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'Call Fast, Call 911': A Direct Mail Campaign to Reduce Patient Delay in Acute Myocardial Infarction

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ABSTRACT

Objectives. A 10-month direct mail campaign was implemented to increase use of emergency medical services via 911 calls and to reduce prehospital delay for individuals experiencing acute myocardial infarction symptoms.

Methods. This prospective, randomized, controlled trial involved three intervention groups (receiving brochures with informational, emotional, or social messages) and a control group.

Results. Intervention effects were not observed except for individuals who had a history of acute myocardial infarction and who were discharged with a diagnosis of acute myocardial infarction; their 911 use was meaningfully higher in each intervention group than in the control group.

Conclusions. The mailings affected only the individuals at greatest risk. (*Am J Public Health.* 1997;87: 1705–1709)

Introduction

Acute myocardial infarction remains the leading cause of mortality in the United States, accounting for more than 400 000 deaths annually.[1] Thrombolytic therapy can alter the course of acute myocardial infarction, reducing morbidity and mortality[2–4]; however, its efficacy decreases with increasing time between symptom onset and treatment.[2,5–7]

Patient delays account for most of the delay in receiving thrombolytic therapy.[8,9] Although medical, demographic, and situational factors have been related to prehospital delay,[10,11] delay is most frequently associated with ambiguity of symptoms[8,12] and symptom severity.[12] Quick use of emergency medical services for acute myocardial infarction symptoms can dramatically shorten overall prehospital delay time.[13,14]

In 1986, we conducted a brief mass media public education campaign in King County, Washington, designed to reduce the time between onset of acute myocardial infarction symptoms and initiation of medical care.[15] The campaign was successful in increasing awareness of heart attack issues but not in altering patient behavior.

The current campaign, "Call Fast, Call 911," had the same objective but a different focus. This time, a brief mass media campaign was followed by a longer term direct mail campaign.

Methods

Intervention

A direct mail campaign is a selective, personal way of reaching target audiences with specific messages.[16,17] In "Call Fast, Call 911," the message content drew upon the theoretical model of Safer and colleagues.[18] Safer divided delay into three successive stages: the time one first notices a symptom to the time one decides that one is ill ("appraisal delay"), to the time one decides professional care is required ("illness delay"), to the time one arrives at the clinic or emergency department ("utilization delay"). Because patients with acute myocardial infarction typically take discrete, cognitive steps prior to seeking treatment for their symptoms, the model seemed to fit well.[19]

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Our messages were designed to expedite the patient's cognitive processes. We addressed appraisal delay by providing information about the signs and symptoms of acute myocardial infarction; we addressed illness delay by providing information about the importance of fast action; and we addressed utilization delay by eliminating uncertainty about the curability of acute myocardial infarction and stressing the importance of emergency medical services in diagnosis and early treatment. Formative research for message content included focus group discussions with persons with heart disease (to investigate delay time and emergency medical service use issues) and pretesting of messages.

We tested three different types of brochures. The informational brochure provided detailed information on acute myocardial infarction symptoms and treatment in a neutral tone. The emotional message was designed to reduce the emotional responses of fear, embarrassment, and so forth that could prevent or delay appropriate health behavior. The social appeal brochure encouraged decision-making responsibility among family members rather than on the part of the patient.

"Call Fast, Call 911" began with a 7-week (mid-October through November 1991) mass media "sensitization" campaign using television and radio. During this campaign,[20] 911 calls for chest pain in King County rose 30% above the precampaign average. For 2 months after the campaign, 911 calls remained consistently about 17% above the average, but this was confounded with the direct mail campaign, which began in mid-December 1991. Effects of the mass media campaign have been described elsewhere.[20]

The direct mail campaign targeted households in King County in which the head of household was 50 years of age or older. A list of 65% such households[21] was obtained from a commercial direct mail address firm.

Study Design

The study involved a prospective, randomized, controlled design. We used the mailing list to randomize individuals, and we linked the list to a registry accumulating coronary care unit admissions from all 16 King County hospitals having such units.

