BRIEF REPORT

Cardiac Arrest on the Links: Are We Up to Par? Availability of Automated External Defibrillators on Golf Courses in Southeastern Pennsylvania

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Abbreviations:
AED = automated external defibrillator
CPR = cardiopulmonary resuscitation
EMS = emergency medical services

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Abstract

Objectives: A growing number of golfers are senior citizens, and it may be predicted that the number of golf-related medical emergencies, including the incidence of cardiac arrest, will increase. This study was designed to survey the level of preparedness of golf courses in Southeastern Pennsylvania to respond to cardiac arrest among their members.

Methods: A telephone survey of all of the 180 golf courses in the area was conducted to determine their type (public/private), volume in rounds per year, presence of automated external defibrillator (AED) devices, number of employees, and percentage of employees with cardiopulmonary resuscitation (CPR) training. Participants also were asked to estimate the time needed to reach the farthest point on their course in order to estimate a maximum time to the application of an AED device.

Results: A total of 131 of 180 golf courses completed the survey (53 private, 78 public) for an overall response rate of 73%. Private courses reported a greater average number of employees with CPR training [private = 9.1, public = 3.6; $p = 0.001$] and in AED presence [public = 9%, private = 58.5%; $p = 0.0001$]. Public courses support a higher volume of play than do private courses [public = 32,000, private = 24,000; $p = 0.001$], yet have far fewer employees [public = 25, private = 44; $p = 0.004$]. The longest time necessary to reach the most remote point on the course was between four and five minutes in all courses. Analysis was performed using the Student's *t*-test and Pearson's Chi-square as appropriate.

Conclusion: Neither public nor private golf courses are well equipped to respond to cardiac arrest, but outcomes on public courses likely are to be far worse.

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Introduction

Golf continues to grow in popularity, especially among the older segments of the population. Every year, thousands of medical emergencies occur on golf courses,[1] often beyond the reach of immediate medical attention. As the mature golfing population grows, the number of medical emergencies certainly will increase as older, active participants bring their medical conditions to the course.[2] Although the majority of medical emergencies are minor and managed easily by golfers and/or golf course staff, life-threatening emergencies, such as cardiac arrest, pose a significant obstacle to the delivery of emergency medical services (EMS). Sudden, out-of-hospital cardiac arrest is a leading cause of death and disability in the United States.[3] When out-of-hospital cardiac arrest is caused by ventricular fibrillation, the effectiveness of defibrillation diminishes with each passing minute; early defibrillation is effective in improving survival from out-of-hospital cardiac arrest. The objective of this study was to determine the level of preparedness of golf courses in Southeast Pennsylvania to respond to a cardiac arrest of its golfers and/or guests.

	Private golf courses	Public golf courses	*p*-value
Number of courses completing survey (%)	53 (40)	78 (60)	
Average number of rounds played per year (1,000s)	24	32	0.001
Average number of employees per course	44	25	0.004
Average number of employees trained in CPR on course	9	4	0.001
Number with AED on-site (%)	31 (59)	7 (9)	0.001
Average time to farthest point on course by golf cart (minutes)	4.6	4.1	0.268

Table 1—Preparedness of private and public courses for out-of-hospital cardiac arrest (AED = automated external defibrillator; CPR = cardiopulmonary resuscitation)

Methods

A telephone survey of all golf courses in the Southeast Pennsylvania region was conducted. Institutional Review Board approval was not required. The courses were identified using an online golf course directory for Pennsylvania,[4] supplemented by a telephone directory,[5] to identify the golf courses within the 120 mile radius of Bethlehem, Pennsylvania. One hundred eighty golf courses were identified.

The initial contact was made by the primary authors. For all initial contacts, questions were addressed to the person most responsible for the daily functioning of the facility. A structured telephone survey was conducted in which the manager, director, or owner of each site was asked: (1) the type of golf facility (public or private); (2) yearly number of rounds of golf played (3) number of employees; (4) number of employees with cardiopulmonary resuscitation (CPR) training; (5) presence or absence of an AED machine on site; and (6) estimated time needed to reach the farthest point on their course by golf cart (for purposes of determining time to utilization of AED devices). Statistical processing was performed using the Student's *t*-test and Pearson's Chi-square where appropriate. Researchers attempted to contact appropriate persons at each site up to three times.

