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Lauren Victoria Fortington
Edith Cowan University, l.fortington@ecu.edu.au

Liam West

Damian Morgan

Caroline F. Finch
Edith Cowan University, c.finch@ecu.edu.au

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Implementing automated external defibrillators into community sports clubs/facilities: a cross-sectional survey of community club member preparedness for medical emergencies

Lauren V Fortington,¹ Liam West,² Damian Morgan,³ Caroline F Finch¹

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¹School of Medical and Health Sciences, Edith Cowan University—Joondalup Campus, Joondalup, Western Australia, Australia

²Olympic Park Sports Medicine Centre, Melbourne, Victoria, Australia

³Federation Business School, Federation University Australia, Gippsland, Victoria, Australia

Correspondence to
Dr Lauren V Fortington;
l.fortington@ecu.edu.au

ABSTRACT

Objective There is a growing focus on ensuring the availability of automated external defibrillators (AED) in sport settings to assist in preventing sudden cardiac death. For the AED to be most effective, understanding how best to integrate it with wider risk management and emergency action plans (EAP) is needed. The aim of this survey was to identify sports club/facility member knowledge of AED use and club EAPs, 6 months following participation in a government-funded AED provision and cardiopulmonary resuscitation training programme.

Methods Cross-sectional survey of community sports clubs and facilities in Victoria, Australia. Included participants were members of sports club/facilities that had been provided with an AED and basic first aid training as part of a government programme to increase access to, and awareness of, AEDs. A descriptive analysis of availability of EAPs and AEDs, together with practical scenarios on AED use and maintenance, is presented.

Results From 191 respondents, more than half (56%) had no previous training in AED use. Knowledge on availability of an EAP at the club/facility was varied: 53% said yes and knew where it was located, while 41% did not have, or did not know if they had, an EAP. Responses to clinical scenarios for use of AED were mostly accurate, with the exception of being unsure how to respond when 'a participant falls to the ground and is making shaking movements.'

Conclusions While there were positive outcomes from this programme, such as half of the respondents being newly trained in emergency first aid response, further improvements are required to assist members with embedding their AED into their club/facility EAP and practices.

BACKGROUND

Sudden cardiac death (SCD) is the leading cause of fatality in sport and recreation settings worldwide.¹ Many cases of SCD occur from previously undiagnosed cardiac disease, and there can be no warning signs or symptoms prior to cardiac arrest.² Improved survival requires a rapid response

What are the new findings?

- A government-led programme of automated external defibrillator (AED) provision, and training in its use, at sports clubs/facilities provided an increase in the number of community members with knowledge of AEDs.
- Within individual sports clubs/facilities there is variable knowledge of emergency action plan (EAP) availability among members.
- Improvements in the development, implementation and dissemination of community sports club/facility EAPs are required and should be considered as an integral part of AED delivery.

from bystanders.^{3,4} This emergency response should include recognition of the event, phoning for an ambulance, commencing cardiopulmonary resuscitation (CPR) and, where indicated, activation of an automated external defibrillator (AED).

There is a growing focus on availability of AEDs to aid in the prevention of SCD in sport settings.⁵ The 'Defibrillators for Sporting Clubs and Facilities Program' (DSCF-Program), initiated by the Victorian Government Department of Health and Human Services (Sport and Recreation Victoria), was developed to promote increased community access to AEDs and the capacity of sporting groups to manage emergency medical situations. The multiyear programme (2015–2019) aims to provide up to 1000 sports clubs and facilities across the State with an AED package, including an AED and 6 years of maintenance, tailored training on AED operation and instruction in CPR. In return, sports clubs/facilities are expected to register their AED location with Ambulance Victoria and to update their emergency action plan (EAP) so as to integrate the AED. In cases where there is no existing EAP, development of this

was required in line with the recommendations from a national sports agency, freely available online.⁶ This EAP development is included in the programme on the basis that for an AED to be most effective, the setting in which it is made available requires a planned and practised response, ongoing training, links with local emergency services and a process of ongoing maintenance.⁷

