

A defibrillator or not: an occupational health and safety dilemma – surviving sudden cardiac arrest in public places (the footy, cricket and casino) vs workplaces

Defibrillator Or Not?

Sudden cardiac arrest outside hospital is a confronting and challenging public and occupational health issue which encompasses significant legal implications. This paper explores the medico-legal dilemma that exists between advocated best practice in the management of sudden cardiac arrest, employers' duty of care to employees and others and the risk probability of such events in workplaces.

Finding a way forward appears to lie in employers/corporate entities/workplaces assessing the risk of SCA occurring and the provision of legislative protection from litigation where evidence of low risk is documented and the decision taken not to provide defibrillators on site.

Sudden Cardiac Arrest

In the adult Australian population, cardiovascular disease is still the greatest cause of death in the population, and equates to 46,626 in 2007 - 34% of all deaths recorded. Gender does not play too much of a role as 47% of these cardiovascular deaths were male and 53% were female (1). Of these cardiovascular deaths, coronary heart disease is the largest single cause. About half of the cardiovascular deaths every year result from sudden cardiac arrest (SCA).

30,000 Australians die annually from sudden cardiac arrest (2).

Sudden Cardiac Arrest is often misunderstood. SCA is the abrupt cessation of normal blood circulation due to failure of the heart to contract effectively. Importantly, SCA is **not** a heart attack. This distinction is critical from a "recognition" point of view as people tend to confuse an "arrest" with an "attack". While both are medical emergencies, the person suffering a sudden cardiac arrest has only minutes to live.

A heart attack is a mechanical, pipe/plumbing problem, that is, where a coronary blood vessel (or vessels) becomes obstructed interrupting blood flow to a portion of the heart muscle. Sudden cardiac arrest however, is caused by an electrical problem.



Sudden Cardiac Arrest.

The heart's electrical system malfunctions and as a result, either chaotic abnormal electrical activity or no electrical activity occurs. The two most common, life threatening, arrhythmias are ventricular fibrillation (VF) and ventricular tachycardia (VT) (3). As a result of sudden cardiac arrest, heart function ceases, blood is no longer pumped around the body and death follows in a matter of minutes.

Survival from SCA

In Australia, the current survival rate from sudden cardiac arrest outside hospital may be as low as 3%, I can't be any more precise than this as there is a paucity of data with only one study being conducted in Melbourne to my knowledge. In Europe survival has been shown to be 10.7% and in the US it is 6.4% (4) (5) (6).

Response Times and Survival Rates.

Research has demonstrated however that if defibrillation is given within the first 3 - 5 minutes of a sudden cardiac arrest there is a 49-75% chance of survival (7). Conversely, with each minute after that the chance of success is reduced by a factor of 10%, with little chance of effective revival after 10 minutes (8).

Following sudden cardiac arrest there is a brief window during which an arrhythmia (VF and VT) may be treated by defibrillation. Defibrillation is the process of delivering an electrical shock to the heart muscle with the purpose of reverting these lethal arrhythmias and restoring the heart's normal sinus rhythm.

Defibrillation the Gold Standard.

Automated external defibrillators or AEDs are relatively inexpensive (around \$AU1000-2000), portable and simple-to-use, lifesaving, devices unlike the non-automated, external defibrillators used in hospitals, large medical centres and emergency departments.

AEDs incorporate savvy technology which provides visual and/or voice prompts to guide the operator in the necessary actions required to deliver the shock, that is – to attach electrode pads to the victim's chest. The pads then analyse the heart rhythm, decide the type of arrhythmia AND if the rhythm is a "shockable rhythm", instruct the operator to press the button which delivers an electric shock to the heart. No judgement is required by the operator, all that the operator needs to do is follow the machine's instructions. The specificity and sensitivity of the decision algorithm is 100%, in other words, the AED machine never delivers a shock when a non shockable rhythm is recorded (8,9)



Initiating a community response – the chain of survival concept

The availability of automated external defibrillation (AED) is a critical resuscitation link and this recognition has led to the development of a conceptual tool known as the "chain of survival" which is now used worldwide in planning effective emergency response systems (10).

