Appendix 1

DG HEALTH AND WELLBEING

SBAR: Community Defibrillators

Situation

A proposal was recently given to a local Area Committee scoring panel requesting funds for community defibrillators. The proposal was recommended as a nil award by the Community Safety Partnership Lead Officer Group on the basis that there is no evidence that the availability of defibrillators in the community reduces the mortality rate of people experiencing cardiac arrest. Area Committee members have asked for details of the evidence around this topic.

Background

After cardiac arrest, early defibrillation is significantly associated with neurologically favourable outcome\(^1\). As such, the sooner an automatic external defibrillator (AED) can be used on a person experiencing cardiac arrest, the better. The question is whether the placement of an AED in a fixed location within a community is likely to increase the chance of early defibrillation under these circumstances and thus lead to improved outcomes for cardiac arrest patients.

Assessment

Out-of-hospital cardiac arrests (OHCAs) which may benefit from AED availability are those which occur in a public place and which are witnessed by bystanders. A recent study of public access to AEDs in an urban area of Japan found that 58.9% of OHCAs were presumed to be of cardiac origin; 32.9% of these were witnessed by bystanders; and 9.5% of bystander-witnessed OHCAs occur in public places\(^1\). As such, community AEDs could provide potential benefit to only 1.8% of OHCAs in these circumstances. The rural nature of Dumfries & Galloway may mean that local numbers would vary significantly. A study of 940 OHCAs in a rural area of the US found that no location had more than two OHCAs over the 5.5 year study period\(^2\). As such, the authors recommended that AED facilities for first responders may be a more effective intervention.

Even in areas where public access defibrillation (PAD) has been prioritised, concerns have been raised about the low proportion of incidents where a defibrillator is available and used\(^3\)\(^-\)\(^5\). A study in Maryland, USA, found a poor relationship between placement of defibrillators and location of heart attacks: “No AEDs were registered in the three most frequently occurring locations for cardiac arrests (private homes, skilled nursing facilities, assisted living facilities) and no cardiac arrests occurred at the locations where AEDs were most commonly placed (community pools, nongovernment public buildings, schools/educational facilities).”\(^6\) A mathematical method has been developed in order to identify locations for best
placement of AEDs within an area\(^6\); however there is currently no published evidence available as to whether this is effective in practice.

A 1995 study of OHCAs in Glasgow and Edinburgh found incidences of 92.9 and 45.0 per 100,000 person-years respectively\(^7\,^8\). If we take the largest of these numbers and apply it to the approximately 150,000 population of Dumfries & Galloway, we would expect approximately 140 out-of-hospital cardiac arrests per year in the region. If 1.8% of these could potentially benefit from a community AED, this amounts to approximately 2.5 incidents per year. Unless community AEDs were very widespread within the various communities of Dumfries & Galloway, it would appear that the chance of an AED being available for such incidents is small.

Studies undertaken of widespread distribution of AEDs and associated training have found positive effects in those defibrillated\(^9\,-\,^{17}\). However, it should be noted that these results required either distribution on a very large scale or a very high throughput of individuals. For example, one of these studies looked at nearly 1,000 community units (shopping centres, community centres) and 19,000 volunteer responders trained. At this very large scale, 128 OHCAs were witnessed, of which 30 patients survived\(^9\). Another study looked at defibrillator use in airports in Chicago with an estimated combined throughput of 100 million customers per year. Over a two year period, 18 people had OHCAs suitable for defibrillation, of which 11 survived\(^{11}\). In contrast, a survey of sports clubs in Cork, Ireland, found that though most clubs had defibrillators, use was very low. Only 6.5% of defibrillators had ever been used, resulting in a average figure of one use every 54.5 years for each defibrillator\(^{18}\).

A 2010 review of the effectiveness and cost-effectiveness of AEDs found vastly different results according to the placement of AEDs\(^{19}\). In areas identified as having a high density of OHCA victims and “good Samaritans” (e.g. airports, large casinos etc.), the average cost per year-of-life saved was estimated at between $35,000 and $50,000 (the paper estimated that each survivor lived five years from cardiac arrest, giving approximately $175,000 to $250,000 per life saved). However, figures for other venues were much less encouraging with $500,000 - $2,000,000 for large public venues such as shopping centres or sports grounds (approximately $2.5 million to $10 million per life saved); and between $1 million and $10 million for industrial sites, golf courses, health clubs, and community centres (approximately $5 million to $50 million per life saved)\(^{19}\). Other such studies have come to similar conclusions\(^{20}\). As such, placement is key to cost-effectiveness.

**Recommendation**

It is undoubtedly true that early defibrillation of out-of-hospital cardiac arrests is likely to lead to better outcomes in those defibrillated. However, in order for significant numbers of people to receive this benefit, defibrillators would need to be available either in very widespread locations or targeted to those locations where a relatively high number of cardiac arrests have been shown to take place regularly (In Japan, railway stations have been identified as places with a high rate of defibrillator use;
while in the US, sports facilities and airports have been identified). As such, it is recommended that defibrillators should not be purchased for a small number of locations with no specified high-risk of significant numbers of cardiac arrests or alternatively, providing defibrillators for Scottish Ambulance Service Community First Responders may be a more effective intervention.

References


Appendix 1


**Appendix – Search Strategy**

Ovid Medline (Ovid MEDLINE(R) 1946 to Present with Daily Update and Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations January 15, 2015) was searched for the following terms:

1. Defibrillator*.mp
2. Community.mp
3. "Out-of-Hospital Cardiac Arrest"/
4. 2 or 3
5. 1 and 4
6. Limit 5 to English language and year="2000-current"
Where * searches for multiple endings (i.e. defibrillator or defibrillators); mp searches Title, Original Title, Abstract, Subject Heading, Name of Substance, and Registry Word fields; and “/” denotes a Medical Subject Heading (MeSH term).