In addition to having an EAP, it is important to consider education and training so that club/facility members have the required knowledge and confidence in AED operation and maintenance. For this reason, the DSCF-Program includes a first aid training course as part of its conditions. How this training is delivered is critical and needs to ensure skills and knowledge are retained by a general, lay (non-medically trained) population.^{8,9} Previous studies in lay populations based at shopping centres, railway stations and other public areas have generally had positive results, reporting relatively high proportions of people who are willing to intervene in a medical emergency,¹⁰ more so if they have a healthcare background.^{11,12} There is some uncertainty noted in that literature about who is allowed to use an AED.^{11,13} Further, participants of previous training courses have described a need for the training to be as realistic as possible and to recognise one can never be fully prepared for a real-life medical emergency occurring.¹³

Understanding the confidence and willingness of training programme participants to intervene in the case of a medical emergency, as well as the knowledge retained from the training course, is beneficial to future delivery and development of AED programmes. Within the Australian community sports setting, this has not previously been determined. Therefore, the aim of this study was to describe the knowledge, willingness to intervene and confidence in relation to medical emergencies and use of AEDs in community sports settings, 6 months after participation in the DSCF-Program and its associated training session. The focus on EAPs as part of the programmes was specifically considered and, given the influence in other settings, findings are also explored for people with and without a healthcare background.

METHODS

Design

The project, including this cross-sectional survey, was approved by the Federation University Australia Human Research Ethics Committee (B17-016). There was insufficient time available for public and patient involvement in the study design and reporting; however, there was indirect contribution to the research questions and survey design through an earlier study¹⁴ and piloting of the survey design.

Setting and participants

All non-government and not-for-profit Victorian community organisations and venues that deliver sport or active recreation programmes in Victoria, Australia (population of approximately 6 million people) were eligible

to apply for the State Government programme that led the delivery of AEDs and training.¹⁵ In applying, clubs/facilities agreed to register their AED with Ambulance Victoria and to update/develop an EAP. Full details on the programme and eligibility are available in the programme guidelines, a copy of which is available from the lead author on request. The clubs/facilities represent a mix of organisations: large and small; employed and volunteer led; highly competitive/organised and non-competitive/recreational-style sports; as well as regional and metropolitan areas. Multiple club members (including participants, board members, coaches and parents) at each club/facility could participate in a first aid training programme at their home facility to upskill them in the use of an AED and emergency medical care. The training programme is delivered similarly to a generic (eg, workplace) programme, so while some resources and information are standardised, other elements will differ according to the trainer who leads the course. Those who took part in the first aid training programme were asked to provide their email address with consent to be contacted for research purposes.

Survey instrument

A tailored survey was designed drawing on findings from a previous qualitative study in this setting,¹⁴ existing surveys in first aid evaluation (CPR/AED confidence/knowledge),^{9,10} surveys of behaviours/intentions in community sports medicine (eg, concussion management)¹⁶ and clinical knowledge of AED best practice in sport and resources (eg, presentation slides) from the training programme delivered as part of the DSCF-Program.

Section 1 of the survey focused on information about the club/facility and its emergency management procedures. Questions sought information about the sports that take place at the facility (multiple choice selecting as many sports as relevant), geographical location (regional/metropolitan setting and postcode) and role of the survey respondent (eg, coach, player, parent, grounds manager, and so forth, with up to three response options allowed). Specific questions were also asked on the availability of an EAP, reasons for the club/facility participation in the AED training, previous AED training and personal experiences with sudden cardiac arrest (SCA), and use of an AED.

Section 2 of the survey focused on the AED training programme delivery. The first question presented 5-point Likert scale response options (strongly agree, agree, neutral, disagree and strongly disagree), with an additional option of not applicable, for a series of eight statements relating to course timing, content and materials. A multiple-choice question on preferred training delivery mode (eg, face to face, online) completed this section.

Section 3 of the survey presented seven statements relating to confidence with using an AED or managing an emergency situation, with a 5-point Likert scale

(from strongly agree to strongly disagree). Five clinical scenarios were presented that aimed to identify respondent knowledge of the potential to require an AED to which respondents selected 'yes, I would call for the AED', 'no, I would not call for the AED' or 'unsure'. Subsequently, five maintenance/use scenarios were presented with respondents assuming the role of a health and safety officer and selecting between 'true', 'false' or 'uncertain'.

