Awareness of Heart Attack Symptoms and Lifesaving Actions Among New York City Area Residents

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ABSTRACT *The American Heart Association has a national network of community-based programs designed to reduce response times to cardiac emergencies by improving access to automatic external defibrillators (AEDs) among laypersons. Success of these Operation Heartbeat programs depends in part on the public's knowledge of the warning signs of a myocardial infarction (MI) and appropriate response to cardiac arrest victims. In May 2000, a 7-minute telephone survey was administered to a random sample of adults residing within the American Heart Association affiliate territories of New York, New Jersey, and Connecticut to determine the knowledge of MI symptoms, confidence in cardiopulmonary resuscitation (CPR) use, and the awareness of AEDs. Of the respondents, 60% were women (n=1,128), 83% were Caucasians (n=1,558), 15.2% were non-whites (African American, Asian, or Hispanic), and 38.5% had at least a college degree (n=724). Women were significantly more likely than men to know that sex differences exist in the warning signs for an MI (63% vs. 30.7%, respectively; $P < .001$). Whites had above-average confidence in MI recognition compared with non-whites (39.2% vs. 27.4%, respectively; $P < .001$) and were more cognizant of the public availability of AEDs (54.5% vs. 33.2%, respectively; $P < .001$). Our findings suggest that racial/ethnic and sex disparities exist in the awareness of AEDs and in the knowledge of atypical MI symptoms in women, respectively. Innovative CPR outreach programs might be needed in New York area communities to increase CPR training among all adults, to increase AED awareness in vulnerable populations, and to improve knowledge and confidence in the recognition of acute MI symptoms.*

KEYWORDS *Cardiac arrest, CPR, Defibrillators, Disparities, Race.*

INTRODUCTION

About 700,000 Americans die each year because of coronary heart disease, and half of these are sudden or unexpected.¹⁻³ Sudden death is often the end result of cardiac arrest,

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which is frequently witnessed by a bystander.⁴⁻⁶ Therefore, public awareness of and willingness to perform lifesaving actions, such as basic life support, are critical. Lifesaving actions begin with the initiation of the chain of survival.⁷⁻⁹ The chain consists of four links: early access to emergency medical services (e.g., calling 911), early initiation of basic cardiopulmonary resuscitation (CPR), early defibrillation, and early advanced care.

To further strengthen the chain of survival and reduce delay times, the American Heart Association's Automatic External Defibrillation Task Force convened in 1995 to raise public awareness of lifesaving actions and promote the effective use of automatic external defibrillators (AEDs) by laypersons.^{10,11} These efforts culminated in a large-scale prospective, multicenter, randomized clinical trial known as public access defibrillation.¹² Public access defibrillation assessed whether volunteer, non-medical responders can improve survival from out-of-hospital cardiac arrest by using AED. Preliminary data imply that laypersons can effectively use AEDs and that widening access to the device can save thousands of lives.¹³

Because the success of public access defibrillation initiatives is partially dependent on laypersons' willingness to perform CPR, the American Heart Association created a community-based initiative called Operation Heartbeat.¹⁴ The main purpose of Operation Heartbeat was to encourage local American Heart Association chapters to develop and adopt unique community programs to raise public awareness of heart attack symptoms, AEDs, and appropriate lifesaving actions. To achieve these goals, we designed a survey to assess community awareness of the early warning signs and appropriate responses to heart attack symptoms and cardiac arrest. Information gleaned from the survey would then be used to tailor educational interventions to strengthen the chain of survival. This article describes the results of that survey.

METHODS

Study Population

In February 2000, the Acute Care Task Force of the local Heritage Affiliate collaborated with the professional research and survey firm, Tripp, Umbach & Associates (Pittsburgh, Pennsylvania), to design the Chain of Survival Phone Survey. The source population to be surveyed was people living in the Heritage Affiliate metropolitan service areas: Hartford County, Connecticut; Manhattan and Suffolk Counties, New York; Camden and Bergen/Passaic Counties, New Jersey. These areas were chosen because they allowed communities from all three states within the Heritage Affiliate to participate in the project, had an active staff and volunteer base to allow the implementation of Operation Heartbeat, and were part of the top 100 Metropolitan Statistical Areas.¹⁵ Only people 18 years of age or older were eligible for inclusion. In May 2000, a list of 7,500 potentially eligible people living in the aforementioned areas was obtained from a consumer marketing firm. Trained interviewers from Tripp, Umbach & Associates randomly contacted residents for participation in the survey. A minimum of seven attempts to contact were made; the exact number of numbers dialed was not available. There were 3,800 successful contacts, and 50% agreed to participate ($N=1,907$ completed interviews). Owing to missing or incomplete data for some questions, analyses are reported for 1,880 respondents, except for race/ethnicity ($n=1,855$).

