital attendance to undergo immediate computed tomography (CT) brain imaging. Patients also require transfer to a tertiary SCR centre to access the required procedural expertise if they are SCR candidates. These additional steps take additional time, placing even further importance on the need for public awareness and behaviour change around the recognition of stroke symptoms and the need to treat stroke as a medical emergency and ring ‘111’ without any delay.

In response to the recommendation of the National Stroke Network, the Ministry of Health funded three consecutive three-month long public campaigns in 2016, 2017 and 2018, run by the Health Promotion Agency with support from the New Zealand Stroke Foundation (SF). The SF also ran an initial pilot in the Waikato region in 2015 that informed the subsequent nationwide campaign. The ultimate intent of each campaign iteration was to create behaviour change such that the public would call 111 immediately for suspected stroke.

Here we report on the impact of the more recent 2017 and 2018 national campaigns through information on public behaviour and awareness of stroke symptoms, ambulance callouts and stroke reperfusion intervention rates in New Zealand.

Methods

Campaign details

The three campaigns utilised the widely used FAST message as the cornerstone of the campaigns. FAST stands for ‘Face’, ‘Speech’, ‘Arm’ and ‘Time’, where the patient or bystander is prompted to check for a facial droop, speech difficulties and/or unilateral arm weakness and if any of them are present be aware of ‘Time’ being of the essence to act FAST and call 111.

This screening tool has been validated, has been used as part of other international public awareness and behaviour change campaigns, and is also used by paramedics and emergency department triage nurses to spot stroke patients.^{9,10}

For the 2018 campaign a slight alteration was made changing ‘time’ to ‘take action’ to further emphasise that people needed to actively seek emergency care quickly. This was based on evaluation findings from the earlier two campaigns indicating that some people found the ‘time’ reference confusing (Figure 1).

Figure 1: Campaign logo for the 2018 FAST Campaign.



Formal pre- and post-campaign evaluations were conducted around the 2017 and 2018 campaigns, and this is the focus of this paper.

The campaigns used updated and extended materials (radio adverts using scenarios, and 15-second pre-roll videos online). The material was translated into Te Reo Māori, Cook Island Māori, Samoan and Tongan by the cultural advisors from the Stroke Foundation.

The 2017 FAST campaign ran for 10 weeks from 4 June 2017 to 15 August 2017 and the 2018 FAST campaign ran for 10 weeks from 21 July 2018 to 30 September 2018.

The 2017 and 2018 FAST campaigns were evaluated through national surveys to assess changes in campaign awareness, people's knowledge of signs of stroke and of the FAST acronym. Surveys were conducted during the two- to three-week periods immediately before and after the campaigns. The 2017 surveys were based on the UMR Research nationally representative telephone omnibus survey of New Zealand adults age 18 and over aiming for 750 participants. In addition, booster surveys of Māori and Pasifika respondents were conducted aiming to reach 200–300 Māori and Pasifika respondents. The 2018 surveys used the same methodology except that an online rather than telephone approach was used to elicit responses.

An initial internal 2017 campaign evaluation showed that Māori and Pasifika people were less able to correctly identify signs of medical stroke, and less were aware of the FAST campaign as compared to non-Māori and non-Pasifika people. For this reason, the 2018 campaign aimed to still resonate with all New Zealanders but with *particular* focus on Māori and Pasifika people. This included more focus on media channels based on media habits of Māori and Pasifika. For example, the campaign previously included only radio commercials in English. The 2018 campaign included Māori Television commercials in Te Reo Māori. In addition, the campaign worked more directly with relevant regions/local health sector for things such as best billboard placement and all translations, including those into Te Reo Māori, Samoan, Tongan, Cook Island Māori etc, were rechecked and posters reformatted to improve ease of understanding.

In addition, St John Ambulance provided data on the number and nature of their callouts from 1 March 2017 to 21 December 2018, providing data from the three months before the 2017 FAST campaign to three months after the 2018 FAST campaign. The last 10 days of December were excluded from the analysis due to the impact of strike action on data recording. The data was divided into five categories; pre-2017 campaign (March–June 2017), 2017 campaign (June–August 2017), between campaigns (September 2017–July 2018), 2018 campaign (July–September 2018) and post-2018 campaign (October–December 2018). Although Wellington Free Ambulance provided us with 2018 data, this was excluded from this analysis as we sought to understand the impact of both campaigns and only St John Ambulance could provide call data for both 2017 and 2018 campaign periods. We also obtained data from the National Stroke Register to assess for potential impact on stroke intervention rates.

