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Cardiac Arrest and Cardiopulmonary Resuscitation (CPR) Knowledge at an Academic Research Organization in Durham, NC

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Abstract

Objectives: Bystander cardiopulmonary resuscitation (CPR) is critical in the chain of survival for out-of-hospital cardiac arrest. In the United States, overall survival remains 7%–8%. Public knowledge of cardiac arrest and CPR skills is not well described.

Methods: We implemented a CPR awareness/training program at a large academic research organization. At baseline, employees completed an online survey to gauge confidence with CPR and knowledge of cardiac arrest and CPR skills. The program included expert lectures, a documentary of a patient's cardiac arrest, and a video demonstration of hands-only CPR. Afterward, trained volunteer instructors evaluated the practical CPR skills of participants. An online post-program survey followed.

Results: In total, 173 employees completed the pre-program survey; 67.6% had been previously trained in CPR, 59.8% of whom were trained ≥5 years previously. At baseline, a minority of respondents were aware that cardiac arrest is associated with high mortality (19.7%) or that most cardiac arrests occur at home (23.7%). While 83.8% of respondents knew correct hand placement for CPR, only 27.2% and 28.9% knew correct compression rate or depth, respectively. After program implementation, significant improvements were observed for cardiac arrest and CPR skills knowledge. Confidence with performing CPR increased from 44.5% to 86.3%. Employees who participated in manikin practice, compared with those who did not, were more likely to correctly answer CPR-performance questions.

Conclusions: Cardiac arrest and CPR knowledge is not optimal at our organization. Community awareness is likely lower than observed. These data highlight opportunities for CPR-awareness programs in academic settings and in the community.

Keywords: Cardiac arrest; Cardiopulmonary resuscitation

Introduction

Bystander cardiopulmonary resuscitation (CPR) is a critical step in the chain of survival and is associated with significant improvements in survival for out-of-hospital cardiac arrest (OHCA). Compared with traditional CPR, hands-only (or compression-only CPR) is associated with an increased likelihood of bystanders initiating CPR and is associated with improved survival [1]. Educational campaigns and mass citizen hands-only trainings have contributed to these associated improvements, as studies have shown that participants who are exposed to brief (60-second) CPR demonstrations are more likely to attempt CPR compared with untrained laypersons [2]. CPR education is routinely available to health care professionals at hospitals to improve the response to and survival of cardiac arrest patients in the hospital setting, but these resources are not routinely made available to non–health-care staff or faculty. Large employers and health care or research institutions have the potential to significantly increase bystander response to cardiac arrest by ensuring CPR training exposure to all employees.

In North Carolina in 2012, bystander CPR was only initiated in 16% of cardiac arrests (CARES data 2012). At the Duke Clinical Research Institute (DCRI), we sought to understand the awareness and knowledge of cardiac arrest and CPR skills. Our institution comprises more than 1200 employees, including health-care and non–health-care employees, with an overall mission to develop and share knowledge to improve patient care around the world through innovative clinical research. We believed that such an assessment might help to identify current gaps in academic institutional and community approaches to improving bystander response to cardiac arrest.

Methods

Setting

On June 8, 2012, we implemented a one-hour CPR awareness and training program during National CPR & AED (automated external defibrillator) Awareness Week at the DCRI to increase knowledge of cardiac arrest and the need for CPR. The program included expert lectures on cardiac arrest and CPR, a documentary detailing a Duke patient's cardiac arrest, and a 60-second American Heart Association video (http://www.heart.org/HEARTORG/CPRAndECC/

HandsOnlyCPR/Hands-Only-CPR_UCM_440559_SubHomePage.jsp) demonstration of hands-only CPR. After the one-hour session, trained volunteers evaluated the practical CPR performance skills of each participant. Each employee was read a standardized script on a cardiac arrest scenario. The employees were initially observed by a coach for one minute without correction or instruction. This was followed by feedback and demonstration of correct CPR performance techniques. Finally, each employee who did not correctly perform CPR initially was asked to perform CPR again after instruction.