Survey Instrument

The 7-minute telephone survey consisted of 16 questions with a mix of Likert scale and open-ended questions. The first set of questions was designed to determine the

respondents' confidence in recognizing the warning symptoms of a heart attack and whether they believed heart attack symptoms were different in men and women. Open-ended questions were used to elicit responses for heart attack symptoms and actions to take if they witnessed a cardiac arrest. The second set of questions asked whether the respondents were ever trained to perform CPR, the length of time since last training, and their level of confidence in performing CPR if they believe someone was having a cardiac arrest. To determine the levels of confidence, we used a five-point Likert scale (1, "least confident"; 3, "average"; 5, "most confident"). Respondents were also asked whether they were aware of the publicly available lifesaving device called AEDs and whether they were ever trained in its use. The last section of the survey asked demographic information such as age, sex, race/ethnicity, level of education, and major source of information.

Data Analysis

Frequency outputs were available from the survey company and were used to perform additional analyses by using EPISTAT 1989. Descriptive statistics were used to describe the overall population. Age was dichotomized because descriptive statistics revealed a bimodal distribution. Because of the paucity of Asians ($n=40$), they were combined with the category of non-whites along with African Americans ($n=153$) and Hispanics ($n=95$). Responses to Likert-scale questions on confidence levels were collapsed and analyzed categorically by chi-square tests, with 4 or 5 indicating above-average confidence and 1–3 indicating average or less confidence. Pearson's chi-square tests were also used to examine differences in heart attack awareness by the demographic characteristics of the respondents.

RESULTS

Based on the number of actual phone contacts, the crude response rate was 50% (1,880/3,800). The mean age of the respondents was 49.8 (SD=17.5) years. Most respondents were females (60%) and white (82.9%). Although 41.7% had been trained in CPR, 55% had not been recertified in over 2 years (Table 1).

The respondents were fairly knowledgeable about heart attack symptoms. When asked to give three common symptoms of a heart attack, approximately two-thirds indicated chest pain and difficulty breathing among the three (Table 2). When asked what is the first thing they should do if they thought someone was experiencing a heart attack, almost 70% correctly responded that they would call 911.

Overall, there were low levels of confidence in myocardial infarction (MI) recognition, despite the respondents being able to list the major warning signs of an MI (Table 3). Whites had above-average confidence more often than non-whites, as did people with a college degree compared with those without a degree ($P<.001$). Although no sex differences were found in confidence levels regarding MI recognition, additional analyses revealed that women were significantly more likely than men to know that sex differences exist in the warning signs for an MI (63% vs. 30.7%, respectively; $P<.001$).

There were no significant sex or race/ethnicity differences in CPR training status. However, when we examined CPR training status by time, significant differences were found by sex and race/ethnicity. Among those ever trained in CPR ($n=784$), 55.4% had not been recertified in over 2 years. Women and whites had gone more than 2 years since CPR recertification, more often than men and non-whites, respectively

TABLE 1. Demographic characteristics of the study population

Characteristics (N = 1,880)	N (%)
≤49 years	997 (52.0)
≥50 years	883 (48.0)
Female	1,129 (60.0)
Race/ethnicity*	1,855 (98.7)
White	1,558 (82.9)
African American	153 (8.1)
Asian	40 (2.0)
Hispanic	95 (5.1)
Other	9 (0.6)
Unknown	25 (1.3)
College degree or higher	724 (38.5)
Cardiopulmonary resuscitation trained†	784 (41.7)
Affiliate areas surveyed	
Bergen/Passaic, New Jersey	385 (20.4)
Camden, New Jersey	369 (19.6)
Hartford, Connecticut	389 (20.7)
Manhattan, New York	350 (18.6)
Suffolk, New York	387 (20.6)
Major source of information	
Television	1,066 (56.7)
Print media	526 (28.0)
Radio	128 (6.8)
Internet	118 (6.3)
Other	40 (2.1)

*Owing to missing data on race/ethnicity, N = 1,855. Other includes Native American (n = 1), Indian (n = 5), Arab (n = 2), and mixed (n = 2). Others were excluded because of the paucity of complete data on these respondents.

