

ORIGINAL ARTICLE

The Effectiveness of Stroke Awareness Campaign in Promoting Knowledge on Stroke Among the Public in Malaysia

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ABSTRACT

Introduction: Inadequate public knowledge and healthcare-seeking behavior regarding stroke impede efforts to reduce its burden, particularly in developing nations. This study evaluates the impact of stroke awareness campaigns on public knowledge and healthcare-seeking behavior in Malaysia. **Materials and methods:** A cross-sectional study with pre- and post-survey design was conducted among adults aged 18 and older who registered for the Virtual ResQ Stroke Run event (May-November 2021), part of the ResQ Stroke Campaign (RSC) for World Stroke Day. 178 participants were recruited. Validated questionnaires assessing stroke knowledge, treatment attitudes, and actions during a stroke incident were administered before and after the campaign. Participants engaged in stroke awareness activities, including online forums, virtual runs, and social media campaigns promoting stroke recognition. SPSS version 28 was used for data analysis, with non-parametric methods due to non-normal distribution. McNemar's test compared pre- and post-campaign data. **Results:** Post-RSC, respondents were 80% more likely to recognize FAST stroke signs compared to pre-RSC. For actions, positive outcomes were observed, with most respondents stating they would call an ambulance or go to the hospital within the recommended 4.5 hours on the same day (pre: 66.9%, post: 91%). However, attitudes toward stroke require improvement, as 48% indicated they would seek non-emergency medical help, despite 96.1% stating they would go to the hospital. **Conclusion:** Knowledge, actions, and attitudes toward stroke improved after the media-driven RSC. However, continuous campaigns are needed to maintain public awareness of stroke symptoms and appropriate action.

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INTRODUCTION

Globally, the majority of stroke-related fatalities, accounting for 75%, are concentrated in low- and middle-income nations, and Asian countries have registered the highest lifetime stroke risk between 1990 and 2016 [1]. In Malaysia, stroke stands as the second most prevalent cause of morbidity and the third leading cause of mortality [27]. Despite significant advancements in the management of acute ischemic stroke (AIS), there persists an issue where many stroke patients do not receive prompt treatment, and this challenge might be attributed

to factors associated with healthcare professionals [28]. In Malaysia, a new clinical practice guideline (CPG) for AIS management was introduced in 2021, marking a decade since the last CPG publication. This lengthy gap between guidelines could have resulted in limited awareness of the latest management approaches [29]. Over the past five years, there have been very few studies on AIS management knowledge, with none originating from Malaysia. These studies mainly targeted general practitioners, paramedics, and emergency nurses, rather than the general public. The results from these studies displayed a wide range of responses, particularly among healthcare professionals, and underscored the need for enhanced stroke education to improve their knowledge [29].

However, previous research has not delved into factors

such as behavior, attitudes, measurements, and self-risk assessment, particularly among individuals and the general public. Additionally, it's crucial to note that stroke prevention is both feasible and practical, with an estimated 80% effectiveness when appropriate precautions are taken based on an understanding of the risk factors associated with the disease [2-3]. Nevertheless, a significant knowledge gap exists between developing and developed countries, particularly evident in the poor recognition of stroke symptoms in developing nations [30]. Furthermore, in developing countries, patients often tend to opt for complementary alternative treatments rather than seeking immediate medical attention, which is critical since current hyperacute stroke treatment hinges on timely arrival at a stroke-ready hospital within a specific timeframe. The lack of knowledge and healthcare-seeking practices in developing nations poses a substantial obstacle to combating stroke. Consequently, this study aims to establish a baseline understanding of stroke recognition, appropriate actions during a stroke event, and the healthcare-seeking attitudes of the Malaysian public. Additionally, we intend to evaluate the effectiveness of our stroke awareness campaign, the ResQ Stroke Campaign (RSC), in collaboration with World Stroke Month (WSM) in October 2021.

MATERIALS AND METHODS

Study recruitment

Study design and setting

This is a cross-sectional online questionnaire study during a pre- and post-survey design involving adults aged 18 and older who registered for the Virtual ResQ Stroke Run event. Adults aged 18 years registered to join our RSC (mainly Virtual ResQ Stroke Run) who are able to read, well-informed about or proficient in the use of modern information technology and social media from May until November 2021. A random sampling method was used to recruit participants based on inclusion and exclusion criteria. All participants who joined RSC were invited to participate in the study. Based on a study done by Advani et al., 2016 [27] a minimum sample size with 80% of power was calculated using a single sample proportion with a total of 250 minimum sample participants. A total of 215 out of 250 participants joined the RSC. But, only 178 participants agreed and consented to participate in this study.

