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Background.

In the United Kingdom 60,000 people a year will suffer a pre-hospital Sudden Cardiac Arrest (SCA) with a variable survival rate below 12% (British Heart Foundation *BHF* 2011). It is estimated that between 80-90% of these will initially present with a heart rhythm that could be treated with a defibrillator (Engdahl et al. 2001). When a famous person survives such an incident, modern communication means their experiences can be used to raise public awareness. Examples include the explorer Sir Ranulph Fiennes who suffered an SCA in Bristol airport in 2003 and the singer “Shakin” Stevens who was resuscitated at home in 2010 (Elevaed 2011 and BHF 2011). Most recently the successful resuscitation of footballer Fabrice Muamba who “died” for over an hour has raised awareness about Cardiopulmonary Resuscitation (CPR) and the importance of defibrillators (BBC 2012, Resuscitation Council UK *RCUK* 2013). This coincided with a popular nationwide campaign launched by the BHF, employing actor Vinnie Jones to promote CPR. These high profile individuals are valuable for raising awareness and saving other lives. Members of the public (survivors and rescuers) are also valuable for demonstrating the importance of early life support and rapid defibrillation via the media. These have recently included a child saved following a devastating lightning strike during a storm (Hough and Marsden 2012) and a Rugby player (who was himself a Nurse) who was saved on-pitch during a game (Western Morning News 2013).

Most recently following his full recovery and rehabilitation, Mr Muamba started a charity “Hearts and Goals” and along with other sudden death charities such as the OK Foundation, delivered a petition to Downing Street to provide AEDs in public places. “It was one of the first machines they used on me when I was on the floor. As small as it is, it is very powerful, trust me, it is very, very powerful” (Muamba as cited by ITV News 2012). Despite the petition of 110,000 signatures and a debate in Parliament on 25th March 2013, the legislation was rejected at this time by a UK Government Health Minister (HM Gov.2013). The irony of this is that the London Ambulance Service *LAS* (2013) recently installed 16 AEDs in the Houses of Parliament. Despite this CPR training and public defibrillator access seems even more relevant for Wales due to the statistically high heart disease rates in such a small country (NHS Wales 2013).

Defibrillators – a brief history.

Within the paradigm of the “Chain of survival” (Appendix I) each rapidly instigated link is essential for increased survival from an SCA (where the heart stops). The sooner a defibrillator is used to re-start the heart the more likely it is the victim will survive (McNally et al. 2011, Ornato 2000b RCUK 2011a). Since the 50’s defibrillator technology has developed from large manually-operated machines found in hospitals to automated portable units. Automated External Defibrillators (AED) have a recognition component that delivers a life-saving “shock” to the victim’s chest facilitated by a suitably trained persons. AEDs have been voluntarily installed in many public areas for deployment before an ambulance arrives. For some providers that serve the public, AEDs are strongly recommended via professional guidelines only. A growing body of evidence suggests that untrained bystanders can safely deploy and use an AED on SCA victims (Caffrey et al. 2002, Eames, Larsen and Galletly 2003, Jorgenson et al. 2003, Andre et al. 2004a, Andre et al. 2004b, Colquhoun et al. 2004, Abella et al. 2007, Andre et al. 2009, Mosesso et al. 2009). This led to a statement from the RCUK citing the International Liaison Committee on Resuscitation (ILCOR 2010):

*“An AED can be used safely and effectively without previous training.
Therefore, the use of an AED should not be restricted to trained rescuers.
However, training should be encouraged to help improve the time to shock
delivery and correct pad placement.”*