We randomized households on the mailing list, presorted by zip code for equal representation across King County, into four groups. Each of three intervention groups received one type of brochure. The control group did not receive brochures. The intervention involved the mailing of six (somewhat different) brochures, one every 2 months. The first mailing was on December 14, 1991, and event collection began 3 days later. Event collection ended on December 31, 1993, providing 2 months of data collection after each mailing and a year of follow-up.

Events (one per household) referred to patients in our coronary care unit admissions registry whose addresses linked to an address on the mailing list. The case definition of an event was admission to the coronary care unit with a diagnosis on the unit log of "rule out myocardial infarction" (including acute myocardial infarction, angina, chest pain, cardiac arrest before arrival at hospital, and congestive heart failure). We excluded patients who were admitted for scheduled procedures or who developed acute myocardial infarction symptoms after hospital admission.

The registry contained patient data abstracted from hospital records. Two outcome measures were abstracted from the medical chart: method of transport (emergency vehicle [911] vs self-transport [not 911]) and delay time from acute symptom onset to emergency department arrival. For time of symptom onset, abstractors distinguished (1) clock time (date, time), (2) time interval prior to emergency department arrival (days, hours, minutes), and (3) other information accurate within 1 day (e.g., "symptom onset after dinner"). Information from the third category was insufficient for accurate quantification and was considered as "missing" for the main analysis.

The distribution of delay time was skewed, with a median of approximately 2.5 hours and a maximum beyond 2 days. We used the transformation ln(ln [delay time]), approximately normally distributed, to test mean differences between groups. (Testing median differences was impractical because delay time data clustered at 0.5- and 1-hour multiples.)

Hypotheses

We tested two hypotheses: Among patients admitted to the coronary care unit during the study period (for the intervention groups relative to the control group), household mailings would (1) increase the percentage of patients calling 911 and (2) decrease patients' delay time. We considered an increase of 10 percentage points in the rate of 911 calls and a decrease of 30 minutes in delay time to be meaningful intervention effects.

We carried out statistical analyses with SPSS,[22] using z tests for differences between proportions, t tests for differences between means, and chi-squared tests to compare distributions. To maintain statistical significance at an alpha level of .05 for each outcome measure, we tested the difference between each intervention group and the control group at $P < .017$ (.05/3).[23]

Results

A total of 5447 patients were identified as events in this study. For persons 50 years of age or older, our estimated linkage rate linking coronary care unit admissions to the list of households was 87%. Distributions of population characteristics among the three intervention and control groups were very similar, indicating successful randomization (Table 1).

Because of small numbers in the African-American and Asian/Pacific Islander subgroups, as well as certain medical insurance categories (Table 1), analyses were restricted to the relatively homogeneous group of patients (90% of events) who were White and who reported having private medical insurance or Medicare or being a member of a health maintenance organization (HMO).

Percentage of Patients Calling 911

Temporal variation in intervention effects over the 2-year period was explored through a variety of statistical approaches, but no variation was observed. Therefore, we present summary results collapsing data over the 2 years.

Although the percentage of persons calling 911 in each of the three intervention groups (informational, emotional, social) was somewhat higher than that in the control group, differences were not significant (two-sided $P < .2$, $P < .06$, and $P < .6$, respectively; Table 2). We controlled for covariates, using logistic regression[24]; intervention effects remained nonsignificant. With approximately 1150 cases per group, our power to detect a change of 10 percentage points in 911 calls between each intervention group and the control group was more than 99% (two-sided z test, $\alpha = .05/3$).[25]

Exploratory (post hoc) analyses examined the possible role of two medical variables, prior history of and discharge

diagnosis of acute myocardial infarction, each highly associated with emergency services calls. Four subgroups were formed combining the two variables. In one subgroup, coronary care unit patients who had a prior history of acute myocardial infarction and whose discharge diagnosis was acute myocardial infarction, effects were meaningfully large for each intervention group (11, 19, and 18 percentage points for the informational, emotional, and social groups, respectively) (Table 2).

Delay Time from Acute Symptom Onset to Emergency Department Arrival

Quantifiable delay time information (clock time or time interval data) was present in 69% of events; 22% had information accurate within a 1-day interval, and 9% were missing data.