Binary and continuous variables were analysed using logistic and linear regression respectively. Ambulance data was analysed using ANOVA.

Analysis was completed in StataIC 13.0.

Results

The 2017 baseline survey (26 April 2017 to 7 May 2017) included a total of 1,079 respondents; 750 from the omnibus, 232 Māori and 200 Pasifika respondents from omnibus and booster survey). The 2017 post campaign survey (1 September 2017 to 20 September 2017) included a total of 1,081 respondents (750 from the omnibus and 237 Māori and 200 Pasifika from the omnibus and booster surveys).

The 2018 pre-campaign survey (19 June 2018 to 16 July 2018) included 1,362 respondents (750 from the omnibus and 423 Māori and 300 Pasifika from omnibus and booster surveys). And the 2018 post campaign survey (24 September 2018 to 8 October 2018) included 1,242 (750 from from the omnibus and 307 Māori and 301 Pasifika respondents from the omnibus and booster surveys).

To assess the impact of both campaigns results, the 2017 baseline results were compared with the 2018 post-campaign findings and are summarised in Tables 1 and 2.

Table 1: Overall impact of FAST campaign comparing pre-2017 to post-2018 campaign survey findings.

	Pre-2017 N=1,079 n (%)	Post-2018 N=1,242 n (%)	p-value
FAST awareness	411 (38.1)	650 (52.3)	<0.001
Correctly identifying weakness as a sign	511 (47.4)	699 (56.3)	<0.001
Correctly identifying speech as a sign	655 (60.7)	842 (67.8)	<0.001
Correctly identifying weakness and/or speech	774 (71.7)	943 (75.9)	0.022
Correctly identifying 'time critical' nature of stroke*	87 (8.1)	394 (31.7)	<0.001

*This was defined as the survey respondent stating that 'T' stands for 'Take action,' 'call 111,' and/or 'time'.

When considering all four campaigns there were significant differences in all outcomes for all ethnic groups except for Māori awareness of weakness and/or speech representing stroke symptoms (70.3%, 73.4%, 68.1% and 74.3% (p=0.25) across the four time epochs) and this outcome was only just below the ≤ 0.05 significance level for Pasifika (58.5%, 66.0%, 63.7%, 71.1% (p=0.03)). All others had a values of p<0.0001. Findings over time are depicted in Figures 2 and 3.

We also looked at the impact of the campaigns on ambulance callouts. Figure 4 depicts the number of calls per day received by St John for a suspected stroke (blue dots) and the number of cases of paramedic clinical impression of stroke (red dots). An

increase in the number of incidents for both measures is associated with each campaign period, and over the two-year period there was a significant increase in mean daily incidents. One-way ANOVA showed there were significant differences between the five categories for both suspected stroke ((F(4,656)=30.63, p<0.01) and paramedic clinical impression (F(4,656)=9.04, p<0.01). Post-hoc comparisons using Bonferroni adjustments confirmed that the mean number of calls for suspected stroke at 111 call increased from a pre-2017 campaign baseline of 21.5 daily calls to a post-2018 campaign mean of 25.7 daily calls (see Table 3) (t=4.3, p<0.01). Similarly, the mean number of cases with paramedic clinical impression of stroke increased from 6.0 daily cases to 7.2 daily cases (t=1.2, p<0.02).

Table 2: Results.

	Pre-2017 Māori N=232 Pasifika N=200 n (%)	Post-2018 Māori N=307 Pasifika N=301 n (%)	p-value
FAST awareness			
Māori	91 (39.2)	156 (50.8)	0.007
Pasifika	43 (21.5)	137 (45.5)	<0.001
Correctly identifying weakness and/or speech			
Māori	163 (70.3)	228 (74.3)	0.3
Pasifika	117 (58.5)	214 (71.1)	0.004
Correctly identifying 'Time critical'			
Māori	21 (9.1)	88 (28.7)	<0.001
Pasifika	9 (4.5)	100 (32.6)	<0.001

Figure 2: Improvement over time in the awareness of the importance of time and/or to ‘take action’.

