

Don't be a flamin' fool: Effectiveness of an adult burn prevention media campaign in two regions in Queensland, Australia—An interventional study

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BACKGROUND: Major burn injuries cause devastating physical and psychosocial morbidity, combined with significant health care and community costs. The aim of this study was to evaluate the effectiveness of a targeted burn prevention message on burn safety knowledge and behavior.

METHODS: An 11-year retrospective review of patients admitted to an adult tertiary burn center identified flammable liquid burn injuries in males older than 15 years as 23% of admissions and the most common preventable injury. Burn safety knowledge and experience were measured in a single-blinded, controlled, restricted (male, >15 years), interventional, (therapeutic) prevention study using a total of 2,053 computer-assisted telephone interviews in an intervention region (IR) and control region. A two-week multimedia campaign with the theme “Don't Be a Flamin' Fool” was delivered in the IR.

RESULTS: The preintervention survey revealed that 13% (218 of 1,637) reported having previously had a gasoline (petrol) burn. Following the intervention, there was a higher percentage of respondents in the IR that had seen or heard a burn prevention message in the previous 3 months (51% vs. 10%; $p < 0.001$) and perceived that gasoline was a danger when used to start a fire (97% vs. 91%; $p = 0.001$), that any volume of gasoline was unsafe (85% vs. 65%; $p < 0.001$), and that gasoline can explode (96% vs. 92%; $p = 0.001$). Awareness and memory reverted to preintervention levels at 12 months. Eighty-three percent of respondents (100 of 120) who had seen the “Flamin' Fool” campaign thought it was effective in getting its message across.

CONCLUSION: This collaborative study found that a media prevention message had a significant impact on burn safety knowledge, which diminished over time. (*J Trauma Acute Care Surg.* 2013;74: 652–657. Copyright © 2013 by Lippincott Williams & Wilkins)

KEY WORDS: Burns; evaluation; health promotion; media; prevention.

Burn injuries are among the most devastating of all injuries and represent a major global public health crisis.^{1,2} The considerable physical and psychosocial morbidity is long lasting, while the cost to the community is considerable.^{1,3,4} There are various causes of burn injuries in adults, which include gasoline (petrol) used on a fire, hot oil burns associated with cooking, and hot water scald burns, particular in the elderly. Most are preventable.²

While there have been a large number of studies evaluating the adult population at risk of burn injury, translation and evaluation of this information into effective preventive programs is limited.⁵ Burn prevention faces a number of challenges. These include scarce resources, the need to develop high-

quality research methodology, and delineating the optimal way to deliver the prevention message.^{1,6,7} The aim of this study was to evaluate the effectiveness of a burn prevention multimedia message in burn safety knowledge and behavior in an at-risk adult population.

PATIENTS AND METHODS

Identification of the Target Population

The Royal Brisbane and Women's Hospital is a tertiary referral center for adult burns from Queensland and northern New South Wales, Australia. This is an area of 665,000 sq mi (1.7 million sq km), which is 2.5 times the size of Texas, with a population of only 5 million. Annual acute admissions to the burns unit have ranged between 400 and 450 in the previous 5 years. The study was registered with www.clinicaltrials.gov (trial identifier: NCT01608581)

An 11-year analysis of the burn unit database from 1997 to 2008 was conducted. Variables reviewed included burn type and size, circumstances of the burn, predisposing condition, age, sex, and location. From this review, the most common preventable injury and risk group were males older than 15 years with flammable liquid burn injuries. Patients using flammable liquid to self-harm were excluded. Twenty-three percent (503 of 2,215) of all admissions involved males with flammable liquid flame burn injuries. Three women

Submitted: June 8, 2012, Revised: August 21, 2012, Accepted: August 21, 2012. From the Professor Stuart Pegg Adult Burn Centre (M.J.M.), Royal Brisbane and Women's Hospital; and The Burns, Trauma and Critical Care Research Centre (M.J.M., J.M.D., J.D.P.), and the School of Journalism and Communication (J.M.H., B.R.R.), The University of Queensland, Brisbane, Australia.