Study measurements

This study is divided into two parts, i.e., pre and post-survey questionnaires. A validated questionnaire was used to assess the stroke awareness of the public in Malaysia which was developed per Malaysia clinical practice guideline [30, 8]. Both pre- and post-assessment used the same set of questionnaires. All participants consented using an e-consent via the google link form, and those who agreed will proceed to

the questionnaire using the same google link. The same set of questionnaires was sent as a post-assessment at the end of the campaigns.

Questionnaire validation

Two senior consultant neurologists and three primary care physicians developed the questionnaire content, validate and published [8]. The questionnaire explores three main topics, i.e., knowledge of stroke and recognition of stroke symptoms, attitude towards medical treatment of stroke and knowledge on actions to be taken during a stroke. The respondents were assessed with questions about stroke warning signs and the appropriate behavioural response and action toward acute stroke management. These questions also acted as 'control' questions and facilitated the evaluation of the sensitivity and specificity of the FAST message.

Run Stroke Campaign activities (ResQ Stroke Campaign, RSC)

All participants are encouraged to attend the stroke awareness activities as a part of the study eligibility. This includes the virtual stroke forum (RSC Talk) via online webinars, virtual RSC Fun Run 8 KM or 10,000 steps, FAST campaign, i.e. stroke recognition via mnemonic FAST (Facial weakness, arm weakness, speech difficulties and time to call an ambulance) through social media and regular information on stroke was updated on our Facebook page, which participants were invited to follow to get updated on our RSC and details regarding stroke.

Five RSC Talks were organized via online platforms from April until November 2021. Each RSC Talk will cover a different aspect of stroke management and involve specialists from multidisciplinary such as; 1. RSC Talk 1.0: What is a stroke? (Promote the public's basic understanding of stroke recognition and prevention of stroke, 2. RSC Talk 2.0: Stroke – Prevention and Treatment (reiterate the importance of early stroke recognition and presentation to the hospital) 3. RSC Talk 3.0: Stroke – Diet and Exercise (importance of exercise and a healthy diet to prevent stroke) 4. RSC Talk 4.0: Stroke during Covid-19 Pandemic (emphasize to the public the importance of early hospital visits even during the Covid-19 pandemic), 5. RSC Talk 5.0: Stroke Patients Need Help (focusing on helping stroke patients, especially during the pandemic because stroke patients were significantly affected socially and economically). The questionnaire was administered both before and after (1 month after) the campaign activities were conducted as study eligibility.

Statistical analysis and data management

Data from the google link was extracted and cleaned before proceeding for data analysis. The latest version of SPSS 28 was used to analyze $p < 0.05$ and was determined as a significant difference and association for variables calculated. Data were not normally

distributed; hence the non-parametric analysis was used. Data is represented as n (%) and IQR. A McNemar's test analysis was used for the data analysis to compare the pre and post analysis.

Ethical approval and consent to participant

This study was approved by the Ethics Committee Involving Human Subjects Universiti Putra Malaysia (JKEUPM-2020-121). All methods were carried out in accordance with the JKEUPM guideline and regulation. All respondents consented and informed consent was obtained via the google link form.

RESULTS

A total of 178 respondents have agreed to participate in this pre-and post-study (Table I and Figure 1). The respondents were 109 females (61.2%) and 69 males (38.8%); more than half of the respondents, 103 (57.9%), were married with a median age of 35 years old (IQR:30-42). The majority were Malay Muslims (62.9%) with tertiary education (93.8%). Almost one-third of respondents had a medical background. In terms of medical comorbidities, 23 (12.9%) have hypertension, 13 (7.3%) diabetes mellitus, and 25 (14%) hyperlipidemia. More than half had their blood pressure (BP) regularly checked, with the majority having home BP self-check.