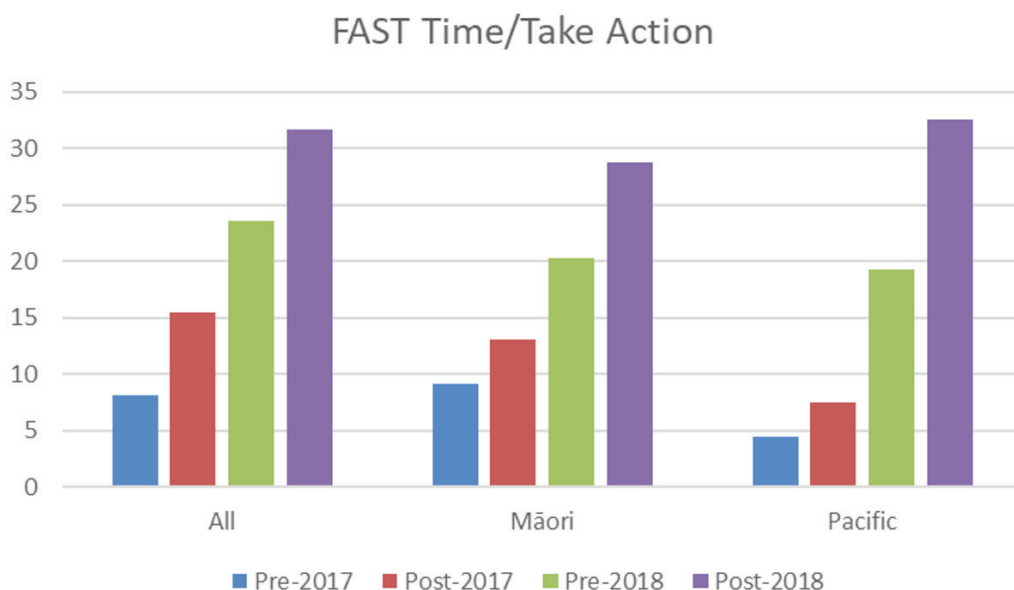
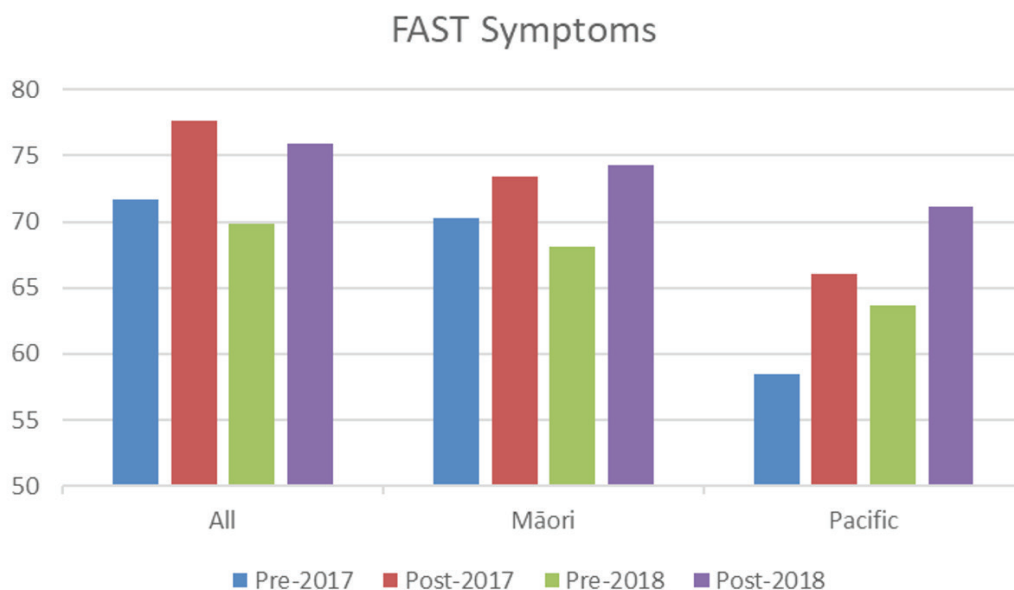


Figure 3: Change over time in stroke symptom recognition (weakness and/or speech problem).



Examination of the national stroke register shows that the percentage of stroke patients accessing reperfusion therapies in New Zealand has increased since 2015 (Figure 5). This increase was significant between the pre-2017 campaign and post-2018 campaign (see Table 3). The blue vertical bars depict the reporting period immediately following a campaign (including 2016 campaign). Peaks in the rates are associated with the three FAST campaigns, particularly the 2016 and 2017 campaigns (Figure 5).