This study was presented in oral form at the 43rd annual meeting of the American Burn Association, March 30, 2011, Chicago, Illinois.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text, and links to the digital files are provided in the HTML text of this article on the journal's Web site (www.jtrauma.com).

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DOI: 10.1097/TA.0b013e31827d5f42



Figure 1. Making the television commercial: B.R.R., M.J.M. and patient (left to right). A sample of the TVC can be accessed at http://vimeo.com/41111263?utm_source=internal&utm_medium=email&utm_content=cliptranscoded&utm_campaign=adminclip.

with similar injuries were identified; only one had been the instigator.

Selection of the Intervention and CR

The number of new burn injuries per statistical subdivision was tabulated with the number of persons older than 15 years using 2006 census data.⁸ Regions with a similarly high incidence of burn injury and an equivalent population size were considered for the intervention region (IR) and control region (CR). The IR chosen had a greater potential to achieve media saturation and containment of the message given that it is nonmetropolitan and relatively media isolated.

Study Design and Setting

This was a single-blinded, controlled, stratified (male, >15 years), comparative, prevention study conducted in two regions in Queensland, Australia. A telephone questionnaire was developed using a focus group with health professional

and burn care, epidemiologic, and media expertise. Questions related to respondent demographics, burn safety knowledge, exposure to a burn safety message in the media, and personal experience relating to a gasoline or flammable liquid burn injury. Occupation was coded using the Australian and New Zealand Standard Classification of Occupations.⁹ The survey was reviewed for content and face validity and pilot tested on 10 hospital employees of comparable age and sex with the intended test population. Burn safety knowledge and experience were measured before and after a targeted multimedia intervention using computer-assisted telephone interviews (CATIs) conducted in each region. Burns unit admission numbers for fuel and flame burns from the IR were obtained for 1 year before and after the intervention. The study received ethics approval from hospital and university review boards.

Media Intervention

Media academics performed the development of the multimedia intervention. This included a series of television commercials (TVCs) depicting the impact of using gasoline on a fire. The TVCs included first-hand perspectives provided by an actual patient and a burn surgeon (Fig. 1). Written consent was obtained and is held for broadcast of the patient image. The TVCs were created and edited by B.R.R. who, before becoming a media academic, was a successful producer and director of TVCs, feature films, and documentaries. TVCs of different lengths were created with slightly different scripts to keep the message “fresh.” The TVCs were 45 seconds, 30 seconds (×2), and 15 seconds. A longer TVC would begin an ad break, and a 15-second TVC would complete an ad break as a reprise, thereby bracketing the ad break. The script for the 45-second TVC is available in the Supplemental Digital Content, <http://links.lww.com/TA/A227>. Eighty-two TVC spots ran across nine consecutive days in the IR, Friday to Saturday, so as to optimize weekend viewing audiences.

Three of five television stations servicing the area, which were able to quarantine the media to the IR, were used. TVC spots were distributed unevenly between stations to match the

TABLE 1. Demographic Characteristics of Survey Respondents

Characteristic	Preintervention		Postintervention		
	IR, n = 405 (%)	CR, n = 415 (%)	IR, n = 406 (%)	CR, n = 411 (%)	IR-12, n = 416 (%)
Age, y, mean (standard deviation)	53 (18)	54 (18)	59 (16)	56 (17)	60 (17)
Occupation					
Technician/trade worker	110 (27.2)	133 (32.0)	82 (20.2)	89 (21.7)	105 (25.2)
Manager	33 (8.1)	37 (6.5)	110 (27.1)	74 (18.0)	58 (13.9)
Professional	43 (10.6)	57 (13.7)	46 (11.3)	54 (13.1)	82 (19.7)
Laborer	35 (8.6)	34 (8.2)	56 (13.8)	59 (14.4)	60 (14.4)
Machinery operator/driver	47 (11.6)	38 (9.2)	47 (11.6)	40 (9.7)	45 (10.8)
Other	137 (33.8)*	116 (28.0)	65 (16.0)	95 (23.1)	66 (15.9)
Employment					
Full-time	172 (42.5)	201 (48.4)	153 (37.7)	197 (47.9)	111 (27)
Part-time	38 (9.4)	47 (11.3)	33 (8.1)	41 (10.0)	39 (9.4)
Unemployed/retired	190 (46.9)	166 (40.0)	220 (54.2)	173 (42.1)	266 (64)
Not stated	5 (1.2)	1 (0.2)	—	—	—