†Cardiopulmonary resuscitation represents ever trained in the technique.

TABLE 2. Respondents' knowledge of myocardial infarction (MI) warning signs and immediate actions to take

Variable	N (%)
Myocardial infarction warning signs*	
Chest pressure/tightness/pain/heaviness	1,254 (66.7)
Pain spreading from chest to shoulder	1,314 (69.9)
Difficulty in breathing	1,182 (62.9)
Chest discomfort with shortness of breath/fainting/sweating	832 (44.3)
Stomach or abdominal pain	235 (12.5)
Sweating	118 (6.3)
First response/action, if witnessed myocardial infarction†	
Call 911	1,307 (69.5)
Give aspirin	201 (10.7)
Call local ambulance	124 (6.6)
Lay person down	98 (5.2)

*All responses were unprompted, and only the first three responses were recorded. Variables listed, only if at least 5% or more indicated respective response.

†Only the first response was recorded.

TABLE 3. Cardiac training and awareness according to demographic variables

Variable	Confidence in myocardial infarction recognition [N = 706 (37.5%)]		Cardiopulmonary resuscitation trained [N = 784 (41.7%)]*		Automatic external defibrillator aware [N = 962 (51.2%)]	
	n (%)	P	n (%)	P	n (%)	P
Age						
≤49 years (N = 997)	377 (37.8)	.84	514 (51.5)	<.001	501 (50.2)	.42
≥50 years (N = 883)	329 (37.5)		270 (30.6)		461 (52.2)	
Sex						
Male (N = 751)	275 (36.6)	.53	301 (40.1)	.26	376 (50.1)	.46
Female (N = 1,129)	431 (38.1)		483 (42.8)		586 (51.9)	
Race/ethnicity						
Non-white (N = 288)	79 (27.4)	<.001	115 (39.9)	.70	96 (33.3)	<.001
White (N = 1,558)	611 (39.2)		654 (41.9)		848 (54.4)	
Education						
College degree (N = 724)	457 (63.1)	<.0001	391 (54.0)	<.001	431 (59.5)	<.001
No degree (N = 1,156)	249 (21.5)		393 (34.0)		531 (45.9)	

*Confidence determined by response of above-average confidence (4 or 5) versus average confidence or less (1–3) on a five-point Likert scale. N = 706 represents only those who had above-average confidence in the recognition of a heart attack or myocardial infarction (MI). White versus non-White, N = 1,846, owing to missing data. N = 784 for cardiopulmonary resuscitation represent people *ever* trained in the technique.

[57.6% (n=250) vs. 42.4% (n=184), $P=.012$ for sex; 57.5% (n=374) vs. 43.1% (n=50), $P=.005$ for race/ethnicity].

Awareness of the public availability of AEDs was significantly higher among whites and people with a college degree ($P<.001$). When AED awareness was stratified by CPR training status, 63.4% of people trained in CPR were aware of the public availability of the device, compared with 42.4% of those who were never CPR trained ($P<.001$). An extremely low number of respondents had AED training (4.6%; n=87). However, almost all of these people were CPR trained (96.6%).

DISCUSSION

Although most of the respondents could list appropriate first actions to take if witnessing a heart attack, the main findings from this study are that most respondents were not trained in CPR and lack confidence in their ability to recognize a heart attack. Further, men did not know that warning signs for an MI can be different in women, and confidence levels in MI recognition were significantly lower among people less educated and non-whites. Non-whites (Asians, African Americans, and Hispanics) were more likely to be recertified in CPR, yet they were not as aware of the public availability of AEDs as whites. These results imply that strengthening the chain of survival in New York area communities will require increasing CPR training rates, especially in populations most likely to witness a cardiac arrest, such as older adults; lessening racial/ethnic disparities in MI recognition and knowledge of AED; and educating men of the atypical symptoms of MI in women. Tailored CPR training programs might be needed to achieve these goals.