Discussion

The main aim of the National FAST campaigns was to achieve a ‘behavioural change’ with particular focus on the concept that strokes are medical emergencies and that it is important to act fast and take action, because time is of the essence. Our findings provide clear evidence that the FAST campaigns have succeeded in this area with a marked increase in the number of people who report that they would take immediate action and call 111. In addition,

Figure 4: Daily ambulance call outs from St John between March 2017 and December 2018.

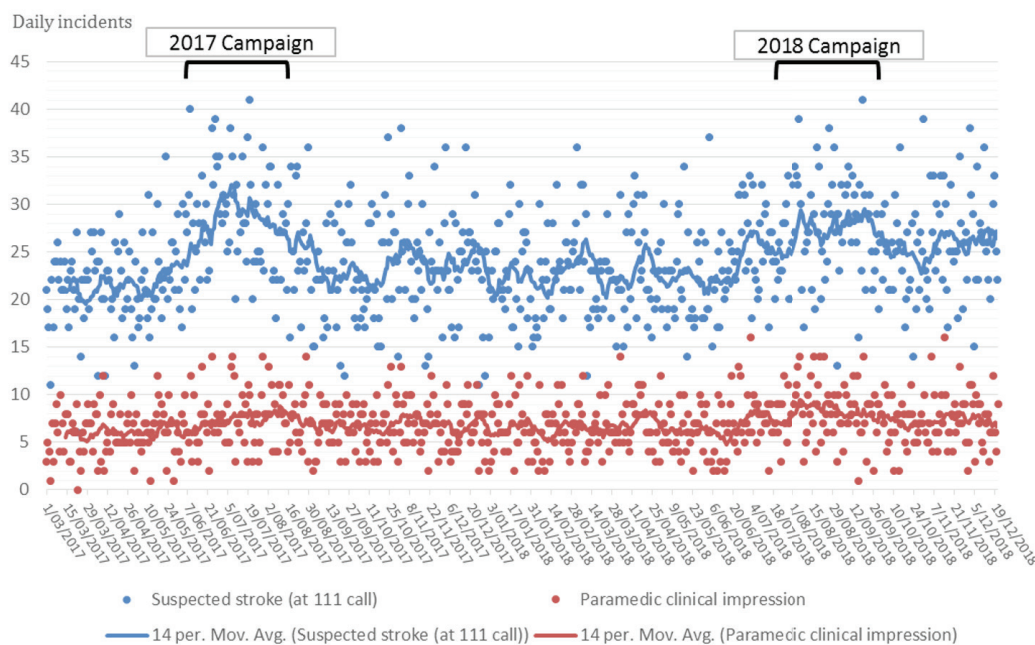
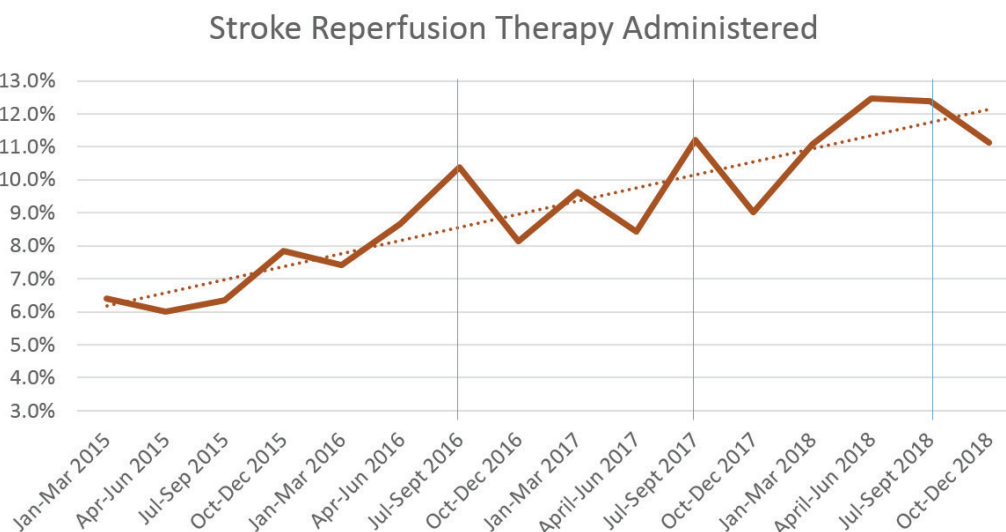


Table 3: Mean number of calls per day to St John ambulance services comparing pre-2017 and post-2018 campaign evaluation periods.

