Clinical paper

Community public access sites: Compliance with American Heart Association recommendations

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Abstract

Background: Public access defibrillation (PAD) programs are a major goal of the American Heart Association (AHA) to ensure that automated external defibrillators and trained lay rescuers are available in public areas where sudden cardiac arrest (SCA) is likely to occur. The Johnson County Early Defibrillation Task Force (JCEDTF) is a volunteer organization which distributed AEDs throughout Johnson County, Iowa. JCEDTF was responsible for initial training but ongoing support was the responsibility of each site.

Objective: The purpose of this study was to evaluate compliance of community PAD sites to recommendations for site maintenance as proposed by the American Heart Association (AHA).

Methods: Thirty-two surveys were distributed to community PAD sites that received assistance from JCEDTF. PAD sites were categorized into business, educational, or community sites. A twenty-five point scoring system to assess PAD programs was developed based on AHA recommendations. On-site evaluations were conducted to verify survey results and assess barriers to an effective PAD site. Differences among the three categories were measured with ANOVA.

Results: No site was able to comply with all the AHA guidelines for a PAD site. The mean score among all sites was 57% of possible points with no significant differences among the three categories. Business sites were more compliant with ongoing training compared to educational and community sites (p < 0.022).

Conclusions: Community PAD sites in Johnson County currently do not comply with the recommendations for effective PAD sites. After initial training and establishment of community PAD sites, better methods for assuring ongoing training and maintenance are needed for sites to be effective.

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1. Introduction

Sudden cardiac arrest (SCA) is a major cause of death in United States. Ventricular fibrillation is a common rhythm abnormality detected in SCA which is effectively treated only if delivery of an electric shock to chest occurs quickly. For every minute delay in defibrillation, survival rates fall 7–10%.

Automated external defibrillators (AEDs) are designed to distinguish between shockable and non-shockable cardiac arrest rhythms and to deliver a shock, if indicated. In 1994, the American Heart Association (AHA) began recommending lay rescuer AED programs to improve survival rates of out-of-hospital SCA in adults. Public access defibrillation (PAD) programs became a major goal of AHA. The goal of PAD programs is to shorten the time from onset of ventricular fibrillation until CPR and shock delivery by ensuring that AEDs and trained lay rescuers are available in public areas where SCA is likely to occur. The AHA has published recommendations for the elements of an effective PAD site. These include: a planned and practiced response; ongoing training of anticipated rescuers in CPR and use of AEDs; links with local EMS agencies and a process of ongoing quality improvement.

The Johnson County Early Defibrillation Task Force (JCEDTF) is a volunteer, non-profit organization incorporated in 2002 with the primary goal of reducing death and disability resulting from SCA through use of AEDs. The JCEDTF Board of Directors includes paramedics, nurses, and physicians from the local EMS agencies and hospitals, law enforcement officers, and representatives from the American Red Cross and the AHA. The goals of JCEDTF are to develop awareness in Johnson County about the importance of early public access defibrillation; serve as a resource to individuals and organizations who wish to establish public access defibrillation programs and develop a strategic plan to prioritize locations.
in Johnson County where the need is greatest to place AEDs. The task force is supported by donations and grants. All AEDs were purchased with grant funds. JCEDTF equipped or assisted with the purchase of AEDs within first responder units and AEDs in community PAD sites.

Johnson County has a population of 120,000 persons in a geographical area of 623 square miles. One-half of the population is in Iowa City, which is 10% of the land area. Coralville is a small contiguous town, and the remaining population is rural. First responder units within separate fire and law enforcement units are dispatched to all medical calls within the county. Johnson County Ambulance Service is the sole 911 provider for the county and responds to 50–60 cardiac arrests annually. Although the average response time within Iowa City limits is 5–6 min, the average county-wide response time is 15 min. Thus, effective PAD sites may significantly improve survival.

The purpose of this study was to evaluate adherence of the community PAD sites to the AHA guidelines for PAD sites after program initiation. We hypothesized that the components of an effective PAD program were present in sites that received or purchased AEDs in Johnson County and that programs were maintained over time.

2. Methods

2.1. Participants and survey distribution

In 2002, JCEDTF established a priority list to determine appropriate PAD locations which was based on prior arrest locations. Those sites were contacted directly, and if interested, were provided funds for AEDs and initial training. Additional sites independently requested assistance with AED purchase and these requests were accommodated. Sites for this study received assistance from the JCEDTF between 2002 and 2004. JCEDTF provided or assisted with initial CPR training and AED operation at all sites. Information on AED maintenance and recommendations for repeat training every 2 years was provided at program initiation, but no additional support was available from JCEDTF.