Design

Employees completed an anonymous online pre- and post-program survey, using Qualtrics survey software, to gauge knowledge of cardiac arrest and CPR skills and confidence. An explanation of the study and an informed consent waiver were included in both online surveys.

Statistical analysis

Results

At baseline (upon email invitation to DCRI employees), 173 participants completed the pre-program survey; 117 participants completed the post-program survey. Of those who completed the pre-program survey, 74.6% were from non–health-care backgrounds. Also, 67.6% of pre-program respondents reported having prior CPR training, but 59.8% of those reported having been trained >5 years previously. Finally, 20.2% of participants (82.8% of which were health care professionals) reported performing CPR on a real person (Table 1).

Participants were assessed on cardiac arrest and CPR knowledge as well as confidence with CPR performance. Most pre-program survey participants (94.2%) correctly answered that cardiac arrest was a leading cause of cardiovascular death in the United States. However, only a minority of participants knew that an average of >90% of cardiac arrest victims die every year in the United States (19.7%) or that most cardiac arrests occur in the home as opposed to in a public setting (23.7%) (Table 2). Regarding knowledge of CPR skills, at baseline 65.9% of the population correctly answered that calling 911 should be the next step after witnessing a cardiac arrest. Most participants knew that the correct hand placement for CPR was the distal portion of the sternum between the nipples. However, only 28.9% and 27.2% of participants knew correct CPR compression depth and rate, respectively. Also, 37% of respondents recognized that CPR was indicated in the presence of gasping. Significant improvements in knowledge of CPR skills after the DCRI implementation program occurred (Table 2).

	Pre-Program (n=173)	Post-Program (n=117)
Non–health-care participants	129 (74.6%)	91 (77.8%)
Previous CPR training	117 (67.6%)	70 (59.8%)
Timing of last training		
Within past year	9 (7.7%)	2 (2.9%)
Within past two years	14 (12.0%)	6 (8.6%)
Within past five years	24 (20.5%)	10 (14.3%)
More than five years	70 (59.8%)	52 (74.3%)
Prior CPR use on real person	35 (20.2%)	—
Prior witness to CPR on real person	61 (35.3%)	—

Data presented as n (%). CPR, cardiopulmonary resuscitation.

Table 1: Baseline characteristics of DCRI study participants at pre- and post-program evaluation.

	Pre-Program (n=173)	Post-Program (n=117)	P-value
Knowledge of cardiac arrest			
Cardiac arrest leading cause of CV death	94.2%	98.3%	0.09
Percent of cardiac arrest victims who die annually	19.7%	45.3%	0.001
Percent of cardiac arrests occurring in the home	23.7%	43.6%	0.001
Difference between cardiac arrest and acute MI	68.2%	77.8%	0.08
Knowledge of CPR			
Calling 911 as next step after witnessing cardiac arrest	65.9%	86.3%	0.001
CPR compression rate	27.2%	74.4%	0.001
CPR hand placement	83.8%	94.9%	0.004
CPR compression depth	28.9%	72.7%	0.001
Chest–compression-only CPR for children and adults	26.0%	44.4%	0.001
Does cardiac arrest victim still need CPR after gasping	37.0%	73.5%	0.001
Can a victim be harmed if CPR is performed	51.5%	84.6%	0.001
Knowledge of NC law protection for performing CPR	54.3%	72.7%	0.002

CPR, cardiopulmonary resuscitation; CV, cardiovascular; MI, myocardial infarction; NC, North Carolina.

Table 2: Study participants with correct answers to cardiac–arrest-knowledge questions.

In the post-program survey, participants who practiced with CPR coaches were more likely to correctly answer questions about CPR skills compared with participants who elected not to practice on a manikin. Coach-practice participants (92.5% versus 73.0%, P=0.004) were much more likely to know that 911 is the first step after witnessing an OHCA, the correction compression rate (83.8% versus 54.1%, P<0.001), and the correct compression depth (85.0% versus 45.9%, P<0.001). Participants were equally likely to know correct hand placement irrespective of practice with a coach. Practice with a coach did not influence answers to questions about CPR knowledge, gasping, use of CPR in children, benefit versus harm for use of CPR, and knowledge of Good Samaritan laws (Table 3).

