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Reliability, sustainability and effectiveness of automated external defibrillators deployed in workplaces and public areas

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In Australia, sudden cardiac arrest (SCA) is a leading cause of death. Prompt defibrillation increases the likelihood of people surviving a cardiac arrest away from a hospital. However, owing to ambulance response times (especially in built-up metropolitan areas), by the time emergency defibrillation arrives, it may be too late to save the victim. Consequently, having a wide distribution of automated external defibrillators (AEDs) available for employees at workplaces and the public in general is essential to saving lives. However, the situation in Australia is dire. Even though perhaps more than 30,000 people die from SCA every year in Australia, there is scant distribution of defibrillators — either at the workplace or in public places. As AEDs gradually become more widely distributed, it is important that government policymakers and employers ensure that routinely maintained and monitored AEDs are correctly deployed at properly identified locations, with adequate numbers of trained rescuers. Further, public education programs aimed at increasing the awareness of how to use a defibrillator in an emergency situation would assist in empowering bystanders to be first responders.

KEYWORDS

- CARDIAC ARREST
- DEFIBRILLATORS
- TRAINING
- WORKPLACES
- PUBLIC PLACES

Introduction

In Australia, as in the United States, sudden cardiac arrest (SCA) is a leading cause of death. In the US, according to fairly reliable estimates, there are up to 350,000 SCA deaths annually,^{1,2} whereas in Australia, the number of people who die from SCA is not known (with the nearest estimates ranging from 23,000 to 33,000 deaths per year).^{3,6} Even though the precise number of annual deaths is not known, according to Errol Carey, Chief Executive Officer of St John Ambulance, Queensland:

“Sudden cardiac arrest kills more Australians each year than breast cancer, shootings and road crashes combined and can happen anywhere, to anyone — young or old, man or woman — and often without any warning ... About 75% of arrests happen away from hospital and the survival rate for such incidents is just 6% ... The scary thing is that the chances of survival for any person who has had an SCA decreases by 10% for every minute the heart is in ventricular fibrillation.”⁶

This means that, after 10 minutes without action, the person who has had the SCA has virtually no chance of surviving.⁶

Separate data are not kept for the number of workplace SCA deaths in Australia and, for OHS purposes, this makes identifying the hazards and controlling the risks very difficult. However, highly variable US workplace data suggest that between 4.5% and 13% of all cardiac arrests in the US occur at the workplace.^{7,8} More research is required to establish the proportion and number of SCA deaths that occur in Australian workplaces. According to the Australian Resuscitation Council, the chance of survival from an out-of-hospital cardiac arrest in Australia is less than 10%, and cardiopulmonary resuscitation (CPR) and early defibrillation are key factors that can significantly improve the chance of survival from cardiac arrest.⁹ Errol Carey’s comments mirror the Australian Resuscitation Council’s position: “Defibrillation is the only real chance people have of surviving an arrest away from

a hospital ...”⁶ However, owing to ambulance response times (especially in built-up metropolitan areas), by the time emergency defibrillation arrives, it may be too late to save the victim (that is, for every minute lost, the chance of survival diminishes exponentially). Consequently, having a wide distribution of automated external defibrillators (AEDs) in locations where large numbers of people regularly gather would contribute to reducing the death rate from SCA. However, the situation in Australia is dire. Even though perhaps more than 30,000 people die from SCA every year in Australia, there is scant distribution of defibrillators — either at the workplace or in public places.

As AEDs gradually become more commonplace, it is important that policymakers and employers ensure that AEDs are correctly deployed at properly identified locations with adequate numbers of trained rescuers. Furthermore, the public at large should at least be made aware of how they can apply a defibrillator in an emergency situation (notwithstanding that some studies of public access defibrillation (PAD) programs in the US, the United Kingdom and, most recently, Australia, demonstrate that untrained people may be less likely to apply an AED for a variety of reasons, as discussed below).