The survey finished with five demographic questions covering age, sex, postcode of residence, education and training/work in a healthcare provision role. The survey is available as online supplementary table S1.

Survey procedures

A pilot survey was completed by 19 people who responded to a request sent to 43 programme participants (44%) recruited from the clubs/facilities who had taken part in an earlier phase of the project. Fifteen of the 19 pilot respondents provided consent to participate in a survey retest approximately 3 weeks following, with 11 subsequently doing so. Based on the test-retest pilot data, two refinements were made to the survey: (1) an open response option describing the reason for participation in the DSCF-Program was restructured to provide a drop-down list of options (based on summarised response themes from pilot), with an option for other written responses made available; and (2) the initial five scenario-based questions were combined into two to reduce the length of time required for survey completion, with the average time in the initial survey taking over 12 min and a desire for the survey to be completed in under 10 min to minimise participant burden.

The survey was administered online through SurveyMonkey. The survey link was sent directly to all participants who had provided a valid email address when participating in the first aid training course. In addition, a club/facility contact person was provided with the link and encouraged to distribute to participants of the training programme. The survey remained open for 4 weeks with an email reminder sent to people yet to open or complete the survey, as well as the club/facility contact person, at 10 and 20 days. A paper-based version of the survey was offered, if required, but this option was not used.

Analysis

Descriptive analyses of the survey responses are presented with *n* (%) for categorical data. Fisher's exact test was used for comparison of responses to questions relating to AED use and confidence between those with and without a health background, with the assumption that more people with a health background would have higher confidence (strongly agree, agree) than those without a health background. Responses were grouped as agree (agree, strongly agree) or disagree (disagree, strongly disagree). Neutral responses were grouped according to the direction of question. For positively loaded questions (eg, I would do all that I can) neutral was grouped with

disagree while for negatively framed questions (eg, I am not very confident) neutral was grouped with agree. In this way, the most conservative result to each of the items is presented. A statistically significant result was considered at $p < 0.05$. Responses to the open-ended questions were summarised into common themes, presented in tables. The number of completed responses and missing data are indicated for each question. Data were managed and analysed using Microsoft Excel and Stata V.13.

RESULTS

A total of 985 persons provided their email for direct contact, from which 53 had incorrect/insufficient details, 132 emails were undeliverable and 21 people opted out of the survey. Of the 530 people who opened the email inviting them to the survey, 150 responded. A further 59 people completed the survey link that was sent to club contacts. The exact number of training course participants is unknown as participation was not always noted but the estimated response rate is 21% (based on 985 total direct invitations sent). On review of responses, 18 people indicated they had only completed their training within the previous 6 months and were therefore excluded as we were seeking information on knowledge/skill retention over a longer time period. In total, 191 participants were included for the main analysis.

Table 1 presents the demographic data and previous knowledge and experience of medical emergency management by the participants. There was an almost equal proportion of males and females and a range of age groups represented. Team ball sports and racquet sports were most highly represented. Of the 191 responses, 155 had one sport/activity as focus, and 36 listed more than one sport/activity. Most ($n=143$) respondents had a management-type role at their club/facility. One in five respondents reported a healthcare background.

More than half (56%) of respondents had not previously participated in an AED training course. Those who had some prior training (44%) had gained this at work (49% of previously trained) or through a national accredited first aid training organisation (34%). Over a third (38%) of respondents had witnessed or knew someone who had experienced SCA.

Half (53%) of the respondents indicated that their club/facility had a written EAP and knew where this was located, while 7% knew they had a plan but not how to access it. A further 12% stated their club did not have a written EAP and the remaining 29% of respondents did not know if their club/facility had a written EAP.