For patients having quantifiable delay time data (Table 3), *t* tests comparing mean delay time between each intervention group and the control group were not significant (two-sided $P < .4$, $P < .7$, and $P > .9$ for the informational, emotional, and social groups, respectively). With approximately 800 cases per group of quantifiable delay time data, the power to detect a 30-minute change between each intervention group and the control group was 70% (two-sided *t* test, $\alpha = .05/3$).[26]

Comparing overall distributions of delay time and stratifying delay time into 1-day intervals (including data accurate within 1 day) provided no new information. Post hoc exploratory analyses within the four previously noted subgroups were also not informative.

TABLE 1—Distribution of Population Characteristics of Patients (n = 5447): Three Intervention Groups Combined (Informational, Social, Emotional Brochures) and Control Group

Covariate	Intervention Groups (n = 4101), %	Control Group (n = 1343), %
Age, y		
20–49	3.0	3.3
50–59	9.0	9.9
60–69	28.4	28.4
70–79	36.9	36.7
80+	22.7	21.8
Male gender	54.9	55.4
Race		
White	92.3	91.6
African American	4.1	5.2
Asian/Pacific Islander	3.2	2.9
Native American/Alaskan	0.1	0.0
Hispanic	0.4	0.2
Marital status		
Married	65.0	65.3
Single	8.7	8.1
Divorced/widowed/separated	26.3	26.5
Income, $		
<20 000	35.4	31.0
20 000–39 999	21.9	22.9
40 000–49 999	20.2	19.2
≥50 000	22.6	26.9
Medical insurance		
Private/group/HMO	23.2	22.8
Medicare	73.8	73.6
Medicaid	1.8	2.1
None	1.1	1.4
AMI[b]	26.2	25.8
Prior history of AMI[b]	29.1	28.9
New onset/unstable angina[a,b]	20.8	21.7
Prior history of angina[b]	41.0	39.4

Note. AMI = acute myocardial infarction. Mean ages were 71.3 and 71.1 years in the intervention and control groups, respectively. Three patients were excluded because their medical charts could not be located. All covariate data were abstracted from medical charts, except for income, which was derived from the mailing list. Percentages of missing data for covariates were as follows: marital status, 2%; medical insurance, 1%; other variables, <1%.

[a]Diagnosis at discharge.

[b]Dichotomous variable (characteristic present).

Discussion

The "Call Fast, Call 911" campaign was a randomized trial designed to decrease prehospital delay time and increase use of emergency medical services in individuals admitted to a coronary care unit with acute myocardial infarction symptoms. Although 911 use in each of the three intervention groups was greater than that of the control group, this increase was neither meaningful in magnitude nor statistically significant. The intervention had no impact on prehospital delay time.

Exploratory subgroup analysis revealed that, for individuals with a prior history of and a discharge diagnosis of acute myocardial infarction, 911 use was meaningfully higher in each intervention group (informational, emotional, social) than in the control group. Perhaps the intervention was effective in people for whom the message was most relevant. Persons with a prior history of acute myocardial infarction may be more motivated to remember messages, and, if they experience another such event, they may be better able to recognize the symptoms.

Health and other organizations highlight acute myocardial infarction and 911 issues at irregular intervals with variable impact; the campaign occurred within this context. Also, there is no charge for emergency services use in King County, and such services already evidence a relatively high rate of use. These two factors might explain the absence of a large increase in overall 911 use. Reducing delay time may require more than a direct mail campaign. The Swedish "Heart-Pain-900000" campaign, disseminating messages through newspapers, radio, buses, hospitals, pharmacies, post offices, and banks, did decrease prehospital delay time for acute myocardial infarction patients.[27]

Nonrandomized patients were similar to randomized patients, except the former tended to be younger. This was expected given the age structure of the mailing list used for randomization. Our findings pertain to the 90% of patients who were White and who had private medical insurance or Medicare or were

TABLE 2—Percentage of Patients Calling 911 (n = 4704): Stratification by Prior History of Acute Myocardial Infarction (AMI) and by AMI Discharge Diagnosis