A related and key issue is to ensure the reliability of AEDs. A longitudinal study in the US found that more than 21% of all AEDs and AED accessories examined between January 1996 and December 2005 (numbering 385,922) were affected by electrical or software problems.¹⁰ The authors based this finding on an analysis of weekly US Food and Drug Administration (FDA) enforcement reports for the 10-year period to identify all recalls and safety alerts (collectively referred to as “advisories”) for AEDs and AED accessories (see Table 1).¹¹

In Australia, the number of AEDs deployed and their reliability rates are unknown. In order to minimise out-of-hospital SCAs, a twin deployment model of maintained and remotely monitored AEDs is required in Australian public areas and workplaces. Deployments should be supplemented with an

TABLE 1
Type and frequency of automated external defibrillator (AED)
and AED accessory advisories

<i>Reason for advisory</i>	<i>Number (%)</i>	
	<i>AED advisories</i>	<i>AED units affected</i>
Battery	3 (8.1)	20,651 (12.6)
Capacitor	3 (8.1)	6,840 (4.2)
Electrical	8 (21.6)	31,906 (19.4)
Failure to detect*	4 (10.8)	31,963 (19.5)
Failure to shock*	5 (13.5)	51,545 (31.4)
Miscellaneous hardware	4 (10.8)	6,439 (3.9)
Software	6 (16.2)	12,311 (7.5)
Other	4 (10.8)	2,447 (1.4)
AED total	37 (100)	164,102 (100)

	<i>AED accessory advisories</i>	<i>AED accessory units affected</i>
Battery accessory	3 (20)	5,916 (2.7)
Cable	7 (46.7)	148,243 (66.8)
Labelling	1 (6.7)	16,736 (7.5)
Pads	4 (26.7)	50,925 (23.0)
AED accessory total	15 (100)	221,820 (100)
AED and AED accessory total	52 (100)	385,922 (100)

* More specific mechanisms of potential failure were not reported. These advisories may be due to hardware or software abnormalities.

Source: This table is based on Shah, JS and Maisel, WH, Recalls and safety alerts affecting automated external defibrillators, *JAMA* 2006, 296(6): 655-660, at p 657.

adequate cohort of trained first responders (10 per AED), particularly in workplaces where first aiders can be more easily identified. However, in situations where only untrained bystanders are available, these people can successfully apply defibrillation therapy due to the electronic prompts and “smart systems” of contemporary defibrillators which analyse the victim’s heart status and instruct bystanders on how to proceed (even in the event where no shock is required). A comprehensive federal government campaign to publicise the failsafe capacity of most contemporary AEDs would help to alleviate the hesitancy of untrained bystanders to use and apply them to SCA victims. Further, in the interest of enhancing SCA survival rates, each government of Australia’s nine jurisdictions should comprehensively publicise that “good samaritan” legislation protects all SCA responders from litigation should the rescue attempt fail.

Public access defibrillation

Two large-scale PAD trials in the UK and the US have demonstrated that public access to defibrillation has the capacity to save lives, even if untrained members of the public apply the AED to the victim.^{12,13} In Australia, one (numerically) small longitudinal study conducted by Wassertheil et al of events at the Melbourne Cricket Ground (MCG) and the Shrine of Remembrance between 1989 and 1997 also supports the efficacy of PAD:¹⁴

“Twenty-eight cardiac arrests occurred between December 1989 and January 1998. Of these, 25 episodes were situated at the MCG and three at the Shrine of Remembrance. The incidence of cardiac arrest at the MCG site was 1:500,000 patron admissions. Of the 28 patients, 24 (85.7%) were successfully resuscitated at the venue. Subsequently, 20 (71.4%) were discharged home from hospital. Age ranged

from 23 to 83 years (Mean: 64.57. SD: 10.86. Fig. 1). CPR was commenced on 26 patients (92.1%) within 2 min of the time of documented collapse. The two cases where CPR was delayed occurred in the MCG Stadium car park prior to the commencement of the event and before amalgamation of equipment and deployment of personnel.”¹⁵

Wassertheil et al’s pioneering study also points to one of the main objectives of the present article concerning the role of trained lay persons as well as “other responders” (that is, untrained members of the public):

“The term ‘first responder’ is a relatively new term, which has been coined to describe a trained provider of first aid working within a medically accountable system [32]. Although the term is new, the providers and the system, such as a first aider working within the SJAA [St John Ambulance Australia] Operations Branch, have existed for decades. Owing to the advent of shock advisory defibrillators, first responder capabilities from training and service delivery have been broadened and continue to develop. With further evolution of technology, it should be possible for untrained citizens to be advised by an SAED [semi-automated external defibrillator] machine of the steps to be followed to defibrillate patients in cardiac arrest whilst the machine simultaneously electronically alerts the ambulance of its activation and location.”¹⁶