The willingness and confidence of respondents to use an AED or intervene in an emergency is presented in table 2. There was a statistically significant difference in respondents with and without a healthcare role in the questions relating to confidence with healthcare providers being more confident to perform CPR or to handle an emergency situation. Responses to questions about the willingness to assist and use an AED did not

Table 1 Demographic details and medical emergency response knowledge of survey respondents (n=191)

Item	Responses	n	Valid responses (%) [¶]
Sex	Male	89	49.2
	Female	92	50.8
	Missing	10	–
Age (years)	18–24	6	3.3
	25–34	15	8.3
	35–44	22	12.2
	45–54	61	33.7
	55–64	42	23.2
	65+	35	19.3
	Missing	10	–
Health provision role	Yes	39	21.5
	No	142	78.5
	Missing	10	–
Highest level of education achieved	Primary/secondary school	57	31.5
	Certificate or advanced diploma	50	27.6
	Bachelor's degree	35	19.3
	Graduate certificate or diploma	21	11.6
	Postgraduate degree	18	9.9
	Missing	10	–
Sport*	Team ball	67	35.1
	Racquet	65	34.0
	Target	18	9.4
	Stick/bat	11	5.8
	Individual athletics/running†	7	3.7
	Wheeled non-motor	6	3.1
	Horse	6	3.1
	Other‡	28	14.7
Club/facility location	Metropolitan—one location	51	26.7
	Metropolitan—multiple locations	32	16.8
	Regional—one location	65	34.0
	Regional—multiple locations	38	19.9
	Other	5	2.6
Participants' role in club/facility†	Manager/committee/board/administration	143	74.9
	Participant	60	31.4
	Parent	35	18.3
	Coach	24	12.6
	First aid provider	11	5.8
	Team manager	9	4.7
	Facility manager	8	4.2
	Other	11	5.8
Previous training with an AED	Yes	83	43.9
	No	105	55.6
	Can't remember/missing	3	0.5

Continued

Table 1 Continued

Item	Responses	n	Valid responses (%)†‡
Knowledge of SCA	I know someone personally who experienced SCA	30	15.9
	I have witnessed someone experiencing SCA	18	9.5
	Both of the above	25	13.2
	Neither of the above	111	58.7
	Other§	5	2.6
	Missing responses	2	–
Have you ever used an AED in an emergency?	Yes	9	4.8
	No	180	95.2
	Missing responses	2	–

*Multiple responses were possible.

†Parkrun, orienteering, athletics.

‡Combat, snow sports, multiple sports, wheeled motor sports, aircraft and other activities.

§Includes cardiac arrest survivors and clinical staff working in emergency care.

¶Valid responses includes only those participants who provided a response to that question.

AED, automated external defibrillator; SCA, sudden cardiac arrest.

differ between healthcare providers and those not in healthcare roles.

The potential emergency scenarios for requiring an AED are presented in table 3, with the preferred response shown in the shaded cells. For the most part, the largest proportion of responses matched with the preferred answer, with the exception of being unsure how to respond in the situation described as ‘a participant falls to the ground and is making shaking movements.’ Finally, respondents were asked to put themselves in the role of club health and safety officer and asked about practical issues with the AED. Two in five (40%) participants

responded yes or unsure to the battery having a 20-year lifespan. Further, 10% of respondents answered that the location of the AED should be known only to trained club members.

DISCUSSION

With the growing promotion of the role of AEDs in Australian community sport, there is a need to consider how best to implement and integrate them into daily practices. The DSCF-Program provided a unique opportunity to undertake research across a broad range of sports in the Victorian community sports setting. The overarching

Table 2 Willingness and confidence in first aid and AED provision in emergencies (n=181)

Statement	Response	Healthcare role (%)	No healthcare role (%)	P value*
If I saw a person requiring urgent medical assistance, I would do all I could to help.	Agree	20.4	74.6	0.96
	Disagree	1.1	3.9	
I am not very confident about performing CPR in an emergency.	Agree	6.1	39.2	0.02
	Disagree	15.5	39.2	
An AED is easy to use.	Agree	19.3	71.8	0.73
	Disagree	2.2	6.6	
If I found a person unconscious, I would not hesitate to initiate use of an AED.	Agree	18.2	70.7	0.33
	Disagree	3.3	7.7	
Since doing the training course, I feel more confident to handle an emergency situation.	Agree	16.0	69.1	0.03
	Disagree	5.5	9.4	
I would only use an AED if there was no one else around.	Agree	6.6	23.2	0.86
	Disagree	14.9	55.2	

For questions in bold text, there was a statistical association between the response and health role (or not) of the respondent.