The finding that most adults had knowledge of appropriate first actions to take when someone was having a heart attack is laudable. However, the low rate of CPR

training is troublesome because strengthening the chain of survival will require large increases in the number of persons trained in CPR and AED administration.¹³ It is particularly important that older adults be targeted for training because this population is at a higher risk of sudden death and most likely to witness a cardiac arrest of a family member or spouse in the home.^{16–18} The low rates of CPR training might be improved by recruiting adults with television and print media advertisements because our survey indicates that most respondents receive their information from these sources. Community centers and churches could be used to foster CPR training and recertification among adults as well as provide venues for the discussion of psychosocial factors that impede implementing CPR during a cardiac arrest.^{19–21}

It has been previously reported that the overall knowledge of the MI warning signs is suboptimal and is based on preconceived ideas of symptoms.^{22–24} Thus, it is not surprising that we found low levels of confidence levels in MI recognition among the respondents. Lower confidence levels might be associated with perceptions regarding one's ability to effectively intervene during a cardiac emergency or may be related to sociocultural factors because Asians, African Americans, Hispanics, and people without a college degree had lower confidence levels.^{20,25,26} Nonetheless, all laypersons must learn and understand that prompt recognition of and intervention during a heart attack can save lives by minimizing delays in treatment.^{22,27,28}

Taken together, the increased use of a modified or combined CPR/AED program could improve the chain of survival in communities by increasing the overall number of people trained in CPR, thereby improving the frequency of CPR during cardiac arrest and strengthening a critical link in the chain.^{29–32} Furthermore, a modified or combined CPR/AED program could be designed to implement strategies to improve the laypersons' confidence in the recognition of acute MI and actions to take during cardiac emergencies. In addition, a combined program could raise the awareness of AED devices among vulnerable populations, such as African Americans.^{19,20} Targeting minorities, the underserved, and communities where older adults reside will provide an appropriate venue to educate the lay public regarding atypical symptoms of an acute MI in women, Asians, and African Americans.^{28,33,34} It is important that such initiatives aggressively target African Americans because they are a population known to experience higher rates of death and disability due to coronary disease than Whites, Hispanics, and Asians.^{35–38} Widespread efforts to increase CPR training in New York City would be timely because legislation has been passed to place AEDs in the public schools.^{39,40} Without addressing the special needs of laypersons in our communities, weak links in the chain of survival will persist.

LIMITATIONS

This study has some limitations. First, there was a low response rate and data were not available to compare respondents with nonrespondents. Based on national surveys, it is unlikely that nonrespondents or refusers were more likely to be CPR trained or have higher confidence levels in MI recognition.^{22,41} Second, the survey was completed in 2000, and awareness of AED has probably increased since then, and confidence in MI recognition and CPR administration may have as well. Further, differences in AED awareness might be due to local availability of the device, which was not studied here. Third, our results are based on self-report, and the results obtained might be inflated by the respondents' desire to give the most appropriate answer.⁴² Thus, actual confidence levels and CPR training status might be even lower. Yet, even if confidence in MI recognition, CPR training, or AED

awareness are lower than reported here, this would further substantiate the need for nontraditional CPR training programs. Fourth, respondents may not be representative of the diversity in the overall New York area population because there was a lower proportion of Hispanics surveyed in Manhattan compared with their proportion based on census data.⁴³ In future surveys, Hispanics might require over-sampling to ensure that they are adequately represented. Last, data were provided in descriptive formats, and only bivariate analyses could be carried out by using statistical software, such as EPISTAT. Thus, race/ethnicity disparities in MI recognition and AED awareness might be attenuated in multivariate analyses. Nonetheless, the sample size was robust and our results are in accord with those of others.^{22,44}

CONCLUSIONS

In summary, we have found that most adults surveyed had low confidence in their ability to recognize heart attack symptoms and low sustained rates of CPR training. Moreover, their knowledge of the public availability of AEDs was suboptimal. This article extends the finding of earlier studies by examining confidence in CPR administration and MI recognition in a diverse population in the northeast. Results of this survey can assist in the expansion of nontraditional or tailored CPR/AED outreach programs aimed at strengthening the links in the chain of survival in all communities. Such tailored programs must be culturally sensitive and provide a venue to explore factors that impede prompt initiation of the chain. To effectively lessen death and disability due to cardiovascular disease, laypersons and health care advocates must work in concert to achieve this enormous undertaking.

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