A more recent PAD project sponsored by the federal Department of Health and Ageing mirrors the findings of these earlier trials. The PAD Demonstration project indicates that governments and employers have a role to play in ensuring that members of the public and employees at their workplace do not die from preventable deaths, that is, by installing AEDs at accessible locations. In this trial, St John Ambulance Australia (St John) was engaged by the department to design and implement the project. A total of 147 AEDs were installed by St John (largely at airports, train stations, tourist sites (such as zoos), schools,

shopping centres, sporting stadiums and clubs (such as local golf or bowling clubs)), with 98 public and private organisations participating in the trial.¹⁷ Most of these AEDs were installed between May 2007 and June 2008.¹⁸ The efficacy of this limited trial is shown by the 20 reported AED activations that resulted in shockable rhythms (that is, where the victims’ heart responded to defibrillation). Of these, “10 victims survived to ambulance handover (three later died in hospital)” — which suggests that seven lives were saved.¹⁹

Specifically, St John’s role was to:

- establish the PAD Demonstration in Australia;
- encourage organisations to participate in the project;
- ensure the appropriate installation of AED devices in host organisations;
- provide quality training in the use of the AED devices and other valuable first aid skills to selected first responders at host organisations; and
- monitor the use and efficacy of the devices.¹⁸

While St John is a renowned first aid and training provider, elements of the final report prepared by Campbell Research & Consulting for the Department of Health and Ageing suggest that St John may not have had the expertise or the resources to adequately design and implement the PAD Demonstration according to the department’s requirements.

Key findings in the final report suggest that the essential objectives of the PAD initiative were not met. For example:

“The PAD Demonstration has shown that the appropriate and effective installation of AEDs can save lives — but it has been used by trained first responders rather than untrained staff or members of the public.”¹⁹

Clearly, notwithstanding the general reluctance by untrained members of the public to use an AED, a PAD program that is not used by members of the

public cannot be deemed to be successful in this regard. The final report liberally relies on a literature review from a UK study that was conducted by Clare “to ascertain the evidence for effectiveness of Public Access Defibrillation Programmes using any level of first responder”.²⁰

Based on an overview of 22 studies on PAD and related programs, Clare concluded that there was some evidence for the efficacy of PAD programs and that they had a small, but noticeable, positive effect on survival rates for victims who have had an SCA in public places. Clare’s observational findings are at odds with research results from first-hand reporting on the deployment of AEDs which found that PAD programs significantly produce increased survival rates.¹⁴ In the UK, a 2007 report on the national defibrillator program (by 2007, 110 sites had received 681 AEDs and more than 6,000 people had defibrillation training under this program) claimed that: “The overall aim of the programme is to increase the proportion of people who survive a public cardiac arrest to one in five.”¹³ The late Jeff Wassertheil (Associate Professor and director of emergency medicine at Frankston Hospital, and a foundation director of the Cardiac Arrest Survival Foundation) consistently claimed that, as a conservative estimate, 25% of out-of-hospital cardiac arrests could be survived with appropriate access to public access (and workplace) defibrillation. To this end, the Cardiac Arrest Survival Foundation is dedicated to reducing the number of needless SCA deaths in Australia by facilitating the adoption of cardiac responder systems in the home, workplace and public areas and by increasing public awareness and contributing to public policy. The foundation is in the process of establishing the Australian Cardiac Arrest Registry to determine the number of SCAs occurring in Australia.²¹

Clare also found that many of the studies in the literature review incorporated bystander CPR training as part of their interventions. The presence of people with CPR training was reported to have a far greater effect on survival rates compared with PAD alone (that is, without training). Clare’s article concluded: “Thus without increased rates of

bystander CPR and faster response times it is almost certain that the benefits of level one PAD programmes will never be realised.”²² Clearly, Clare’s admonition indicates that fully effective PAD programs must incorporate public awareness campaigns about defibrillation and training of potential responders, whether they are untrained bystanders, trained members of community groups, or trained employees at workplaces or at public places.