<http://www.resus.org.uk/pages/AEDsecst.htm>

If untrained bystanders are to safely deploy AEDs, the unit itself must be recognisable and user-friendly but fears related to possible harm and potential litigation must also be addressed (Eames, Larsen and Galletly 2003, Andre et al. 2004a, 2004b, 2009, Woollard 2006, Harrison-Paul 2009, Bogle et al. 2012). The UK has no laws in relation to AEDs (RCUK 2012) whereas by comparison the French principality of Monaco has a national Public Access Defibrillator (PAD) scheme even considering them for high risk residential areas with aged citizens, many of whom may have heart-disease (Bouquier 2010). In the United States (US) cities like Seattle do have state legislation on CPR training and PAD schemes and this seems to impact on survival rates that are between 30%-50% (Caffrey et al. 2002, RCUK 2007, BHF 2011). It seems improbable that many untrained members of the public would chose to respond in places where there is no statutory impetus to learn CPR coupled with a lack of PAD legislation. MacNally et al. 2011 and the RCUK 2011c suggest that even with the aforementioned programmes the overall survival rate remains very poor as most incidence occur in private residence. It is argued that even if the survival rate was 1% from public places it would be worth it for those individuals. It is also suggested by the Petitioner that one survivor alone could offset the cost of that single AED by reducing the over-all cost to public and private funds when dealing with the sudden death (from a reversible cause) of an individual in a Welsh public place. This obviously does not even begin to quantify the obvious humanitarian and emotional cost of saving a life with a single AED.

Rationale.

SCA continues to be a significant cause of death and disability across the world each day (Caffrey et al. 2002, Colquhoun et al. 2004, Hazinski et al. 2005, Hallstrom AP et al. 2005, MacNally et al. 2011, RCUK 2011b Ornato 2011a, Bogle et al. 2012). Despite the number of PAD's proliferating in the last 20 years, the problem exists that the ILCOR guidelines may not be reflective of how UK citizens react when witnessing an SCA. It is reasonable to first establish how many UK citizens have basic CPR skills and therefore providing access to an AED in a public place may improve individual survival rates. A large quantitative survey demonstrated that only 30% (n=1011) of those interviewed had received CPR training (Donohoe, Haefeli and Moore 2006). Only 25% of interviewees felt confident in CPR according to the St John Ambulance (2009) and worse still the BHF (2011) cite their own research that nearly 75% of the UK population are not CPR trained. They contrast this with other European countries where around 80% of people are said to have CPR skills. The Petitioner remains optimistic however as more recent low level reports seem to indicate that targeted campaigns in the UK (London) seem to be improving survival rates with CPR awareness alone (Goodchild 2012).

1. A Literature review.

Search Strategy.

Hand searches of key publications were undertaken using the databases in Medline, The Royal College of Nursing Online Portal, Science Direct/SCOPUS and Google with the *Search terms* highlighted using *Boolean logic* (Holland and Rees 2010) found in Table 1 (Appendix II). Of the 375 results, 32 were relevant. Three relevant studies were found after the initial literature search using Google and Social Media.

Relevant search results.

The following themes emerge from the search: previous training, PAD location, those who deploy the AED and survival rates. This body of research seemed rigorous. Most of the studies had multiple authors and were all quantitative with one mixed method. The search did not reveal any previous research on AED use in the UK by untrained bystanders and there was very limited data available internationally. Individual survivor testimony is also valuable.

Training.

Continuous responder training has previously been considered important for skill retention (Harrison-Paul 2009, Woollard 2006) but there are now calls for alternative training methods (Riegel B et al. 2006, Cleland et al. 2007, RCUK 2010, 2013). For example the "no training" model of regularly repeated short public announcement videos would incur less cost and might encourage a previously untrained bystander to access an AED (Sommers 2002, Caffrey et al. 2002, Ornato 2011a). However Eckstein (2012) cited Schober et al. (2011) revealing that over 50% of (non-medical) bystanders were able to recognise an AED but less than 50% of them were willing to use one.

Even in countries with targeted campaigns, Riegel et al. (2006) said that awareness remains “unacceptable” low despite suggesting that AED is easier to learn/retain than CPR. Enabling AED access for the person nearest the victim has been described as the “Fire Extinguisher” model by Caffrey et al. (2002) and Mell and Sayre (2008). It is argued that all public buildings must have fire extinguishers and yet incidences of SCA are more common than fires. Indeed the LAS (2013) very recently revealed that in 2011 fifty six people in London were killed in fires but 10,000 people suffered a Cardiac arrest there in the same year.