The "chain of survival" principle of early defibrillation suggests that the first person to arrive at the scene of a cardiac arrest should have a defibrillator. For this reason, it is recognised internationally that first aiders and trained laypersons involved in public access programmes, which have a duty to perform CPR should also be trained, equipped and authorised to operate an AED (11).

Let's look more closely at the "chain of survival" strategy. As 85% of sudden cardiac arrest victims upon collapse are in VF or VT and as these arrhythmias respond well to defibrillation, they have a great chance of survival (12). However, conditions have to be right and time is a critical factor. A person's chance of surviving is dependent upon a strong "chain of survival" in his or her workplace or community.

The concept describes the critical emergency actions necessary when an unresponsive collapsed victim is not breathing and shows no sign of circulation.

Chain of Survival

Early access for emergency medical support (EMS) 000/911/999/112 etc

The second link Early cardiopulmonary resuscitation buys time by supplying oxygen to keep the brain and heart alive until defibrillation and other advanced care can restore normal heart action. Recent research has shown that with VF an initial period of CPR may actually improve the likelihood of shock success and survival (13) (14) (15).

Early defibrillation is the link in the chain most likely to improve survival as it often restores the normal heart rhythm.

The fourth - Early advanced care provided by highly trained emergency medical personnel such as paramedics (ambulance officers, MICA, paramedic, fire officers etc) who are trained to provide CPR, defibrillation and more advanced care such as administering cardiac drugs and complex airway management.



The first 3 links in the chain of survival – **Early access, Early CPR, and Early Defibrillation** are as strong as the rapidity and effectiveness of the actions of the first aider/first responder following assessment and recognition of a cardiac arrest.

The development of AEDs has made the concept of a community based response to out-of-hospital SCA practical and viable. Consequently the push across the world is for AEDs to be accessible for anyone to use when such an emergency occurs in public places. AEDs can now be found in planes, trains, shopping centres, airports, casinos and sporting arenas.

Importantly, research studies are numerous and the evidence strong, in demonstrating that, with public access defibrillation, the survival rates to discharge of neurologically intact individuals ranges from 40 to 73%.

Initiating a community response...

For example, international studies on AED effectiveness in casinos (16) and airplanes (17) found survival rates to hospital discharge were 53% and 40% respectively.

Australia's health – initiating structural change for survival

As mentioned earlier, Australia's survival rate from out of hospital cardiac arrest is poor. The Australian Resuscitation Council (ARC), Australia's peak body on resuscitation and a member of the International Liaison Committee on Resuscitation, through its policy guidelines, and active lobbying of federal and state/territory governments (6 states and 2 territories), advocates the introduction of AEDs into Australian public places and workplaces in line with world-wide resuscitation trends.

The Melbourne Cricket Ground (MCG) is known internationally as a public sporting venue. Each year over 1.5 million people attend a veritable feast of events from cricket and football to music and other diverse cultural gatherings. Crowd attendances have been known to exceed 100, 000 at a single event. The provision of first aid to the public, police and venue staff at the MCG is the responsibility of St John Ambulance volunteers. Their crews include a number of both standard first aid and defibrillation response teams.

Ground breakers MCG.

For over 13 years first aid incident data has been analysed and it shows that the sudden cardiac arrest (SCA) rate at this venue is 1: 500,000 attendances, that is 3 a year. During all of the 13 years the total number of SCA's has been 28. Of these 28, 24 SCA (86%) had a return of cardiac output at the scene



and 20 people (71%) were discharged home from hospital, neurologically intact (18). The survival rate from cardiac arrest at the MCG is better than world's best practice (19). With the timely provision of CPR and early defibrillation to arrested patients in VF or VT this "workplace" has the best result of "saves" in the world.

Not more than a few kilometres away is the Crown Entertainment Complex. It is located on the southern bank of Melbourne's Yarra River and is Victoria's award winning main tourist attraction. With over 500,000 square metres of appointed space spanning two city blocks it provides a mix of accommodation, entertainment, conference, shopping, dining, bars and casino facilities. Approximately 40,000 people work or attend the Crown complex daily. Given its 24-hour activity, the complex operates a busy first aid centre catering for employees and members of the public and is staffed with several first aiders supported by security personnel.

Defibrillators were introduced to the Crown in September 2000 and placed strategically in central locations. Other than the first aid Centre staff, Crown security staff is trained in AED operation.