Frequently, public places are also workplaces (such as those in the PAD Demonstration, which included airports, train stations, tourist sites, zoos, schools, shopping centres, and sporting stadiums and clubs). Having trained employees at these sites improves a person’s chances of surviving an SCA. As well as having an adequate number of trained responders at hand, locating AEDs in highly visible and readily accessible places is also essential in providing quick response times. Disappointingly, the final report of the PAD Demonstration does not report on the importance of visible and accessible AEDs. The author of the present article was made aware of this by a trainer who discovered that, when she undertook training subsequent to the PAD Demonstration, out of the 10 staff who were about to be trained, one did not know that the site had an AED and three did not know its location.

This lack of knowledge points to another omission relating to the ownership of the AEDs issued by St John for the PAD Demonstration. Through the funding model organised by the federal Department of Health and Ageing for the PAD Demonstration, St John purchased the AEDs, arranged their installation, and provided training for their deployment. However, whether St John, the distributor, the recipient organisation (which conceivably became the owner), or the manufacturer/importer/supplier was responsible for the maintenance of the defibrillators was apparently not made clear. Given the finding from the longitudinal study cited above that more than 21% of AEDs examined between 1996 and 2005 were affected by electrical or software problems, a lack of a regular maintenance regime is likely to result in an

AED which cannot deliver a therapeutic shock when it is most needed. At a workplace, not knowing who is responsible for the maintenance of an AED is likely to breach OHS legislation. For example, under the New South Wales *Occupational Health and Safety Act 2000*, employers, designers, manufacturers and suppliers of plant for use at work have particular duties of care. Under section 8, an employer's duty includes:

- “(b) ensuring that any plant or substance provided for use by the employees at work is safe and without risks to health when properly used,
- (c) ensuring that systems of work and the working environment of the employees are safe and without risks to health ...”

Under section 11, designers, manufacturers and suppliers of plant and substances for use at work must:

- “(a) ensure that the plant or substance is safe and without risks to health when properly used, and
- (b) provide, or arrange for the provision of, adequate information about the plant or substance to the persons to whom it is supplied to ensure its safe use.”

In addition, the duties under section 11:

- “(a) apply only if the plant or substance is designed, manufactured or supplied in the course of a trade, business or other undertaking (whether for profit or not), and
- (b) apply whether or not the plant or substance is exclusively designed, manufactured or supplied for use by people at work, and
- (c) extend to the design, manufacture or supply of components for, or accessories to, any plant for use by people at work, and
- (d) extend to the supply of the plant or substance by way of sale, transfer, lease or hire and whether as principal or agent, and
- (e) extend to the supply of the plant or substance to a person for the purpose of supply to others ...”

In Australia, the likelihood of a defective AED not being detected is exacerbated by the reporting system used by the Therapeutic Goods Administration (TGA). As a result of this system, the Zoll AED Plus Defibrillator (manufactured by the Zoll Medical Corporation in the US) had still not been recalled in Australia at the time of publication of this article (October 2009) — seven months after the AED had been recalled in the US. However, the TGA has an internal process in place under which it did notify the NSW Department of Health of the recall in March 2009. Nevertheless, it is important to note that, unlike in the US, this was not a Class I recall (the most serious category), but a Class II which is less serious.

This product (which was distributed and manufactured from May 2004 to February 2009) was recalled by the TGA's US counterpart, the Food and Drug Administration (FDA). The reason given by the FDA for the recall or advisory was: “The AED failed to deliver the defibrillation energy.” In other words, it was not able to perform the function for which it was manufactured and, as a consequence, was classified under a Class I recall. The TGA places the responsibility for reporting any problems with sponsors (that is, those who are responsible for the supply of a medical device in or from Australia and manufacturers — in other words, the suppliers or manufacturers under the auspices of the *Therapeutic Goods Act 1989*, the *Therapeutic Goods Amendment (Medical Devices) Act 2002*, and the *Therapeutic Goods (Medical Devices) Regulations 2002*). In Australia, Zoll Medical Australia Pty Ltd is the importer of the Zoll AED Plus Defibrillator. However, at the time of publication of this article, there was no mention on the organisation's website of the product's US recall notice. When contacted at the time of writing in August, a company representative informed the author that the TGA had been advised of the FDA recall notification in February 2009 — yet, other than the NSW Department of Health recall notice, that is, a “safety notice”, no equivalent public notification has been posted on the TGA website. The department's internal processes recommend that key

departmental hospital officers are informed and that the relevant “areas” receive letters of actions required from the sponsors as identified by the TGA.