	Pre-2017 campaign	Post-2018 campaign	p-value
Daily ‘suspected’ stroke callouts (at 111 call), mean (95%CI)	21.5 (20.6–22.4)	25.7 (24.6–26.9)	<0.001
Daily paramedic clinical impressions of stroke callouts, mean (95%CI)	6.0 (5.5–6.5)	7.2 (6.6–7.8)	<0.02
Nat’l Thrombolysis Rate	8.1%	9.7%	P=0.016

Figure 5: National Thrombolysis intervention rates.



we found that the campaign has resulted in overall better awareness of typical stroke symptoms and campaign awareness overall.

Perhaps more importantly, we have demonstrated that the rise in a better understanding of the importance of taking immediate action has in fact translated into more people with stroke symptoms actually calling the ambulance service to be taken urgently to the hospital. Furthermore, it is good to see that the calls to 111 with 'suspected' stroke actually correlate with a rise in a paramedic 'confirmed' stroke. Similarly, the finding that reperfusion therapy access has increased concurrent with the campaigns throughout New Zealand with apparent peaks during the campaigns themselves suggests that these efforts are translating into real patient benefit.

It is pleasing to see that benefits are seen in all ethnic groups. However, ongoing work is required to target priority populations including Māori and Pasifika people as their overall campaign awareness remains comparatively low.

Unfortunately, there is also evidence that the benefit dips once the campaign is interrupted and while some messages appear to be retained over time it is very likely that sustained campaigning could provide more lasting benefit. Ongoing campaigns are also needed to reduce the evident ethnic disparity in awareness and to maintain knowledge over time. This is becoming increasingly important as more patients are becoming eligible for powerful life-changing treatments with the latest advances in acute stroke care.¹¹⁻¹³

This study has some limitations. Firstly, as with all population surveys, ours were completed by only a small proportion of the New Zealand population and while efforts were made to select a representative sample, we cannot be entirely certain that the findings are truly generalisable. Second, the observational study design precludes drawing definite causative relationships and significant confounders may contribute to the observed trends over time. For example, many initiatives have been implemented to boost reperfusion rates and it is unclear to what degree the FAST campaigns have influenced the rates compared with other initiatives. Finally, the response from participants was coded by non-clinicians and there is a degree of uncertainty around the accuracy of the response allocation. Having said that, the same approach was used each time providing reassurance that there was consistency in data collection and coding over time.

In summary, despite a few methodological limitations our findings provide evidence from multiple sources, including surveys, ambulance data and reperfusion therapy access data, that strongly support that the FAST campaigns are achieving their objective of changing the behaviour of New Zealanders when it comes to 'taking action' at the sign of a stroke. It is pleasing to see that benefits are seen in all ethnic groups. However, more work is required not only to provide ongoing public education, but also to maintain a strong focus on priority high-risk populations, including Māori and Pasifika people.

Appendix Table 1:

Measure	2017 Campaign		2018 Campaign		2018 campaign (July vs Sept)	Both campaigns (May 2017–Sept 2018)	Both campaigns Peak (Sept vs Sept)
	May 2017	Sept 2017	July 2018	Sept 2018			
General							
Signs of medical stroke							
Numbness/weakness	60%	76%	67%	72%	+5%	+12%	-4%
Speech	51%	61%	56%	62%	+6%	+11%	+1%
Awareness of FAST	41%	58%	49%	56%	+7%	+15%	-2%
Knowledge of FAST							
Face	21%	39%	42%	49%	+7%	+28%	+10%
Arm	9%	26%	34%	44%	+10%	+35%	+18%
Speech	16%	30%	36%	44%	+8%	+28%	+14%
Time or take action	9%	18%	28%	32%	+4%	+23%	+14%
Take action only				14%			
Māori							
Signs of medical stroke							
Numbness/weakness	62%	69%	60%	67%	+7%	+5%	-2%
Speech	46%	49%	43%	53%	+10%	+7%	+4%
Awareness of FAST	40%	51%	36%	50%	+14%	+10%	-1%
Knowledge of FAST							
Face	23%	29%	31%	40%	+9%	+17%	+11%
Arm	15%	20%	26%	36%	+10%	+21%	+16%
Speech	18%	20%	27%	36%	+9%	+18%	+16%
Time or take action	9%	13%	20%	29%	+9%	+20%	+16%
Take action only				9%			
Pasifika							
Signs of medical stroke							
Numbness/weakness	51%	63%	54%	64%	+10%	+13%	+1%
Speech	32%	41%	34%	51%	+17%	+19%	+10%
Awareness of FAST	23%	35%	28%	45%	+17%	+22%	+10%
Knowledge of FAST							
Face	10%	23%	23%	40%	+17%	+30%	+17%
Arm	6%	12%	19%	36%	+17%	+30%	+24%
Speech	8%	13%	21%	38%	+17%	+30%	+25%
Time or take action	5%	7%	18%	33%	+15%	+28%	+26%
Take action only				16%			

Competing interests:

Nil.