Ground breakers Crown

From January 2001 a total of 7 witnessed cardiac arrests with an initial rhythm of VF or VT have occurred. In all cases these people left the scene with normal heart rhythms supporting spontaneous cardiac output. All cases were subsequently assisted by an advanced cardiac life support team provided by Melbourne's Metropolitan Ambulance Service (20). Although unpublished and limited, this raw data supports the research results from other major casino complexes around the world concerning the value of using of AEDs following sudden cardiac arrest (16).

Both these case studies illustrate the critical importance of a strong chain of survival – timely, appropriate and effective responses saves lives in witnessed sudden out-of-hospital cardiac arrests.

As cardiovascular disease is one of the major causes of premature death in Australia its reduction is also one of the federal government's national health priorities.

NSW Rail

I note that in June 09 that the most recent government injection for AED's was into NSW rail.



Aust Frontline Response.

As a result of mounting evidence of the value of AED use in sudden cardiac arrest for relatively low cost, in 2005-2008 the Federal government invested approximately one million dollars over a 3 year period to fund a Public Access Defibrillation (PAD) pilot scheme where 147 defibrillators were placed with 98 organisations across Australia. These key public locations and organisations included busy shopping centres, sporting, education and entertainment venues, railway stations and major office buildings.

The pilot project report found that “all stakeholders, including participating organisations, expressed a strong view that the installation of AEDs should become best practice corporate governance for larger Australian businesses, particularly those with high risk such as large public gatherings, the trafficking of large numbers of public thoroughfare and staff, students or clients with known risk” (21).

Further, occupational health and safety regulatory structures were identified as a key driver for the establishment of best practice. However, because of the focus on public liability, governance and regulatory structures were considered to be broader than occupational health and safety regulations.

Fear of litigation: a defibrillator deterrent

The PAD pilot scheme report highlighted that some larger venues were reluctant to participate in the program despite the fact they were identified as most likely sites for out-of-hospital cardiac arrests to occur. A key barrier to this participation was found to be fear of litigation. Despite training of personnel, many large organisations have not been able to overcome this fear and remain reluctant to install AEDs (21).

USA and AED's

The US has been the forerunner in the world in developing a legal position on the use of AEDs and the position there is at best confusing. Currently US federal laws provide the basic framework for limiting liability and AED ownership, oversight and use. But the confusion arises from the variation in state laws across the country. Some of the states have legislated the use of defibrillators by lay responders while others have not and in some state laws are vague. All fifty states provide levels of “Good Samaritan” protection as well as legislation requirements for establishing an AED program (22) (23). An AED-trained first responder is provided immunity only from civil liability for damages resulting from negligence associated with defibrillation.

Prior to 2004, the Food and Drug Administration viewed the defibrillator as a restricted device which could only be used by trained personnel and under the supervision of a medical officer. For an organisation to purchase a



defibrillator, a medical practitioner needed to oversee the program and was required to write a prescription for the device (23).

Recent US court opinions have also influenced AED deployment. For example, England, in a recent article in the Journal of the American Medical Association (JAMA) points to the legal complexities affecting defibrillator uptake in workplaces, “Legally the issue presented to a jury is whether the defendant’s conduct in not using a defibrillator on a victim following SCA was unreasonable. In most instances the duty of care is a requirement to take reasonable measures to protect patrons, customers and clients from reasonably foreseeable risks of harm. Generally the higher the risk, the higher the duty of care that must be met. Numerous lawsuits have been filed or are pending against airlines, health clubs, hotels and businesses arising from their failure to have AEDs deployed. Several lawsuits have resulted in large fines for businesses arising from their failure to have an AED”.

17 Australia and AED

In Australia, at this time, there are no laws relating to limiting liability, AED ownership, oversight and use. There is however precedence around the world relating to the provision of public access defibrillation and Australia is moving with acceptable pace with federal and state governments supporting development and major corporate stakeholders assuming accountability and control.

The key dilemma – a defibrillator in all workplaces vs risk magnitude

I want to begin this section by briefly outlining Australia’s OHS legislative structure. Under our system of government both the federal government, the six States and two Territories have responsibility for making laws about workplace health and safety and for enforcing those laws within their respective jurisdictions. Each OHS act (10 in all) has a first aid code of practice, standard or regulation which gives practical guidance to employers regarding their legal duties and compliance concerning the provision of appropriate first aid in workplaces. The scope of the code, regulation or standard covers arrangements including first aid needs assessment, first aid personnel and training, kits, other equipment and facilities (24).