On its website, the TGA states:

“Once a medical device has been approved for supply it is necessary to make sure that the product continues to meet all the regulatory, safety and performance requirements and standards that were required for the approval. This is in addition to ensuring that any problems with the product are dealt with and reported through appropriate channels.”²³

These requirements are quite specific and are further outlined in the TGA document, *Australian Medical Devices Guidelines Postmarket Activities*.²³ This guidance document details the obligations and responsibilities of sponsors and manufacturers of medical devices after they have been approved for supply in Australia. The document stipulates that:

“The sponsor is responsible for ensuring that the manufacturer of the medical devices has procedures in-place for the introduction and maintenance of the post-marketing surveillance system. They should also have procedures to:

- collect information from users about incidents and the performance of devices and send this information to the manufacturer (section 41FN of the Act);
- report details of certain incidents and performance issues to the TGA (section 41FN of the Act);
- report any overseas regulatory actions to the TGA if the product involved from the same batch or production run was supplied in Australia (section 41FN of the Act);
- report results of investigations undertaken by the manufacturer to the TGA (section 41FN of the Act);
- assist the TGA and the manufacturer in the investigations (section 41FN of the Act);

- follow-up action taken under the Vigilance System (section 41KA of the Act); and
- maintain distribution records for product supplied in or exported from Australia (section 41FO of the Act).²⁴

With regard to the Zoll AED Plus Defibrillator, neither the sponsor nor the manufacturer has met the full requirements of the legislation so far. The reason offered by Zoll Australia is that its “on-sellers” (distributors) have not in every instance put the recall notification into effect. This issue has resonance with the way in which most brands of defibrillators are sold in Australia, that is, by on-sellers who may or may not pass on recall notifications.

The PAD Demonstration is a case in point. Although the brand of defibrillator distributed was not Zoll, St John is the distributor for the PAD Demonstration. It is not clear whether any of these units have had to be recalled or whether any had faults, as no mention is made of this in the final report. The final report states: “St John recommends that a designated site coordinator performs maintenance checks on the AED on a weekly basis.”²⁵ However, maintenance checks were carried out by only half of the organisations on a weekly basis. Clearly, in the absence of adequate maintenance procedures and uncertain follow-up of recall requirements under TGA legislation, an unknown number of unmonitored defibrillators in and outside of the PAD Demonstration may be inoperable.

When the TGA website was reviewed for recall notices between 2001 and 2008, no medical device recalls were found.²⁶ A report of a Heartstream M4735A Monitor/Defibrillator which had failed to fire (sic) as expected was reported in the 2003 *TGA News*, but for the partially overlapping period examined by Shah and Maisel, they found that: “Automated external defibrillators were recalled in 9 of the 10 study years, and AED accessories were recalled in 7 of the 10 years studied. No year was advisory free.”^{27,28} Further, there were 37 AED advisories (excluding those for accessories) and, of

those, four advisories (affecting 10.8% of recalls) were classified by the FDA as class I (reasonable probability that use of the product will cause serious adverse health consequences) and 31 advisories (affecting 83.7% of recalls) were classified as class II (use of the product may cause temporary or medically reversible adverse health consequences or the probability of adverse health consequences is remote).²⁹ See Table 1 for the types of advisories and the parts affected.

Workplace access defibrillation

As well as the issue of reliability, the accessibility of AEDs in the workplace and in public places is also a significant factor in ensuring that, when an SCA incident occurs, the device is readily available. As a primary prerequisite, AEDs should be placed in prominent locations where they are easily visible and correctly identified. Unfortunately, not all of the AEDs provided by St John under the PAD Demonstration meet these requirements. At some of Australia's airports, for example, although defibrillators are encased, the protective enclosure is placed too high for disabled people to access them, and the signage does not meet the requirements of Australian standard AS 1319 in that it does not conform with the required emergency colours of white on a green background.³⁰ Although contravention of this requirement at workplaces is relatively minor, there are far more serious issues surrounding inaccessibility.