A seven-page survey was mailed to each PAD site contact person in 2006. Surveys collected demographic information about each site and questions of the point scoring system (see below) and budgeted costs to maintain the PAD site. Surveys included specific answer choices for each question in order to standardize the answers. After return of each survey, an attempt was made to perform an on-site evaluation. All site evaluations were conducted by one author (MP).

Site evaluations confirmed survey responses, viewed location of AEDs, and assessed any barriers to finding or using AEDs.

PAD sites were separated into three groups consisting of education, business, and community sites. Educational sites included public schools and one community college. Community sites included churches, shopping malls, libraries, and public recreational centers. Business sites ranged from small, locally owned businesses to major corporations. Number of employees at businesses ranged from less than 50 to more than 500.

This study was approved by the University of Iowa Institutional Review Board.

2.2. Point scoring system

A twenty-five point scoring system was developed by the investigators and derived from the AHA four major components of an effective PAD site.2 Multiple elements with each component were defined and assigned numeric values (Table 1). The point value for each element was assigned empirically by the investigators, weighting elements related to delivery of CPR and use of the AED higher (training and program maintenance) than systems issues of planning and practiced response.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Twenty-five point scoring system for survey.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned and practiced response</td>
<td>How many employees are trained in CPR?</td>
</tr>
<tr>
<td>2-point: trained rescuer is present 25% of business hours of operation.</td>
<td></td>
</tr>
<tr>
<td>1.5-point: trained rescuer is present 50% of business hours of operation.</td>
<td></td>
</tr>
<tr>
<td>1-point: trained rescuer is present 75% of business hours of operation.</td>
<td></td>
</tr>
<tr>
<td>0-point: trained rescuer is present 100% of business hours of operation.</td>
<td></td>
</tr>
<tr>
<td>How many employees are trained in CPR?</td>
<td></td>
</tr>
<tr>
<td>2-point: all employees are trained.</td>
<td></td>
</tr>
<tr>
<td>1-point: 50% of employees are trained.</td>
<td></td>
</tr>
<tr>
<td>0.5-point: 25% of employees are trained.</td>
<td></td>
</tr>
<tr>
<td>0-point: less than 10% of the employees are trained.</td>
<td></td>
</tr>
<tr>
<td>How many employees are trained in the use of a defibrillator?</td>
<td></td>
</tr>
<tr>
<td>2-point: all employees are trained.</td>
<td></td>
</tr>
<tr>
<td>1-point: 50% of employees are trained.</td>
<td></td>
</tr>
<tr>
<td>0.5-point: 25% of employees are trained.</td>
<td></td>
</tr>
<tr>
<td>0-point: less than 10% of the employees are trained.</td>
<td></td>
</tr>
<tr>
<td>What steps have been taken to minimize the likelihood of tampering/vandalism/theft of the AED?</td>
<td></td>
</tr>
<tr>
<td>1-point: defibrillator is placed in a controlled location, in a protective wall mounting, or some other mechanism is in place to prevent/alert when the device is being tampered with or removed from its case.</td>
<td></td>
</tr>
<tr>
<td>0-point: defibrillator is not placed in a controlled location, and is not in a protective wall mounting.</td>
<td></td>
</tr>
<tr>
<td>Do you have a written policy established on the use of the AED?</td>
<td></td>
</tr>
<tr>
<td>2-point: daily AED check.</td>
<td></td>
</tr>
<tr>
<td>1.75-point: weekly AED check.</td>
<td></td>
</tr>
<tr>
<td>1.5-point: monthly AED check.</td>
<td></td>
</tr>
<tr>
<td>1.25-point: quarterly AED check.</td>
<td></td>
</tr>
<tr>
<td>1-point: yearly AED check.</td>
<td></td>
</tr>
<tr>
<td>0-point: no maintenance check.</td>
<td></td>
</tr>
<tr>
<td>Is the location of an AED placed so that it can be reached with ninety seconds from all areas of the program site?</td>
<td></td>
</tr>
<tr>
<td>1-point: yes, maintenance is documented.</td>
<td></td>
</tr>
<tr>
<td>0-point: no maintenance documentation occurs.</td>
<td></td>
</tr>
</tbody>
</table>

2.3. Research ethics

This study was approved by the University of Iowa Institutional Review Board.
Table 1 (Continued)

| 1-point | managers/supervisory staff and employees are required to attend CPR and AED training. |
| 0.5-point | only managers/supervisory staff or employees are required to attend CPR and AED training. |
| 0-point | neither employees nor managers are expected or required to attend CPR and AED training. |

How often are individual required to undergo CPR and AED training?
- 2.0-point: quarterly. |
- 1.5-point: every 6 months. |
- 1.0-point: yearly. |
- 0.5-point: every 2 years. |
- 0-point: not applicable.

Does your facility have an emergency response protocol in place?
- 1-point: yes. |
- 0-point: no.