*Fisher's exact test.

AED, automated external defibrillator; CPR, cardiopulmonary resuscitation.

Table 3 AED use in emergency scenarios and practical issues with the AED

Statement*	Yes, I would call for the AED		Uncertain, I'm not sure if the AED would be needed		No, I would not call for the AED	
	n	%	n	%	n	%
In what situation would you consider the possibility to initiate use of an automated external defibrillator (AED)?						
1. A participant falls to the floor suddenly with no competitors nearby.	103	56.6	72	39.6	7	3.9
2. A participant falls to the ground and is making shaking movements.	46	25.3	79	43.4	57	31.3
3. You find a participant on the floor of the changing room, with occasional breaths but you are unable to find a pulse.	157	86.3	19	10.4	6	3.3
4. You find the coach sitting on the bench, unresponsive.	124	68.1	45	24.7	13	7.1
5. A participant takes a knock to the chest from another player/equipment and they fall to the floor, holding their chest and screaming in pain.	30	16.5	56	30.8	96	52.8
	True		Uncertain		False	
You have been appointed your club's health and safety officer. What is true about your AED?						
1. The pads have a use by date but the battery lasts for a minimum of 20 years.	38	20.9	38	20.9	106	58.2
2. Once used, the pads can be cleaned with soapy water and then put back with the AED machine for next time.	13	7.1	30	16.5	139	76.4
3. The location of the AED should be known only to trained club members.	18	9.9	3	1.7	161	88.5
4. Some minimal training in CPR and defibrillation is necessary before a person is allowed to use the AED.	52	28.6	15	8.2	115	63.2
5. No training is necessary to use the AED in an emergency scenario.	105	57.7	25	13.7	52	28.6

*Shaded cells show the preferred response choice for each scenario. CPR, cardiopulmonary resuscitation.

aims of the DSCF-Program were to enhance access to an AED at sports facilities and to expand the number of community members with training in use of an AED. These aims were achieved by the programme in that half of the respondents had no prior training with an AED and the delivery provided access to AEDs at multiple sites across the state. More in-depth investigation is required to ensure that knowledge from the training programme is retained and that devices are indeed accessible and integrated into the club/facility EAPs.

One of the key findings from this study is that one-third of the respondents did not know whether their sports club/facility had an EAP, despite the review of this documentation being a requirement of club participation in the DSCF-Program. Some respondents knew their club/facility had a plan but had no knowledge on how to access it. Such limitations to access could be critical in a life-saving situation. The DSCF-Program stipulated the review and revision of club safety procedures as a requirement, but it appears this was difficult for clubs to enact. The proportion of clubs with written EAPs is in line with research from the early 2000s into first aid safety policies and practices,¹⁷ indicating there is still a need to improve this element of risk management in community sports settings. Further, 10% of respondents answered that the location of AEDs should be known only to people who had been training and 29% responded that training was required before someone could use the AED. Both assumptions are inconsistent with preferred practice and suggest that additional information or new methods for its delivery need to be considered in the first aid training.

Knowledge of AED use

The level of knowledge about basic AED operation was generally good following training with survey respondents correctly identifying most scenarios for AED use. The medical emergency scenarios were designed such that good practice would see the AED called for in all scenarios where someone is unresponsive, on the premise that this saves time if the AED is ultimately required (keeping in mind the ideal time from someone collapsing to receiving an initial shock if required should be within 3–5 min). Therefore, a response of yes or unsure was preferred for items 1–4: participant falling to the floor suddenly; participant falling to the ground with shaking movements; participant found on the floor in the changing room; and the coach found unresponsive (refer to table 3). These scenario questions were generally well answered. Scenario 5 (*participant with chest impact falls to floor, screaming in pain*) is the only one that would immediately be ruled out of needing an AED (as the participant is clearly responsive), which half of the respondents recognised. A response to scenario 5 of 'yes' or 'unsure' was considered a better choice than a response of 'no' to any of the other scenarios (1–4).