*Not stated (n = 29).

target population of the campaign to that of the station's target demographic. To enable both depth and spread of the message, half of TVCs were broadcast in entertainment programs, a third in news and current affairs programs, and the remainder split between sport and lifestyle programs. More spots were aired on weekends than on weekdays. One of the commercials showed a simulation of gasoline being thrown on a fire. Fear of copycatting and disturbing children lead to a rating of "parental guidance recommended," restricting broadcast to after 6:00 PM. Other linked media components included regular logo appearance in print media, large banners carrying the logo displayed around a major urban center in the IR, and a small number of radio and print articles. The cost of the campaign was AU\$25,000. The CR did not receive any specific intervention.

Surveys

The CATI surveys were administered in the IR and CR before and 3 months after the media intervention. A repeated survey was conducted in the IR 12 months after the media intervention. The postintervention survey contained three additional questions on whether the respondent had seen the media campaign and, if so, whether it was perceived to be effective.

A required sample size of 387 per region per wave was estimated based on 80% power, an α of 0.05, and a 10% change in burn safety knowledge in one region with no change in the other. The number of calls to be made per postcode to achieve a sample of 400 per region was determined from 2006 census data on the number males older than 15 years residing in each postcode. An external company (Callrite Boulder Communications Pty Ltd.) was contracted to undertake the telephone surveys to diminish bias.

Statistical Analysis

Statistical analysis included descriptive and comparative analysis with use of Pearson's χ^2 test. McNemar's test was used for paired comparison of questions relating to knowledge and actual practice. A two-tailed $p < 0.05$ was considered

TABLE 2. Change in Burn Prevention Knowledge (Percentage of Respondents Answering "Yes")

Question/ Region	Preintervention, % (n)	Postintervention, % (n)	Change, %	<i>p</i>
Do you see any danger in using petrol (gasoline) to start a fire?				
IR	90.8 (367/404)	96.6 (392/406)	5.7	0.001
CR	93.5 (388/415)	93.8 (386/411)	0.4	0.80
Can petrol (gasoline) explode?				
IR	92.1 (373/405)	95.6 (388/406)	3.8	0.001
CR	94.9 (394/415)	94.4 (388/411)	-0.5	0.73
Have you seen or heard anything in the last 3 mo about burn prevention?				
IR	10.12 (41/405)	50.96 (207/406)	40.86	<0.001
CR	16.63 (69/415)	19.71 (81/411)	3.08	0.25

*Results at 12 months after intervention and comparison with 3-month post-intervention result (Pearson's χ^2 test).

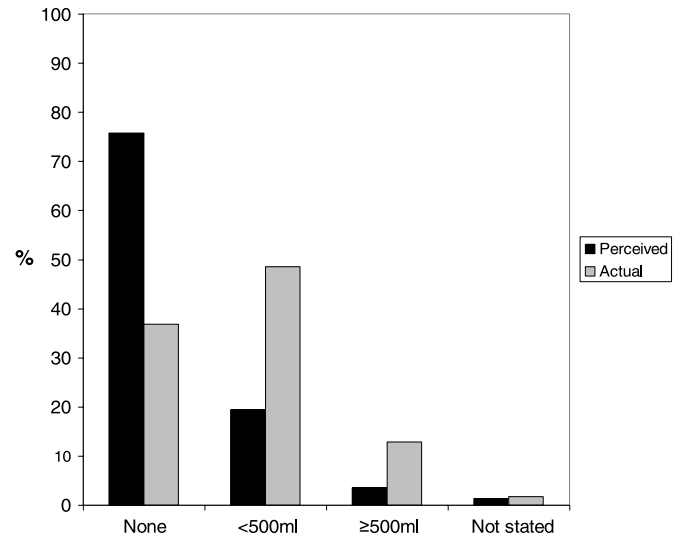


Figure 2. Volume of gasoline perceived as safe to start a fire versus actual volume of gasoline used to start a fire.

statistically significant. Statistical analysis was conducted using IBM SPSS Statistics version 20 (Armonk, NY). A thematic analysis of qualitative feedback on the effectiveness, or otherwise, of the "Don't Be a Flamin' Fool" campaign was performed. One of the authors reviewed the qualitative comments creating a list of themes (codes) developed from the data. Two independent coders reviewed the themes; discrepancies between the three coders were discussed, and final categorizations were agreed upon.