Some have also questioned the funding of PAD schemes comparing them to other preventative and responder schemes (Kellermann 2005, Pell, Walker and Cobb 2007, Mell and Sayre 2008, Cairns 2010). Others continue to argue that compared with standard responses by professionals and lay rescuers alone, modern PAD schemes are effective (Sommers, 2002, Colquhoun et al. 2008, Cave et al. 2011, Eckstein 2012, LAS 2013).

Only two studies in the search incorporated UK schemes and although valuable, were not fully relevant as they related to trained responders (Colquhoun 2008, Harrison-Paul 2009). They assessed the deployment of the UK Defibrillators in Public Places Initiatives DiPPI (n=113 of 437) with a survival rate of 26%. There was recognition that providing defibrillation to the victims of SCA was a key feature of the National Health Service.

Location of AEDs in Public places.

Authors often examined where AEDs are most likely to be used. With regard to minimal training Jorgenson et al. (2003) looked at AEDs in/near patients’ homes (n=2828) with a deployment rate of nearly 12% per year. Kellermann (2005) later expressed reservations about such procurement in high risk homes (of aged persons with previous heart problems) without medical authorisation. He cites an earlier study by Eisenberg and Cummins (1989) suggesting that survival rates from such incidents could be worsened at home by breaking the chain of survival by *delaying* dialling for help (Appendix I). It is assumed that because of the very high numbers of visitors involved, airports seem to be the commonest place for PAD schemes but included shopping centres, leisure centres, educational establishments and gated communities (Sommers 2002, Caffrey et al. 2002, Eckstein 2012, LAS 2013). Indeed one manufacturer and service provider claim that their programme has saved at least 100 lives since 1998 (Cardiac Science / David Lloyd Leisure 2013). There are now calls to at least ensure AEDs are available in schools with dedicated CPR training (BHF 2011, RCUK 2012). Malhotra (2013) suggested that in the UK up to 16 young people die from an SCA every week and cites Iqbal suggesting “In my view, just as we have access to a fire extinguisher in the event of a fire, AEDs should be immediately available if someone suffers a cardiac arrest”.

Who deploys AEDs in Public places?

A range of “responders” were discussed in the results. Sanna et al. (2008) noted that only 7% of victims received “lay public” care and the remaining had care delivered by trained personnel. It could be argued this figure of 7% could be lower than this as some bystanders were “unknown” on follow-up. Eckstein (2012) confirmed that “uniformed” responders (not lay public) delivered AED “shocks” in 66% (n=39) of SCA cases. The remaining figure (n=11) looks promising but it transpires 7 of these (63%) were coincidentally professionals who had previous medical training (doctors, nurses, fire fighters).

Survival.

Important evidence was elucidated with regard to which type of PAD responder was the most effective. Jorgenson et al. (2003) reported a 100% (n=4) survival for those treated by minimally trained members of the public, although the very small sample size is noted. Sanna et al. (2008) performed a Meta-analysis of 1583 resuscitation attempts by non-health care professionals and concluded that mortality improved with CPR alone but further improved with rapid AED deployment (Appendix III). Weisfeldt et al. (2010) undertook a population-based cohort study of (non-trauma) SCA victims (n=13,769) and noted the survival rate increased to 38% (n=64 of 170) where CPR was administered with a “shock” from a bystander. MacNally et al. (2011) analysed the outcomes of nearly 32,000 SCAs in the US (mortality rate of over 92%) suggesting an “almost invariable” poor prognosis where there was no pulse prior to hospital. This challenges the belief that as long as there is an AED, survival rates will compare to in-hospital events. When individual survival rates are extrapolated for a population the size of North America, Weisfeldt et al. (2010) anticipated the survival of 474 individuals per year. Contrary to this rather disappointing evidence, targeted campaigns in the UK are yielding very encouraging increases in survival rates. The LAS (2013) has very recently revealed that in the last 20 years survival in the English capital has risen from 2% to 32%.