The scenarios featured signs/symptoms that can occur during an SCA that can be confusing for first responders, including involuntary shaking-type movements (akin to a seizure) or occasional breaths.¹⁸ The description of a participant continuing to make shaking movements resulted in incorrect responses or confusion, with 31% not calling for the AED and 43% being unsure. Further, while only a small proportion overall, 4% of participants

failed to recognise the more commonly described scenario of SCA in sport, where a participant falls to the floor for no apparent cause. For a general first aid provider in a sports setting (ie, with no healthcare background or prior knowledge and experience), education and training can simplify the assumed need for the AED, rather than needing to make a decision under pressure. In essence, an unresponsive individual or where someone falls to the ground, with no obvious cause, is best assumed to be SCA and an AED promptly made available.

Emergency action plans

Additional requirements for maintenance of the AED need to be included within EAP documentation. One in five respondents indicated that batteries can last for up to 20 years and a further one in five were unsure. While checking a battery is a seemingly simple task, there is still a need for a structured routine for AED maintenance; the situation of AEDs without operational batteries could be catastrophic. The fact that this can, and has occurred,¹⁹ stresses the importance of documented responsibility for AED maintenance as an essential component of ownership. The content and procedures of the EAPs prepared by clubs/facilities were not evaluated in this study. Previous research exploring EAPs linked to sport has mostly been reported for the US school and college settings.²⁰ In Australia, few clubs/facilities will have full-time access to all required first aid personnel and be able to meet all demands of safety policies and practices.¹⁷ In such settings, the development and enactment of an EAP typically falls on a largely volunteer-based board.²¹ Clubs therefore rely and draw on members' specific skill sets (eg, those with a medical background) or by modelling EAPs and safety resources from their workplaces.¹⁴ A freely available medical emergency planning guide, developed by Sports Medicine Australia,⁶ was provided to clubs in the DSCF-Program as a start point on which to prepare their EAP. Despite this, it appears clubs still had challenges with updating their EAP and making it available.

Strengths and limitations

This is the first study to consider AEDs in a broad Australian community sports setting. Respondents covered a range of sports, age groups and backgrounds, with a mix of men and women, regional and metropolitan areas, and people with and without healthcare backgrounds. While this broad representation was a positive, the overall response to the survey was modest at 22% and there is a risk of respondent bias in those who took part. More than half of respondents were in a management or committee role, which may not reflect the everyday member of a club/facility, but rather, someone with more insight of the procedures and processes. In this case, the results present an overestimation of the positive elements of the study, in other words, this is likely to be the best-case scenario for club/facility member knowledge. Ideally, assessment of participant knowledge, confidence and

willingness to use an AED would be addressed before and after participation in any training programme or delivery of an AED (test-retest design), with standardised training. This was not possible within the time frames of this evaluation but would be of value to gain further insight to the new information that is identified and retained by participants. Similarly, more robust evaluation using standardised delivery of the training materials would be useful to ascertain specific improvements for education and training.

CONCLUSION

An AED is an important tool in responding to a medical emergency in sport. However, the AED can only be effective when people are confident with the broader emergency response process (including calling for an ambulance), when people know where to locate the AED and the AED has been properly maintained. For this reason, training and an update of the club/facility EAP was a requirement of the DSCF-Program. Results from this evaluation were positive in that half of the respondents were newly trained in use of an AED and for the most part, indicated they were willing to intervene in an emergency situation, if required. However, there is substantial room for improvement with the development, dissemination and updating of EAPs. Consideration of whether this latter process is a facility, club or individual responsibility will allow appropriate support to EAP development in future programme delivery. Ultimately, an emphasis on the education and emergency process for sports clubs/facilities is of equal, if not more, importance than reliance on any device (AED).

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Contributors All authors made substantial contribution to the information and material submitted and have read and approved the final version. LVF, CFF and DM designed the study and were awarded funding for the larger programme of work to which this study contributes. LVF performed the data collection, analysed the data and wrote the manuscript. CFF, DM and LW assisted with the data collection, interpretation of results and critical insights for the manuscript.

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