RESULTS

Database Analysis

The 23% of total patient population who were identified to have been burned by a combination of flames and fuel were almost exclusively male (500 of 503), with a median age of 32 years (interquartile range, 21–46 years). Predisposing

TABLE 3. Medium of Exposure to Prevention Message in the Past 3 and 12 Months

Medium	IR (n = 811)	CR (n = 826)	IR (Previous 12 mo) (n = 416)*
	n (%)	n (%)	n (%)
Television	197 (79.4)†	85 (56.7)†	51 (50)†
Newspaper	20 (8.1)	13 (8.7)	16 (15.7)
Work	4 (1.6)	14 (9.3)	10 (9.8)
Radio	7 (2.4)†	6 (3.3)†	4 (3.9)†
First-aid course	3 (1.2)	4 (2.7)	5 (4.9)
Banner/poster	0	8 (5.3)	2 (2.0)
Internet	1 (0.4)	3 (2.0)	1 (1.0)
Other	5 (2.0)	7 (4.7)†	12 (11.8)
Not stated	12 (4.8)	12 (8.0)	1 (1.0)
Total exposed	248	150	102

*Twelve months post the intervention.
†Multiple responses (n = 3).

conditions were identified in 20% of cases with disclosed alcohol and/or drug intoxication (9.5%) predominating.

Survey Demographics

A total of 2,053 surveys were conducted with 405 in the IR and 415 in the CR before the intervention, 406 in the IR and 411 in the CR 3 months after the intervention, and 416 in the IR 12 months after the intervention. Demographics of participants surveyed are listed in Table 1 and are similar between regions as was baseline burn safety knowledge (Table 2).

Baseline History of Burn Injury

Previous burn injury was 11% (91 of 811) in the IR, and 15% (127 of 826) in the CR reported having had a burn from gasoline or other flammable liquid ($p = 0.017$). Of those with a burn injury, there was no difference in the proportion of those who saw a doctor (33% vs. 37%, $p = 0.54$), the proportion of those who were admitted to the hospital (12% vs. 15% $p = 0.54$), or the proportion that involved alcohol (7.7% vs. 10%, $p = 0.52$) between the IR and CR.

Burn Safety Knowledge

Table 2 lists the response to questions on burn safety knowledge before and after the intervention in both regions. There was an increase from 65% to 85% in the percentage of respondents in the IR who thought it was unsafe to start a fire with any volume of gasoline ($p < 0.001$ Pearson's χ^2 test). The discrepancy between perceived safe volume and actual volume used to start a fire is shown in Figure 2 ($p < 0.001$ McNemar's test).

Exposure to a Prevention Message

Twenty-eight percent of the respondents (113 of 406) recalled having seen or heard the "Flamin' Fool" burn prevention campaign in the IR compared with 1.7% of the respondents (7 of 411) in the CR ($p < 0.001$). Table 3 shows

total exposure to a media prevention message in the previous 3 and 12 months. Television exposure was common in both regions, although television exposure was more closely linked to the "Flamin' Fool" campaign in the IR ($p = 0.001$). Of the respondents surveyed at 3 months who had seen or heard the "Flamin' Fool" campaign, 83% (100 of 120) thought it was effective in getting its message across, while 17% (20 of 120) did not perceive it to be effective. Table 4 lists common themes identified for perceived efficacy of the "Flamin' Fool" campaign.

Burn Admissions During the Study Period

Burn unit admissions for this burn injury type in the IR were three for the year before and two for the year after the campaign.