Workplace Definition

Australian OHS Acts similarly define the workplace as “a place, whether or not in a building or structure, where employees or self-employed persons work and other members of the public may attend/enter” (25).

So lets look at where SCA are occurring?



Where SCA's Occuring Pie Chart

Recent Queensland data indicates that people's homes are the most likely location for SCA at 75%, followed by roads and public places at 12%, nursing homes 3%, recreation and sport facilities at 2.5%, medical and paramedical centres 2.4% and workplaces at 1.5% (26).

Significantly, cardiac arrests that occur in public places are more likely to be witnessed and for this reason have the shortest delay until arrival of the ambulance. Of the cardiac arrests in public places, 12.8% are attended by an ambulance within three minutes (27).

Before moving to look at the issue of AEDs in all workplaces, a recommendation from another recent Queensland review of the availability of AED's in general practice (doctor's offices/medical clinics etc) is worth noting. While only 18% of general medical practices had an AED and the incidence of SCA in a GP office was only 1%, the recommendation was that, given it is not possible to triage all patients with chest pain away from GPs and their clinics are exposed to a small but definite risk of SCA; and as defibrillation is the definitive emergency treatment, AEDs are cheap and cost effective and community expectations are high, general medical practices should have an AED and trained personnel available (28).

So what can we draw from this and similar studies, in terms of the magnitude of risk underpinning employers OHS duty of care decisions in relation to the provision of appropriate first aid. Clearly, while:

- Medical evidence supporting the use of AEDs is persuasive
- AED hardware is relatively inexpensive and safe to use and personnel training of between 2-3 hours at approximately \$100-125 per person per year (29) (30).

Risk Vs Magnitude

The risk of a sudden cardiac arrest in workplaces overall is small (26). It seems reasonable to say that providing public defibrillation programmes in very large spaces and venues is one thing, but providing defibrillators in all workplaces, large and small, is quite another.

So what of specific workplaces, where should employers look for guidance and how should they respond? Determining the magnitude of risk relating to the occurrence of SCA as with other injuries and medical illnesses in each Australian workplace is a critical and essential first step in resolving the dilemma of "a defibrillator or not"?

My years of experience as an OHS consultant undertaking first aid risk assessments in numerous and diverse workplaces, both large and small,



leads me to the view that most workplaces do not incur a significant risk of employees suffering a SCA, nor is there a high degree of probability of occurrence.

Operating on the principle outlined earlier of “the higher the risk, the higher the duty of care that must be met”, the absence of “a tick” in the box seems to be sufficient justification for workplace employer/employees deciding not to purchase a defibrillator(s), nor to funding AED training for first aid officers. However, this logic is currently insufficient to resolve the OH&S dilemma as the US litigious experience demonstrates.

The calculus of negligence in this area is complex (31), something many of you well know. On the face of it, the fact that AEDs are inexpensive, training programs easy to implement and AEDs save lives leads to the ready conclusion that defibrillators should be available in all workplaces. Or, in the absence of an available defibrillator and a worker’s death following SCA, the duty of care assumption that an employer is negligent for not providing one. The emotive case for providing defibrillation in the workplace is compelling, despite the fact that the objective, epidemiological evidence in relation to risk is just not there.

To date, the Australian Resuscitation Council is silent on the issue of whether workplace defibrillation should be made mandatory (8) and, as I’ve discussed, the issue of whether AEDs should be provided in the workplace is not straightforward.

The answer does not lie in a prescriptive approach. Rather regulatory guidelines should, as they currently do in Australia, facilitate in individual workplaces, a consultative approach to determining the risk of sudden cardiac arrest and where that risk is assessed as **low**, the decision not to introduce defibrillators **taken** and the evidence supporting the decision **documented**. Further, and most importantly, legislative protection from litigation needs to be in place. Until that happens I am pragmatic enough to recognise that companies are likely to institute AED programs in an effort to reduce their own negligence liability exposure despite low Sudden Cardiac Arrest odds.