Continuous quality improvement
- Does your facility have a mechanism in place for a post-event review to review components of system function, personnel performance, and AED performance?
  - 1-point: yes. |
  - 0-point: no.

Table 2 shows the scores among educational, business, and community sites. There was no significant difference among overall mean scores of the three different site categories. The mean scores were 13.6/25 (54%) for educational sites, 15.1/25 (60%) for business sites, and 13.8/25 (55%) for community sites. However, a difference among sites was demonstrated when scores for components of a PAD site were compared. Business sites scored statistically higher for ongoing CPR and AED training than the two other categories (p < 0.05). No differences were detected among sites for planned and practiced response, links to local EMS, or continuous quality improvement.

3. Results

Thirty-three surveys were mailed to Johnson County businesses, educational facilities, and community buildings. Thirty-two surveys were returned from 5 educational sites, 13 business sites, and 14 community sites (97% survey response rate). Twenty-two sites visits were completed.

The overall mean score among all sites of an effective PAD site was 14.3/25 (57% of possible points) (Table 2). Among the four individual components, the mean score was 8.91/14 (64%) for planned and practiced response, 4.13/7 (59%) for ongoing training, 1.03/3 (34%) links with local EMS agencies and 0.22/1 (22%) for continuous quality improvement.

4. Discussion

PAD sites are increasing in the United States because of the recognition of need for early defibrillation to improve survival from sudden cardiac arrest. However, to the best of our knowledge, long-term maintenance and ongoing training of voluntary community sites have not been evaluated previously. Our study demonstrates that many community-based PAD sites do not comply with the AHA recommendations for effective sites. Deficiencies were most evident at educational sites. Within the four components, deficiencies in establishing links to local EMS services and continuous quality improvement were greatest, although shortcomings were present within all sites across all components.

The twenty-five point scoring system was based on the four components recommended by the AHA for an effective PAD site. Although the point assignment was empiric and has not been validated, it is apparent that no site in our study was able to comply...
with all of the AHA recommendations. Business sites were more compliant with ongoing training compared to educational and community sites. This may be due in part to more funding allocated. Only three sites allotted >$501 for PAD site maintenance and all were business sites. Despite business sites having more personnel and potentially more funding, there was no difference in overall performance among the three categories. Interestingly, the PAD site that received most points in our study was a local, public recreation center (20 points).

To demonstrate the effectiveness of PAD sites, the PAD trial was conducted between July 2000 through September 2003 within urban and suburban communities served by EMS systems that provided advanced life support. Results of the PAD trial demonstrated more survivors in the sites where the volunteers were trained in CPR and AED use compared to sites with just CPR. The trial supports current AHA guidelines for lay rescuer AED programs and the emphasis on planning, training, and practice of CPR and use of AEDs.

During the PAD trial, all sites recruited for the trial were required to have emergency plans in place prior to participation. Volunteer responders were trained in CPR and AED use at least twice in a 20 month period. Even with these rigorous measures, AEDs were deployed during only 30% of the arrest events. This demonstrates that purchase of an AED is not enough to ensure effective PAD sites and the difficulty in achieving all four components of AHA recommendations.

5. Importance of CPR and ongoing training

It is increasingly apparent that CPR is vital for resuscitation of sudden cardiac arrest. Several studies have shown that 90–180 s of CPR prior to defibrillation improves the probability of defibrillation in the presence of prolonged ventricular fibrillation. Additionally, the quality of CPR affects resuscitation rates. Thus, persons who know and can effectively administer frequent, ongoing training to maintain skills. Ensuring that consistent maintenance protocols need to be implemented to insure the effectiveness of PAD when compared to results of randomized trials. More research needs to be done on cost effectiveness of PAD sites once consistent training and maintenance protocols have been implemented.

8. Limitations

The major limitation of our study is the lack of validation of the twenty-five point scoring system and inability to demonstrate predictive value. The individual point values, although developed from the AHA criteria and CPR literature, were empirically assigned by the investigators. Validation of the survey will require a larger geographic site with greater frequency of cardiac arrest. We were unable to assess effectiveness of individual PAD sites as no cardiac arrest occurred and no AEDs were used at any PAD site during this study.

9. Conclusion

Our study demonstrated the community PAD sites in Johnson County currently do not comply with recommendations for effective PAD sites and that better methods for assuring ongoing training and maintenance are needed for sites to be effective.

Conflict of interest

The authors Sarah Haskell, Michael Post and Dianne Atkins declared that they have no conflicts of interest.

Dr. Cram is supported by a K23 career development award (RR01997201) from the NCRR at the NIH and the Robert Wood Johnson Physician Faculty Scholars Program. Dr. Cram served as a consultant to Medtronic Inc. during 2008 and assisted the company in its efforts to develop a cost-effectiveness model related to PAD. His total compensation was less than $5000.

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