Table I: Baseline demographic and clinical parameter

Demographic	n (%)	Median	IQR
Age		35	30 42
Gender			
Male	69(38.8)		
Female	109(61.2)		
Marital status			
Married	103(57.9)		
Single	71(39.9)		
Divorce	2(1.1)		
Widowed	2(1.1)		
Religion			
Islam	112(62.9)		
Christian	12(6.7)		
Buddhist	51(28.7)		
Others	3(1.7)		
Smoking			
Yes	14(7.9)		
Highest level of education			
Primary (S1-6)	2(1.1)		
Secondary (F1-5)	9(5.1)		
Tertiary (University/College)	167(93.8)		
Medical background			
Yes	66(37.1)		
Comorbidity			
Hypertension	23(12.9)		
Diabetes Mellitus	13(7.3)		

CONTINUE

Table I: Baseline demographic and clinical parameter.

(CONT.)

Demographic	n (%)	Median	IQR
Age		35	30 42
Comorbidity			
Hypercholesterolemia	25(14)		
Renal related disease	3(1.7)		
Cancer	2(1.1)		
Blood pressure (BP) reading			
Yes	139(78.1)		
Last BP reading			
Last year	18(10.1)		
This year	123(69.1)		
Unknown/No	37(20.8)		
Where BP measured			
Clinic	76(42.7)		
Pharmacy	6(3.4)		
Others/Home BP.	96(53.9)		

Note: Data is not normally distributed. Thus, data represent as median and IQR (interquartile range)

Summaries from the Table IV, which there were significant improvements in:

Domain 1: Knowledge

4.1% in general knowledge, 14.1% in knowledge on causes and risk factors for stroke, 79.8% in FAST as recognition of signs of stroke ;(F) Facial weakness 53.4%, (A) Weakness of arms and legs 58.9, (S) Speech difficulties 57.5%, and (T) Call ambulance 104.5% (2.9% prevention of stroke).

Domain 2: Action

75% Call general practitioner or family doctor, 36.1% Go to the hospital within 4.5 hours, 63.5% Go to hospital on the same day and 17.2% Call an ambulance.

Domain 3: Attitude

Going to the hospital is only 4.1% and will get a combination of hospital and faith treatment 2.9%.

Overall knowledge of stroke

Respondents' unprompted descriptions of what constitutes a stroke are summarized in Tables II, III and IV. Domains 1 were compared between surveys using McNemar's analysis test. The comparison was determined based on pre and post campaigns. During the pre-campaign, the respondents could not identify the target organ involved in stroke and the recognition sign of stroke (FAST). It was significantly less likely to provide a wrong description than saying they didn't know during the pre-campaign. However, there were overall significant changes and increments in pre and post that involved understanding what constitutes stroke, the cause and risk factors of stroke; the warning signs of stroke; the recognition of stroke symptoms (FAST); and how to prevent stroke.

Table II: General knowledge on stroke.

Knowledge	Pre		Post		Yes %	No %	p-value
	n	%	n	%			
Organ of the body is affected by stroke							
Brain	171	96.1	178	100	4.1		0.016
Heart	52	29.2	40	22.5		-23.19	< 0.001
Kidney	19	10.7	10	5.6		-47.32	0.004
Liver	8	4.5	4	2.2		-50	0.125
Lungs	9	5.1	1	0.6		-88.89	0.008
Don't know	1	0.6	0	0		-100	1.00
Multiple episode of stroke							
Yes	176	98.9	178	100	1.10		
No	2	1.1	0	0		-100	0.5
Stroke effect on daily activities							
Yes	176	98.9	178	100	1.14		
No	2	1.1	0	0		-100	0.5

DOMAIN 1: Knowledge
 There is a significant difference in perspective in Domain:1 (General knowledge) with $p < 0.005$ except for liver. The increment and reduction of choice post-campaign were listed above.
 * McNemar's test

Table III: Knowledge of the risk factors of stroke.