	Practice with Coach (n=80)	No Practice with Coach (n=37)	P-value
Calling 911 as next step after witnessing cardiac arrest	92.5%	73.0%	0.004
CPR compression rate	83.8%	54.1%	0.001
CPR hand placement	95.0%	94.6%	0.93
CPR compression depth	85.0%	45.9%	0.001
Chest–compression-only CPR for children and adults	50.0%	32.4%	0.08
Does cardiac arrest victim still need CPR after gasping	75.0%	70.3%	0.59
Can a victim be harmed if CPR is performed	88.8%	75.7%	0.07
Knowledge of NC law protection for performing CPR	72.5%	73.0%	0.96
CPR, cardiopulmonary resuscitation; NC, North Carolina.			

Table 3: Post-program study participants who correctly answered CPR knowledge questions by practicing CPR with a coach.

Prior to the DCRI cardiac arrest awareness program, only 44.5% of participants reported feeling somewhat or very confident that they could perform CPR if needed. After the one-hour program, 86.3% of post-program implementation survey participants reported feeling either somewhat or very confident (Figure 1).

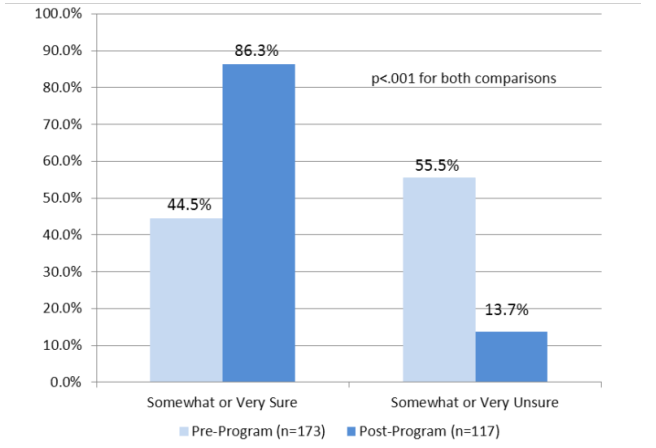

Figure 1: Patient-reported confidence in ability to perform CPR before and after program implementation.

Gains in cardiac arrest and CPR knowledge were seen in participants with and without prior CPR training; however, greater improvements in knowledge were observed in participants who had no prior CPR training who attended the one-hour lectures. For example, self-reported confidence increased by 26.2% for participants with prior CPR training, while mean confidence increased by 73.3% for those without prior training.

Discussion

At the DCRI, awareness and knowledge about cardiac arrest and CPR are low. Few participants knew that most cardiac arrests were fatal or that most events occurred in the home. Only a minority of participants could answer questions related to CPR quality. Significant opportunities exist for increasing knowledge regarding gasping during cardiac arrest and Good Samaritan laws that protect bystander CPR responders. We showed that a simple one-hour lecture on cardiac arrest, including a brief video demonstration of hands-only CPR, was associated with significant improvements in knowledge and awareness of cardiac arrest and CPR. Furthermore, employees who participated in CPR practice with a manikin were more likely to correctly answer CPR performance questions compared with those who did not have skills practice. Finally, self-reported confidence significantly improved after program implementation.

Overall cardiac arrest knowledge was poor among participants prior to program implementation. Efforts to improve knowledge of cardiac arrest may lead to an increased willingness and desire of citizens to learn CPR. Prior efforts to educate the public on myocardial infarction through mass media, public service announcements, and community events led to documented improvements in knowledge [3]. Similarly, statewide efforts to educate and train the public on chest-compression CPR in Arizona significantly increased its use in OHCA from 19.6% in 2005 to 75.9% in 2009 [1]. In Seattle, public service announcements significantly increased bystander CPR in intervention communities compared with communities without targeted media campaigns [4]. Given this, it is likely that the improvements in confidence and knowledge related to cardiac arrest and CPR use will translate to increased use of bystander CPR during OHCA. Employers, including health care systems, are relatively untapped resources for training the public to respond to OHCA and could play a significant role in increasing the use of bystander CPR.