Results

The survey was attempted by a total of 131 of 180 golf courses for a response rate of 73% (Table 1); 53 (40%) were private courses and 78 (60%) were public. An appropriate person at 27 of the courses could not be reached, did not return three phone calls, or refused to participate in the survey. Those who refused to participate did so prior to knowledge of the details of the survey. There was a statistically significant difference in the average number of employees trained in CPR; private courses averaged nine trained employees compared with 3.6 at public courses ($p = 0.001$). The availability of AED machines on site followed similar trends, with 58.5% of private courses having the devices compared to 9% at public courses ($p = 0.001$). Public courses tend to support a much higher volume of play (32,000 rounds per year) than do private courses (24,000 rounds per year; $p = 0.001$), and public courses have fewer employees than do private courses, 25 versus 44 ($p = 0.001$). The longest cart-drive time necessary to reach the most remote point on a course was 4–5 minutes for all courses, public and private.

Discussion

Automated external defibrillators should be placed in locations that may have a high liklihood of out-of-hospital cardiac arrest.[1,6,7] It has been reported that golf courses are the fifth most likely public place for cardiac arrest to occur.[1] Survival from cardiac arrest is dependent on many factors, the most crucial being time from onset to defibrillation.[8,9] Each passing minute without defibrillation with or without CPR equates to at least a 10% reduction in survival.[8–10]

Recent studies suggest that public health planners should make cardiopulmonary resuscitation and rapid defibrillation responses a priority for resource allocation.[11] Many golf courses may have limited or delayed access by EMS, with response times limited by difficult to access locations. Automated external defibrillators have become increasingly available outside the EMS for the treatment of sudden cardiac arrest by rapid defibrillation. Trained laypersons are capable of using AEDs safely and effectively,[12–15] and equipping trained volunteers to attempt early defibrillation can increase the number of survivors after out-of-hospital cardiac arrest in remote public locations. Numerous studies have shown that survival to hospital discharge has increased with the early use of AEDs.[16–18]

Despite the reported efficacy of the early use of AEDs, there is no consensus on where to place them in the public sector.[1–3,6] Data support that if AEDs are made available in both businesses and homes, they frequently will be used by the public in cases of suspected cardiac arrests. Studies also confirm that the correct use of AEDs requires minimal training,[16] and lay responders have successfully used AEDs in emergency situations.[19] Automated external defibrillators have been used successfully by police officers,[20] flight attendants, airline passengers, and airport personnel,[17,21,22] ski patrols,[23] college athletic programs,[24,25] and by casino security guards.[18] The implementation of an AED program should be a component of a more general worksite response plan.[2]

A recent position paper suggests that public access defibrillation with AEDs be placed in areas that could reasonably anticipate one use every five years.[1] Golf courses, with between 20,000 and 40,000 users per year, and many of these participants are >50 years of age, meet this expecta-

tion. Despite the increased vulnerability among the population that enjoys recreational golf, the results of this survey demonstrate a surprisingly low level of preparation in dealing with local response to cardiac arrest of its members among this region's golf courses. Private courses are better prepared for an adverse cardiac event with AED availability and training. The fact that most courses approximately have a maximum of a four to five minute cart drive time to reach the most distant areas on the golf course, suggests that AED application could take place within 10 minutes of cardiac arrest even at the most remote area of a golf course. The optimal positioning of the AED at various locations within the golf course might decrease this time significantly.

This study has several limitations. First, only courses within the Southeastern section of Pennsylvania were surveyed. Preparation for cardiac arrest events may differ in other areas, particularly those with a higher population percentage of older golfers. Second, the number of courses that did not respond (49; 27%) may indicate that the survey is not representative of the region. It is possible that ill-equipped courses were more likely to be non-responders. Researchers tried to limit this bias by providing limited details of the survey until golf courses agreed to participate. Finally, data were collected via telephone, and all of the data were self-reported. These data may represent estimates rather than confirmed numbers. Similar telephone methodology has been employed in other AED studies.[5,24]

Conclusion

Demographic factors make cardiac arrest and the use of AEDs on golf courses an area of planning for public health officials. Private and especially public courses may be ill-prepared for the sudden death of a participant. This initial study of the issue suggests that the potential impact of increased preparation on our golf courses merit closer attention.

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