Risk Factor	Pre		Post		p-value	Yes %	No %
	n	%	n	%			
Risk factors for stroke							
Yes	156	87.6	178	100		14.12	
No	22	12.4	0	0	< 0.001		-100
Risk factors for stroke							
Older age	106	59.6	148	83.1	< 0.001	39.60	
Diabetes	96	53.9	163	91.6	< 0.001	69.79	
Hypertension	154	86.5	175	98.3	< 0.001	13.63	
Cardio-vascular disease	154	86.5	172	96.6	0.002	11.68	
Sedentary lifestyle (Obesity, Bad diet and Lack of exercise)	140	78.7	167	93.8	< 0.001	19.28	
Smoking	112	62.9	159	89.3	< 0.001	41.9	
Alcohol	91	51.1	129	72.5	< 0.001	41.7	
Stress	134	75.3	136	76.4	< 0.001	1.49	
Genetics	76	42.7	141	79.2	< 0.001	85.52	
Migraine	27	15.2	87	48.9	< 0.001	222.2	
Cancer	16	9.0	137	77.0	< 0.001	756.25	
Oral contraceptive	20	11.2	16	9.0	0.541		-20

CONTINUE

Table III: Knowledge of the risk factors of stroke. (CONT.)

Risk Factor	Pre		Post		p-value	Yes %	No %
	n	%	n	%			
Risk factors for stroke							
Poor hygiene	4	2.2	20	11.2	< 0.001		
Tremor	5	2.8	10	5.6	0.063		
Witch craft	2	1.1	1	0.6	1.00		-50

There is a significant difference in perspective in domain:1 (knowledge: causes and risk factors of stroke) with $p < 0.005$ except for oral contraceptive, tremor and witch-craft. The increment and reduction of choice in post-campaign were listed above.
 *McNemar's test

Table V: Data showed on the action that needs to be taken during stroke.

Action to be taken during stroke	Pre		Post		p-value	Yes %	No %
	n	%	n	%			
Planned response to an event of stroke							
Call general practitioner or family doctor	88	49.4	154	86.5	< 0.001	75	
Ask family members or relatives to help	72	40.4	137	77.0	< 0.001	90.27	
Go to chemist or pharmacy for advice or medication	3	1.7	3	1.7	1.0	0	
Self-medication	1	0.6	-	-	-		-100
Ask friend or neighbours for help	35	19.7	91	51.1	< 0.001	160	
Go to hospital on the same day	107	60.1	175	98.3	< 0.001	63.5	
Go to hospital within 4.5 hours	119	66.9	162	91	< 0.001	36.13	
Visit community health centre	29	16.3	29	16.3	1.0		
Visit alternative health care providers	7	3.9	7	3.9	1.0		
Seek spiritual healing (prayer)	1	0.6	-	-	-		-100
Invite a Physio-therapist	14	7.9	-	-	-		-100
Call ambulance	151	84.8	177	99.4	< 0.001	17.21	
Others and don't know	3	1.7	-	-	-		-100

DOMAIN 2: ACTION

1. Knowledge of stroke warning signs

Knowledge of the warning signs for stroke was assessed using an open-ended question with no prompts. Good knowledge was defined as correctly identifying two or more signs classified by NINDS (National Institute of Neurological Disorders and Stroke) [9]. Based on the

questionnaire provided, 87.6% of respondents reported being able to identify the symptom of stroke during the pre-questionnaire and 100% on the post questionnaire. The study reported significant $p < 0.001$ changes in the pre-and post-campaign on warning signs of stroke but not on positive symptoms (weakness or paralysis in one side of the body and numbness of one side) and all negative symptoms except for confusion or disorientation $p < 0.001$. Tabulated the positive and negative symptoms are reported in Table IV.

2. Knowledge of stroke campaigns (FAST)

Respondents were asked if they were aware of the FAST campaign. Only (55%) of respondents were aware of the FAST campaign. The sources of information during the pre-campaign were healthcare facilities (84%), social media (61.8%), and friends and relatives (44.9%). After being educated regarding FAST during RSC, the majority of all patients could describe several details of the FAST (Table IV).

3. Action and response to stroke

When asked how they would respond if they thought they were having a stroke or witnessing someone having a stroke, respondents in post-campaign were significantly more likely to state that they would call an ambulance (99.4% compared to 84.8% in pre-campaign; Table VI). The majority of the respondents will call a general practitioner or call a family doctor post-campaign (86.5% compared to 49.4%), go to the hospital within 4.5 hours (91% compared to 66.9%), go to the hospital on the same day (98.3% compared to pre-campaign 60.1%). Very few participants (0.6%) said they would do nothing or try to ignore it. However, (1.7%) did not know what to do. But, after the post-campaign, none of the respondents reported they did not know what to do (Table V).