We demonstrated significant improvements in cardiac arrest and CPR knowledge and confidence with performing CPR. Several programs have demonstrated improved confidence after teaching hands-only CPR to laypersons [2,5,6]. Bobrow et al. found that laypersons exposed to hands-only CPR training videos were more likely to attempt CPR compared within untrained bystanders [2]. It is likely that self-reported confidence would translate into use of bystander CPR by trained employees.

High-quality CPR is associated with improved survival of cardiac arrest [7]. In our study, few participants knew the correct compression rate or depth for use in adults with OHCA. The Bee Gees hit "Stayin' Alive" has become famously associated with hands-only (or compression-only) CPR as a way of remembering the preferred tempo (or rate) of chest compressions. A simple study demonstrated that when participants were trained in hands-only CPR with this song aide, the rate of chest compressions was maintained on average at >100 beats per minute during initial training and at five weeks [8]. Bobrow et al. demonstrated good CPR quality for patients who watched ultrabrief CPR training videos [2]. In our study, the greatest improvements in knowledge of CPR quality were among those patients who participated in both the educational session and CPR manikin practice.

Gasping is common in cardiac arrest, and is a common reason for delaying bystander CPR. It occurs in up to 39% to 55% of cardiac arrest cases, and it is associated with increased survival; this is especially true if emergency medical services personnel arrive in a

timely fashion [9]. At baseline, in our study, only one-third of participants correctly answered that CPR is needed for a cardiac arrest victim who is gasping. After the program, the proportion of participants who correctly answered this question increased by 200%.

Common barriers to initiating bystander CPR, despite prior CPR training or certification, are panic and fear of not performing it correctly, fear of legal consequences, and fear of causing harm with CPR performance [10,11]. After the American Heart Association's endorsement of chest–compression-only CPR for the lay public, there are now several large programs attempting to increase the use of bystander CPR, including hands-only CPR, across America [1,12,13]. For our campaign, we used the common slogan, "Call 911, push hard and fast" during our educational session; this coincided with the American Heart Association's bystander-only CPR video. For those participants who may experience panic, remembering this easy slogan may help them recall the simple components of chest compression. We also found that about half of the participants were not aware of Good Samaritan laws protecting citizens who perform cardiac resuscitation during cardiac arrest; this knowledge improved significantly with our program. The American Heart Association has called for government agencies, CPR instructors, and emergency medical service leaders to strengthen public awareness of Good Samaritan laws [14]. Our study shows that employer-based CPR programs also have the capacity to increase knowledge. Finally, in the baseline survey, nearly half of participants responded that performing CPR could cause harm to a cardiac arrest victim. This parallels reports in the literature [15]. These three important points (fear of not performing CPR correctly, fear of legal consequences, and fear of causing harm with CPR performance) will need to be addressed in employer-based and community efforts to increase the use of bystander CPR for cardiac arrests in communities.

Limitations

While participants from differing backgrounds (educational level, prior CPR training, and employment) participated in our surveys, only about 14.2% of employees responded. In this setting, the study may not be reflective of overall knowledge of employees at the DCRI. The study was also limited to one institution; as a result, it may not be generalizable to other employers or research institutions. Third, we did experience a drop-off in response for the post-program survey. Finally, we could not determine whether improved confidence and knowledge of CPR translates to improved quality because we did not record CPR performance during manikin practice.

Conclusion

In conclusion, cardiac arrest and CPR knowledge are not optimal at our organization, despite one of our research missions being to improve emergency cardiovascular care. Community awareness is likely lower than that observed at the DCRI. These data highlight opportunities for CPR awareness programs in academic settings and in the community.

Funding Source

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