DISCUSSION

The "Don't Be a Flamin' Fool" media intervention was successful in increasing awareness about the dangers of fuel and flames, with a fivefold increase in respondents reporting having seen or heard something about burn safety and 5:1 respondents perceiving the campaign to be efficacious. This result is tempered by the revealed knowledge that 1 in 10 males (13%) had been injured by gasoline and flammable liquid burn injuries in the past. In addition, while 75% thought there was no volume of fuel that was safe to use, almost half (45%) had done so.

It has been argued that use of the word *accident* in relationship to injury is inappropriate given that these events are not chance occurrences and most are predictable and preventable.¹⁰ The cohort of burn patients targeted by our campaign embodies this notion of predictability. Applying a flame to an accelerant to start a fire predictably leads to ignition. When the air-vapor mixture is optimal, an explosion ensues, and subsequent fireball can engulf the instigator and bystanders. These predictable nonaccidents give rise to almost a quarter of new admissions to our burns unit.

The prevalence of the activity and the risk involved is highlighted by our preintervention survey where a history of burn injury caused by fuel and flames was reported by 13% of interviewees. The difference between regions is explainable by the fact that the CR has the highest incidence (15%) and the IR the second highest incidence (11%) for this type of injury in the state. One tenth of these patients required hospital admission. The burden of this injury is substantial. Hospital costs are possibly only a third of the financial burden. Lost income, government benefits, travel, accommodation, medication, and lost employment are costs that the individual and society must carry.² When human costs of pain, suffering, potential disfigurement, and loss of function are added, the cost is enormous. An endless stream of unnecessarily injured people admitted to our burn unit prompted us to attempt to explore the efficacy of a community prevention program.

Prevention Programs

Injury prevention programs that incorporate elements of education (behavior change), engineering/environmental modification, enforcement, and evaluation (the E's of injury

TABLE 4. Thematic Analysis of Perceived Efficacy of the "Flamin' Fool" Campaign

Theme	Frequency
Positive feedback	
Demonstrates personal impact of a burn	27
Demonstrates effect of putting gasoline on fire ("the explosion")	22
Raises awareness	19
Clear message/"to the point"	11
Uses real-life situations/people	10
Visual impact	9
Good concept/important message	9
Links behavior to consequences	7
Will make an impact on outcomes	4
Negative feedback	
Will not impact attitudes/behavior	11
Not enough visual impact	9
Obvious/common-sense message	5
Not long enough or sustained enough	4
Not real enough	3
Scenario too specific	2

prevention) are considered most effective.^{1,11–14} Seat belt and blood alcohol legislation coupled with enforcement and education have saved many from death or injury relating to motor vehicle crashes.^{15,16} McLoughlin^{17,18} has long advocated an emphasis on environmental and legislative change to bring about long-lasting effects on injury rates, pointing to hard wiring of smoke detectors and flame retardant children's sleepwear as examples. She argues that safe behaviors must be practiced by each and every individual and be maintained for a lifetime. The rate of uptake is therefore low and wanes over time.¹⁹ A combined approach using all modalities in Maine resulted in a threefold decrease in hospitalizations and deaths from burns between 1974 and 1998.²⁰ Of the E's of injury prevention, education (with behavior modification) is the most feasible avenue to counter an activity such as misuse of fuel and fire.⁷

The "chip pan fire" campaign in the United Kingdom, which commenced in the 1970s, was a notable success.²¹ A detailed examination of Fire Brigade callouts revealed a 20% decrease in incidence.²² Structural repairs to public housing were sufficiently decreased to cover the cost of the campaign. More recently, a multimedia public awareness campaign in Auckland, New Zealand, promoting appropriate first aid was successful.²³ A much greater proportion of pediatric patients having received a scald burn were given appropriate first aid. The group receiving appropriate first aid was also noted to have a fivefold decrease in surgical care.²³ Not all campaigns are successful, however. A give-away smoke detector program was not found to be cost-effective in inner city London, United Kingdom.²⁴ Similarly, hot tap water scald burns prevention campaigns have failed to decrease the incidence in Milwaukee, Boston, and Brisbane, Australia.^{19,25,26}