Table V: Data showed on the action that needs to be taken during stroke.

	Pre		Post		p-value	Yes %	No %
	n	%	n	%			
Action to be taken during stroke							
Planned response to an event of stroke							
Call general practitioner or family doctor	88	49.4	154	86.5	< 0.001	75	
Ask family members or relatives to help	72	40.4	137	77.0	< 0.001	90.27	
Go to chemist or pharmacy for advice or medication	3	1.7	3	1.7	1.0	0	
Self-medication	1	0.6	-	-	-	-	-100
Ask friend or neighbours for help	35	19.7	91	51.1	< 0.001	160	

CONTINUE

Table V: Data showed on the action that needs to be taken during stroke. (CONT.)

	Pre		Post		p-value	Yes %	No %
	n	%	n	%			
Go to hospital on the same day	107	60.1	175	98.3	< 0.001	63.5	
Go to hospital within 4.5 hours	119	66.9	162	91	< 0.001	36.13	
Visit community health centre	29	16.3	29	16.3	1.0		
Visit alternative health care providers	7	3.9	7	3.9	1.0		
Seek spiritual healing (prayer)	1	0.6	-	-	-	-	-100
Invite a Physio-therapist	14	7.9	-	-	-	-	-100
Call ambulance	151	84.8	177	99.4	< 0.001	17.21	
Others and don't know	3	1.7	-	-	-	-	-100

DOMAIN 2: ACTION

Table VI: Data showed the attitude of respondents toward medical treatment.

Attitude Towards Medical Treatment	Pre		Post		p-value	Yes %	No %
	n	%	n	%			
Will you go to see medical treatment if you have stroke?							
I will go to hospital/ medical facilities only	171	96.1	178	100	0.016	4.09	
I will go for complementary and traditional medication only	2	1.1	-	-	-	-	-100
I will go for faith treatment only	-	-	-	-	-	-	-
I will get combination of hospital and complementary traditional medication	48	27.0	48	27	1.0		
I will get combination of hospital and faith treatment	34	19.7	35	19.7	1.0	2.94	

DOMAIN 3: ATTITUDE

4. Attitude toward stroke treatment

The attitude toward the stroke treatment was assessed as a Domain 3 (Table VI), which determined the behaviour of the respondents regarding what medical treatment. Our study noticed that most of the respondents chose multiple selections. The majority of them will go to the hospital, and half of them will seek a combination of complementary tradition and faith and medical treatment.

Table VII: Percentage of the pre and post of the source of information during the campaign

Sources of Information About Stroke	Pre		Post		p-value
	n	%	n	%	
Health care providers	150	84.3	178	100	< 0.001
Friends and relatives	80	44.9	82	46.1	0.500
Social media	110	61.8	178	100	< 0.001

CONTINUE

Table VII: Percentage of the pre and post of the source of information during the campaign. (CONT.)

Sources of Information About Stroke	Pre		Post		p-value
	n	%	n	%	
Radio	39	21.9	39	21.9	1.0
TV/Television	61	34.3	61	34.3	1.0
Newspapers	53	29.8	53	29.8	1.0
Electronic media	108	60.7	108	60.7	1.0
Others	20	11.2	-	-	1.0

DISCUSSION

Our study is Malaysia's first small-scale nationwide survey of general community knowledge of stroke, and it follows the introduction of the FAST campaign among the Malaysian population. The findings demonstrate a significant improvement in the public capability to detect stroke warning symptoms, particularly those highlighted by the FAST campaign, and a corresponding reduction in those who had incomplete or inaccurate beliefs about stroke, such as chest pain or palpitations. The campaign was also successful in cueing recognition to action, with a substantial correlation between the ability to name stroke warning signs and recollection of media advertising (Table VII) and the intention to contact an ambulance.

Stroke risk factor knowledge was strong, and rates differed between pre and post-campaign. Risk factor knowledge was greater in this study than in previous studies [10-12], with nearly three-quarters of the sample correctly identifying two or more risk factors. The most commonly mentioned risk factors were hypertension, cardiovascular disease, smoking, and a sedentary lifestyle (obesity, unhealthy diet and lack of exercise). Several studies have shown comorbidities including hypertension, diabetes mellitus, hyperlipidemia, cardiovascular disease, environmental and social factors including lifestyle, smoking, and alcohol as risk factors of developing stroke [13-17]. Many participants are likely to have recognized general risk factors for health disorders, reflecting the media's attention on obesity and smoking in Malaysian health policy. However, public awareness was significantly lower when particular risk factors associated with an elevated risk of stroke were investigated. For example, although the population prevalence of blood pressure is relatively high, [17] respondents had low levels of awareness of blood pressure as a risk factor for stroke.