Author information:

Craig Gordon, Research Team Lead, Health Promotion Agency/Te Hiringa Hauora, Wellington; Rebecca Bell, Researcher, Research Team, Health Promotion Agency/Te Hiringa Hauora, Wellington; Annemarei Ranta, Associate Professor and Head of Department, Department of Medicine, University of Otago, Wellington.

Corresponding author:

A/Prof Anna Ranta, Department of Medicine, University of Otago, Wellington, PO Box 7343, Wellington 6242.

anna.ranta@otago.ac.nz

URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2019/vol-132-no-1507-13-dec-2019/8074>

REFERENCES:

- Feigin VL, Norrving B, Mensah GA. Global Burden of Stroke. *Circ Res* 2017; 120(3):439–48. doi: 10.1161/CIRCRESA-HA.116.308413 [published Online First: 2017/02/06].
- Brown P. Economic burden of stroke in New Zealand. Three decades of Auckland regional Community Stroke (ARCOS) studies: What have we learned and what is next for stroke care and stroke research? *AUT*, 2009.
- Cadilhac DA, Carter R, Thrift AG, et al. Estimating the long-term costs of ischemic and hemorrhagic stroke for Australia: new evidence derived from the North East Melbourne Stroke Incidence Study (NEMESIS). *Stroke* 2009; 40(3):915–21.
- Feigin VL, Krishnamurthi RV, Barker-Collo S, et al. 30-Year Trends in Stroke Rates and Outcome in Auckland, New Zealand (1981–2012): A Multi-Ethnic Population-Based Series of Studies. *PLoS ONE* 2015; 10(8):e0134609. doi: 10.1371/journal.pone.0134609 [published Online First: 2015/08/21].
- Goyal M, Menon BK, van Zwam WH, et al. Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. *Lancet* 2016; 387(10029):1723–31. doi: 10.1016/S0140-6736(16)00163-X [published Online First: 2016/02/24].
- Lansberg MG, Schrooten M, Bluhmki E, et al. Treatment time-specific number needed to treat estimates for tissue plasminogen activator therapy in acute stroke based on shifts over the entire range of the modified Rankin Scale. *Stroke* 2009; 40(6):2079–84. doi: 10.1161/STROKEA-HA.108.540708 [published Online First: 2009/04/18].
- Saver JL, Fonarow GC, Smith EE, et al. Time to treatment with intravenous tissue plasminogen activator and outcome from acute ischemic stroke. *JAMA* 2013; 309(23):2480–8. doi: 10.1001/jama.2013.6959
- Hemmen T. Patient delay in acute stroke response. *European journal of neurology* 2008; 15(4):315–16. doi:10.1111/j.1468-1331.2008.02083.x
- Harbison J, Hossain O, Jenkinson D, et al. Diagnostic Accuracy of Stroke Referrals From Primary Care, Emergency Room Physicians, and Ambulance Staff Using the Face Arm Speech Test. *Stroke* 2003; 34(1):71–76. doi: doi:10.1161/01.STR.0000044170.46643.5E
- Flynn D, Ford GA, Rodgers H, et al. A time series evaluation of the FAST National Stroke Awareness Campaign in England. *PLoS ONE* 2014; 9(8):e104289–e89. doi: 10.1371/journal.pone.0104289
- Albers GW, Marks MP, Kemp S, et al. Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging. *N Engl J Med* 2018; 378(8):708–18. doi: 10.1056/NEJMoa1713973 [published Online First: 2018/01/25].
- Nogueira RG, Jadhav AP, Haussen DC, et al. Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct. *N Engl J Med* 2018; 378(1):11–21. doi: 10.1056/NEJMoa1706442 [published Online First: 2017/11/14].
- Campbell BCV, Ma H, Ringleb PA, et al. Extending thrombolysis to 4.5–9 h and wake-up stroke using perfusion imaging: a systematic review and meta-analysis of individual patient data. *Lancet* 2019;394(10193):139–47. doi: 10.1016/S0140-6736(19)31053-0 [published Online First: 2019/05/28].