The author is aware of a large deployment of defibrillators on the construction sites of a multinational construction company. Many are kept in sheds under lock and key in order to prevent theft and malicious damage. But, rather than locking them away out of sight, the AEDs should be secured in a fully monitored, highly conspicuous (but unlocked) cabinet. By not having AEDs in prominent places, the consequence is similar: whether in office environments (where defibrillators may be kept in desks or filing cabinet drawers, either locked or unlocked), in construction site sheds, or in

any other workplace, AEDs are likely to be partially or totally forgotten, especially when a few or no potential rescuers are trained. Even more seriously, if AEDs are inaccessible (particularly if the key holder is not at work), this is likely to result in a preventable death.

Another aggravating factor in the construction industry is that, due to the fluctuating nature of the workforce, unless defibrillators are prominently identified and displayed, frequently employees will not know where AEDs are located — let alone that they have them on site. Typically, in this situation, defibrillators are not regularly inspected and/or maintained, and their batteries may have passed their life expectancy (which is four years in superior models). These circumstances account for a substantial number of the 21% of faults found by Shah and Maisel in all brands of the 385,922 defibrillators and accessories in the US: 12.6% of those examined had faulty batteries; 19.4% had electrical faults; 19.5% failed to detect whether the administration of a shock was required; and 31.4% failed to shock (see Table 1).²⁸

Having AEDs at accessible locations with a dedicated and direct emergency communication system is also essential. One well-known outdoor sporting facility had only deployed a small number of stand-alone AEDs (that is, without a dedicated communication system) at the clubhouse and some remote locations. A cardiac emergency occurred a long distance from the clubhouse and, owing to a number of complications that are common to stand-alone communication systems, an SCA victim died, probably needlessly. At this sporting facility, as well as at some workplaces (such as construction sites), AEDs are correctly placed near the centre of people's activity in order to save precious time when the defibrillator is needed. However, many of these deployments rely on stand-alone emergency communication systems, of which several proprietary brands are currently available. Reliance on these communication systems can result in delays in getting emergency services (such as an ambulance) to the victim because, even if a victim is defibrillated, they may need immediate paramedical

attention and further specialised hospital treatment and care. There are a number of reasons why these stand-alone communication systems may fail, including: they may be misused for non-emergency situations (such as when members at the abovementioned sporting facility used the system for ordering drinks from the clubhouse); and, typically, no adequate training is provided for proper use which, when added to frivolous use, may result in the responder (at the sporting facility, a receptionist) dismissing the seriousness of the communication, as well as not knowing what to do in an emergency situation. Clearly, having a dedicated communication system which automatically alerts the appropriate emergency services is essential.

These communication flaws graphically illustrate the need to have well-allocated and identified AEDs that are supported by the correct number of trained rescuers, as well as a public awareness program. The examples above demonstrate that the communication system should have the capacity to pinpoint precisely where the emergency is taking place. The system should be able to be connected to a 24-hour control room which checks the AEDs' operability status every day in order to detect the common AED faults found by Shah and Maisel. The control room operators should also automatically alert the appropriate emergency services after verifying with the responder that the AED was removed from its cabinet to rescue a victim and not for frivolous or other non-essential purposes (including theft). To the knowledge of the author, only one fully monitored AED enclosed in a secure cabinet with year-round monitoring and a dedicated emergency response system is available in Australia (supplied by Cardiac Responder).

As far as the author is aware, there are only two large-scale deployments of fully monitored and securely enclosed AEDs in the Australian transport industry and one in the construction industry. In the transport industry, RailCorp NSW has deployed AEDs in key locations at selected railway stations, in CountryLink trains, and in some buildings. RailCorp has also sponsored the deployment of

three AEDs at public locations — thereby promoting awareness of PAD. Each AED is connected via a communication network to a 24-hour control room, electronically checked daily for operability, and alarmed so that an emergency response is triggered if the AED is removed. In addition, these units have the requisite number of trained people (10 for each), as well as annual refresher training and medical oversight for every SCA event.