Media and Prevention Campaigns

The media has been shown to have a profound influence on the actions of children and adults.^{27,28} Unfortunately, the media often portrays negative messages in relationship to burn safety. A study of published materials (comics, advertisements, articles, and television shows) related to burns or burn-related behavior showed that flames and high-risk behavior for burn injury were commonly portrayed as cool, funny, and without consequence.²⁹

In the design of the TVCs, considerable effort was placed on demonstrating the potential risks and personal impact of a gasoline burn injury, while avoiding images that were too graphic and perhaps aversive to viewers or had the potential to induce copycat behavior. There has been an extensive debate in the literature about the efficacy and ethics of fear appeals in advertising and in health communication.^{30–32} In conceptualizing the TVC, the authors recognized that a message of outright prohibition was unlikely to be effective.³³ An alternate message showing the consequences of adding fuel to fire was created. Through a combination of fear/arousal, authority, authenticity, and empathy, we hoped that the necessary emotional connection to the viewer would be made.^{34–37} Feedback from respondents suggests a good balance was achieved.

Media campaigns of this type face the challenge of coverage and sustainability with studies showing that cyclical

repetition of a refreshed message is necessary to maintain the effect.^{38–40} Certainly, the effect of our campaign waned over time with message awareness reverting back to baseline at 12 months.

A new improved version of the TVC would include vision of safer ways to start a fire with an accelerant. This would involve a Fire Service Officer (an authority figure) and a display of alternate techniques such as no flammable liquid, minimal volume, and an alternate accelerant such as diesel fuel. Television was the medium by which the target population was most often exposed to a burn prevention message; however, message tie-in opportunities via work, health care institutions and radio, as well as electronic and print media deserve consideration.

Despite evidence of increased burn safety knowledge by males in the IR, no significant change in burn unit admissions was noted from the IR following the campaign. This analysis was limited by the low event rate, which was limited to patients with a burn injury severe enough to require transfer to a tertiary care center. Display of these combined messages throughout our referral area repeated with refreshed media at some point between 3 and 12 months would be necessary to accurately assess the effect on injury rates. In addition, all burn injury presentations to public health facilities would need to be temporally monitored to measure the impact of the message on at-risk behaviors.

In conclusion, this study demonstrated a positive increase in burn safety knowledge, assessed at 3 months, associated with delivery of a targeted burn prevention message in a defined geographical area. No change was observed in the CR. Although only one of four respondents in the IR recalled seeing the "Flamin' Fool" campaign, there was overwhelming positive feedback on the perceived efficacy of the message. Message awareness waned over time. The message could be improved by demonstrating safer techniques as well as the disastrous consequences of fuel and fire. Broadcast of the campaign throughout our referral area during a prolonged time would test its efficacy in decreasing rates of this injury.

Limitations of the Study

The intervention was not strictly applied in random fashion but "conveniently" applied to the region that would "leak" the media message the least. The study therefore lies in the realm between experimental and quasiexperimental. Spread of the media message to the CR had to have occurred to some extent owing to mobility of the population. History of burn injury was different between regions. This is not surprising because the CR was known to have the highest incidence in the state. Patients surveyed were on average in their 5th and 6th decades of life, and the patients identified from the database were in their 4th decade.

AUTHORSHIP

All authors designed the study. J.M.H. and B.R.R. designed the media intervention. J.M.D. conducted the statistical analysis. J.M.D., J.D.P. and J.M.H. undertook the thematic analysis. J.M.D., J.D.P., and M.J.M., drafted the initial manuscript. All authors reviewed and amended the manuscript and approved the final content.

ACKNOWLEDGMENTS

We thank Queensland Fire and Rescue Service, Queensland Police Service, the Salvation Army, colleagues and family for helping create the commercials. We thank Philip Allen (Callrite Boulder Communications Pty Ltd.) and Teresa Matthews who provided assistance with the CATI surveys and Catherine Hurn for the input into the study design. We thank our patient for sharing his experience in the TVCs.

DISCLOSURE

This study was supported by grants from the Statewide Clinical Trauma Network (Queensland Health) and Royal Brisbane and Women's Hospital Private Practice Trust Fund.

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