Conclusion: “Hearts too good to Die”.

When responding to a victim of SCA, the chain of survival is overwhelmingly supported by an increasingly growing evidence base. Where the links of the chain can be shortened to just a few minutes along with targeted public health campaigns and appropriate funding, lives can be saved, where they would have been lost. English AED campaigners remain steadfast in trying to get the legislation required to ensure the machines (Appendix IV) are available in public places. This is despite their most recent disappointment in the face of a growing body of evidence. It is hoped the Welsh Government can choose a different path in the same way it led the way with important public health campaigns such as the Smoking Ban. Working closely with the Welsh Ambulance Service, local authorities, the Voluntary Aid agencies, private businesses and charities, the Petitioner hopes Wales will see similar results to London in a few years. The petitioner feels that if having legislation to guarantee fire safety in a public building is important then AED access should be considered vital.

WORDS: 2380.

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Appendix I.



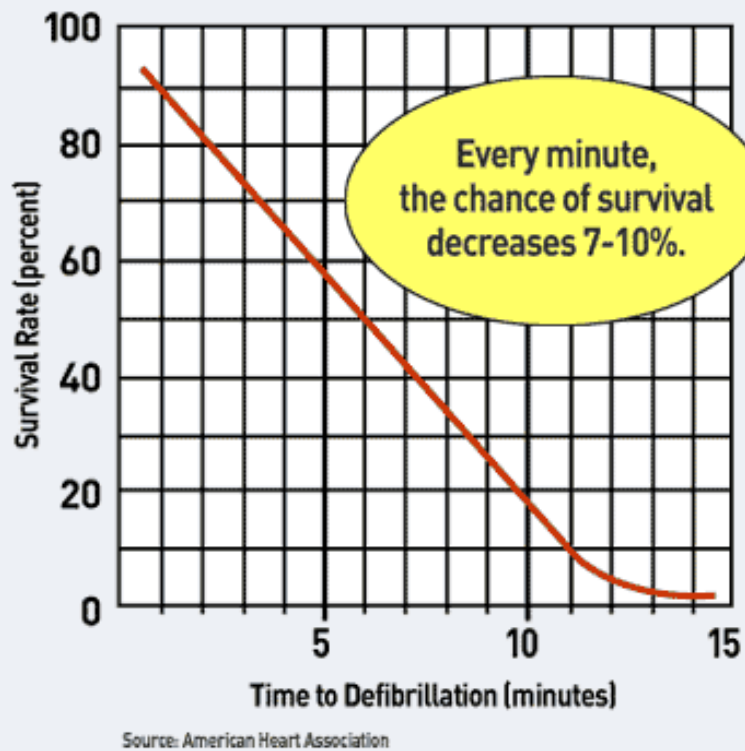
Accessed 28th November 2012.

Appendix II

Table 1:	<i>Search terms used to conduct the literature review:</i>							
Untrained members of the public	<i>AND</i>	Automated External Defibrillators Or AEDs	<i>AND</i>	Public Access Defibrillators Or PADs	<i>AND</i>	Willingness to access and deploy an Automated External Defibrillator Or AED	<i>AND</i>	Willingness to use an Automated External Defibrillator Or AED
Search results across four databases: <i>Articles selected, reviewed and analysed from 1st April to 27th November 2012.</i>								
Inclusion criteria: <i>Any country (within the time frame) in relation to the untrained lay public deployment of AEDs in SCA.</i>								
Exclusion criteria: <i>Non-English language articles. Companies and manufacturers selling AEDs and AED training providers. Implementation of PAD schemes. PAD schemes in Clinical / Hospital areas (due to a high incidence of health professional respondents and organised onsite responses). First Responder Schemes (training / implementation and audit).</i>								
Time frame: <i>Articles published between 2002 – 2012 (10 years).</i>								

Appendix III.

The time to the first shock is the key to survival.



Accessed 23rd November 2012.

Appendix IV.