Qantas has also installed AEDs in its main office locations, engineering hangars, and freight terminals. These Qantas AEDs have the same comprehensive program, including training, maintenance and communication regimes, as well as medical oversight. Qantas also led the aviation industry by being one of the first airlines to install defibrillators on its aircraft, and now has semi-automatic external defibrillators on all of its domestic and international fleets. In the construction industry, Laing O'Rourke has also deployed AEDs, with identical training requirements and medical oversight. In addition, Laing O'Rourke has sponsored the deployment of four AEDs at public locations, principally with volunteer community organisations such as the Dural (NSW) Volunteer Fire Service under its sustainability program, EPIC, to develop and implement a community engagement framework. Employee advocate groups are also becoming aware of the necessity of fully monitored AEDs. In this regard, the Construction, Forestry, Mining and Energy Union (NSW Branch) is a pioneer — currently endorsing the deployment of AEDs on all construction sites.

Notwithstanding the concern that these organisations have shown for the safety and welfare of their employees, members and customers (as well as the social corporate responsibility that they demonstrate by recognising the importance of PAD), the availability of reliable and accessible AEDs is inadequate. Clearly, public awareness needs to be raised, making it clear that (perhaps) the equivalent of two busloads of people die needlessly every day of the year. Further, legislation needs to be

put in place at the federal and state/territory levels to regulate public and workplace deployments of reliable and accessible AEDs (supported by adequate training). In this respect, Australian governments could emulate the Act legislated by President Clinton under which all federal buildings and facilities have to have AEDs.³¹

In the US in June 2006, the Occupational Safety and Health Administration (OSHA) issued the *Best Practices Guide: Fundamentals of a Workplace First-Aid Program* to help employers and employees develop workplace first aid programs.³² Part of the first aid program is devoted to the provision of AED training if an AED is available at the workplace. The guide is only advisory in nature (it is not a standard or regulation) and it creates no new legal obligations.³² According to OSHA:

“All worksites are potential candidates for AED programs because of the possibility of SCA and the need for timely defibrillation. Each workplace should assess its own requirements for an AED program as part of its first-aid response.”³³

This is powerful advice and Australia’s OHS regulators could adapt and adopt (preferably as part of one coordinated strategy for employer due diligence under the national harmonisation of OHS legislation) OSHA’s suggestions for generic CPR training and the application of an AED when needed. According to OSHA, every first aid training program should be designed or adapted for specific workplaces (in accordance with the specific hazard context of each workplace) and should include first aid instruction in:

- establishing responsiveness in a victim;
- establishing and maintaining an open and clear airway in a victim;
- performing rescue breathing;
- treating airway obstruction in a conscious victim;
- performing CPR; and
- using an AED.³⁴

Ideally, rather than merely complying with legislation, organisations should pre-empt it and, in alignment with sound OHS risk management practice, should proactively consider establishing policies and procedures to minimise preventable workplace deaths. Such programs could be designated EAD, that is, employee access to defibrillation, as opposed to PAD, that is, public access to defibrillation.

While not essential, AED training is preferable because more victims of SCA will be saved. Irrespective of whether workplaces have public access or not, CPR training that incorporates AED training can be given to employees and management alike. Reputable organisations can train existing first aiders and those who have not had any previous training to conduct CPR and apply the AED. However, many training organisations do not train enough potential rescuers (that is, only a few training organisations currently provide training for 10 potential rescuers per AED, and annual retraining). The reason why 10 should be trained is because rescuers may be absent from work for a number of reasons. Due to staff turnover, retraining is necessary to ensure that 10 rescuers per AED are always trained. Another essential attribute of ongoing training is that it raises awareness to the potential of SCA and how AEDs can minimise unnecessary deaths.

When purchasing or leasing defibrillators, there are a number of features that organisations should look for. All of the reputable brands should have voice instruction, and LED instruction for the deaf or where there is a lot of background noise (two brands in particular stand out in this regard). With the two brands that are fully automatic, a trained or untrained rescuer only has to apply the AED’s electrodes to the victim’s bare chest and the AED will apply the appropriate level of shock (it will not apply shock if it is not needed). Maintenance (as Shah and Maisel’s article suggests) is the chink in the armour of defibrillation programs. Consequently, organisations that intend to introduce AEDs should, in alignment with the hierarchy of controls, install defibrillators that are fully monitored (engineering

control), rather than defibrillators such as those advocated by St John in the PAD Demonstration which may or may not be fully functional when needed (administrative control).

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