Group	Prior History of AMI	AMI Discharge Diagnosis	Called 911, No. (%)	Intervention − Control	
				Difference, %	P^a
Main analysis[b]					
Informational			63.3 (1190)	2.9	.2
Emotional			64.2 (1166)	3.8	.06
Social			61.8 (1099)	1.4	.6
Control			60.4 (1112)		
Exploratory analysis of subgroups[c]					
Informational	No	No	58.6 (616)	2.1	.5
Emotional			58.3 (592)	1.8	.6
Social			55.8 (545)	−0.7	.9
Control			56.5 (554)		
Informational	No	Yes	66.9 (236)	2.1	.7
Emotional			66.1 (218)	1.3	.8
Social			67.4 (227)	2.6	.6
Control			64.8 (227)		
Informational	Yes	No	68.4 (266)	3.8	.4
Emotional			70.7 (273)	6.1	.2
Social			64.7 (258)	0.1	.9
Control			64.6 (257)		
Informational	Yes	Yes	72.2 (72)	10.6	.2
Emotional			80.5 (82)	18.9	.01
Social			79.4 (68)	17.8	.03
Control			61.6 (73)		

Note. Three percent of events had missing data for the outcome variable. Three events had missing data for prior history of AMI.
[a]Two-sided *t* test of difference in proportions comparing each intervention group with the control group.
[b]Null hypothesis tested at $\alpha = .05/3 = .017$. Bounds for the 98.3% confidence interval of the control group (911 use: 60.4%) were 56.9% and 63.9%.
[c]Two-sided *P* values presented for descriptive value only.[29,30]

TABLE 3—Delay Time from Acute Symptom Onset to Emergency Department Arrival (n = 4704): Comparison of Three Intervention Groups (Informational, Emotional, and Social Brochures) with Control Group

Group	Delay Time, min		ln (ln [Delay Time])			
	Median	Mean[a,b]	Mean	SD	n	$P^{b,c}$
Informational	160	183	1.6509	0.2626	894	.4
Emotional	150	167	1.6331	0.2766	795	.7
Social	140	173	1.6401	0.2738	780	>.9
Control	146	173	1.6391	0.2559	790	. . .

Note. Excluded were 31% of events that had information accurate within a 1-day interval or were missing data.
[a]Mean of transformed variable ln (ln [delay time]), converted to minutes: exp (exp [mean delay time]).
[b]Null hypothesis tested at $\alpha = .05/3 = .017$. Bounds for the 98.3% confidence interval of the control group (mean = 173 minutes) were 154 minutes and 193 minutes.
[c]Two-sided *t* test for difference in means comparing each intervention group with the control group.

members of an HMO. The results are not necessarily generalizable to the rest of the population.

In conclusion, the mailings did not reduce the time before persons with acute myocardial infarction symptoms sought medical care or increase use of emergency medical services by such persons, except for those at greatest risk. □

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Unintended Pregnancy and Breast-Feeding Behavior

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ABSTRACT

Objectives. This study assessed the effect of unintended pregnancy on breast-feeding behavior.

Methods. All women delivering a live birth between January 1, 1995, and July 31, 1996 (n = 33 735), in the 15-county central New York region were asked whether they had intended to become pregnant and their breast-feeding plans.

Results. Women with mistimed pregnancies, and pregnancies that were not wanted were significantly less likely to breast-feed than were women whose pregnancies were planned. After adjustment for confounding variables and contraindications for breast-feeding, the odds ratios of not breast-feeding remained significant.

Conclusions. Promoting breast-feeding among women with unintended pregnancies is important to improve health status. (*Am J Public Health.* 1997;87:1709–1711)

Introduction

Breast-feeding has been shown to have numerous health benefits for both women and their infants.[1] Despite the documented benefits of breast-feeding, rates of breast-feeding continue to be low among certain population subgroups.[1,2] Effective breast-feeding promotion strategies need to account for special interventions designed to address the needs of these selected subpopulations.[3] To date, no study has examined the effect of unintended pregnancy on breast-feeding behavior.

A woman's pregnancy intentions have been shown to be associated with numerous health-related behaviors and birth outcomes.[4] For women whose pregnancies were not planned, therefore, breast-feeding is particularly important. First, breast milk may provide protection from morbidity for which unplanned infants are at risk. Second, the act of breast-feeding may stimulate mother–infant bonding and subsequently help the mother and infant overcome the difficulties associated with parenting among women with unplanned pregnancies. We hypothesized that recently parturient women whose pregnancies were mistimed or not wanted would be less likely to breast-feed their infants.

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