Knowledge of stroke warning signs and proper action increased significantly pre and post RSC campaigns. The ability of respondents to identify two or more stroke warning signs nearly doubled. It is a considerable increase over pre and a somewhat greater improvement than previous research. [10-12] The campaign's most frequently reported warning signs were facial weakness, slurred speech, FAST symptoms, and weakness or paralysis on one side of the body. Post-campaign

respondents were more likely to recognize FAST (50-80 % increase), positive symptoms (10-20 % increase), and negative symptoms (10 % increase) than pre-campaign respondents. However, a few respondents identified the inaccurate warning symptoms such as shortness of breath and chest pain, showing persistent misunderstanding between stroke and heart attack warning signs.

In terms of immediate response to stroke, following exposure to the RSC, respondents were significantly more likely to call for an ambulance or go to the nearest hospital within 4.5 hours or the same day if symptoms occurred. Over three-quarters of respondents indicated that they would call emergency medical services and others would seek medical help using non-emergency means, including contacting a GP, visiting the community health centers and asking for advice from alternate healthcare members, for example physiotherapist or pharmacist. Compared with other studies [12,23-24], with the increase of 30 to 60% in pre and post findings, there is a relative improvement in the impact of the FAST campaign on appropriate behavioural intentions among the Malaysian population.

However, in terms of the treatment of stroke, many participants will still consider alternative, complementary and faith as their treatment choice. Various studies reported using traditional and alternative therapies for disease treatment and management, especially among the Asian population [18-21]. However, the issues are sensitive to be discussed. And, we do believe most of the Asian population, especially the Malaysian population has a strong belief and attitude toward traditional treatments as a part of stroke treatments.

Aside from that, poor retention mentioned by Hickey et al., 2018 stated that the inadequate translation of knowledge, action and attitude towards acute stroke and warning sign indicates the inappropriate behavioural response towards emergency stroke management. Respondents in this study were asked about their knowledge of acute stroke interventions within one month. Unfortunately, the majority of the respondents were aware that there are emergency stroke interventions available, however they were unable to identify the acute intervention and management due to the gap time that was conducted during pre and post RSC.

The FAST advertisement campaign is widely utilized worldwide to raise public awareness of stroke warning signs and appropriate responses [26]. This study shows that the RSC has a considerable influence on stroke warning sign awareness and, to a lesser extent, on proper emergency response. But, the message is highly specific, as evidenced by the campaign's lack of impact on population awareness of aspects of stroke not addressed by the FAST message. There are solutions to improve the FAST message that can and should be implemented. The 'T' component, in particular, does not appear to be

assimilated by the general population.

Findings from this campaign indicate there is an improvement in knowledge, action and attitude toward stroke. But, belief, culture, and time gap between campaigns hinder the awareness of acute stroke management and intervention. Further and continuous campaigns are needed to maintain the public understanding of stroke signs and appropriate responses. Particularly, there is a need to highlight the importance of the emergency response and attitude to stroke.

Limitations of the study

Several limitations should be taken into consideration in this study. Campaign of acute stroke is only being done during the WSM and not continuously being advocated. Thus, respondents' knowledge may decrease and action and attitude may vary. Moreover, a small sample size and a single-centred campaign due to the pandemic may lead to deflecting results which a bigger sample size with multicentre data should consider for better results. Other than that, this study did not show the significant association toward the demographic and risk factors related due to limited sample size. Also, the selected population is mostly from the Asian population. Some of the respondents still stick on the belief, and culture as one of the supplementary or additional treatment for the acute stroke.

CONCLUSION

In conclusion, RSC was a successful event in improving stroke knowledge. RSC demonstrates the significant influence of media-driven health promotion initiatives in improving population knowledge and awareness (Table VII). However, this campaign should not be a one-off effort, and continuous campaigns are needed to maintain public awareness of stroke symptoms and appropriate action.

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