Public Access Defibrillators across the Town and Community Council sector in Wales

Establishing baseline data for future quality improvements.

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Abstract

Objectives

This survey was undertaken to establish baseline data in relation to the level of involvement that Town and Community Council (T&CC) members in Wales have with regard to the management of their Public Access Defibrillator sites (PADs). These were members of the One Voice Wales representative body.

Study design

A survey was developed to collect data from Clerks/Councillor respondents on the number of PADs in their care, maintenance (including consumables resupply) and registration on the National Defibrillator Network for 999 deployments to nearby cardiac arrest incidents.

Methods

The spreadsheet was sent out via email to the total 649 Town and Community Councils One Voice Wales (OVW) membership across Wales. A covering letter from the Chair of Save a Life Cymru (*SaLC,* NHS Wales Executive) and the CEO of OVW. The Survey ran for 8 weeks.

Results

There was a good return rate (n= 272, 42%) by the closing date of the survey. These results are statistically significant (ME= 5%, CI = 95%). Blank responses were excluded for each question. The data demonstrated a high number of reported defibrillators available on the Circuit (only 1 not available). T&CC funding of consumable items (such as electrode pads) to keep the PADs *emergency ready* was also high.

Conclusions

SaLC Community PADs Coordinators should liaise with OVW coordinating repeated ongoing surveys to regarding membership impact towards this life saving public health initiative. New data could then be reanalysed and used to assess the impact of any national quality improvement measures implemented by SaLC. (**Words**: 250)

Keywords: NHS Wales, One Voice Wales, Public Access Defibrillators, Save a Life Cymru, Welsh Ambulance Service.

Introduction

Out of Hospital Cardiac Arrest (OHCA) is a seriously life-threatening, time-critical medical emergency where treatment delays often leads to death within minutes. An OHCA is defined as the heart arresting (stopping) with a sudden collapse and unconsciousness. An arrest of normal breathing then follows. An OHCA can also follow a primary respiratory arrest where the breathing stops first. Multiple causes of OHCA include choking, drowning, severe bleeding, electrocution and sepsis. The most common cause across Europe is a myocardial infarction (commonly known as a heart attack) and the commonest cause of these is coronary heart disease (CHD) (1). There are over 7.5 million people living with cardio-vascular disease in the UK and these account for approximately one death every three minutes (2). In 2019, Public Health Wales (3) reported a remarkable 67% reduction in mortality in the under 70 age group from CHD over the previous 20 years. Conversely, they reported that CHD remained the single major cause of death in Wales (3857 in 2016) and it had a higher prevalence of CHD than the rest of the UK.

OHCA remains a significant cause of sudden mortality across the industrialised world with an incidence of approximately 55: 100,000 per annum and it is also the third leading cause of death in Europe (4-6). Survival rates from OHCA remain poor at between 2-12% (5-9). In Wales there is an estimated 6000 OHCA cases per annum, with an equally high mortality. Some reports suggest a survivorship of only around 5% (10) and therefore OHCA mortality rates remain a major public health concern for Wales (11-13). Due to the lack of a national OHCA registry in Wales there are no exact data.

Heart arrhythmias during OHCA

It is thought most OHCA patients will initially present with a chaotic disorganised heart rhythm such as Ventricular Fibrillation (VF) or pulseless Ventricular Tachycardia (pVT) (1). An electric shock from an Automated External Defibrillator (AED) can re-start the heart through self-adhesive pads attached to the chest. A shock treatment decision is initiated by the internal rhythm recognition component inside of each AED. The sooner a shock is delivered, the more likely it is that a return of spontaneous circulation (RoSC) will occur. RoSC occurs due to the controlled electrical shock passing through the chest-wall re-establishing normal cardiac activity by terminating the chaos of VF or pVT. This restores the pulse and blood-flow to vital organs (1, 14-16).

Improving the chances of survival from OHCA

In the last 35 years many evidence-based interventional programmes have been developed as sector best-practice. The aim is to continuously strive for improvements in long-term OHCA survivorship rates. Within the Chain of survival concept (*Table 1*) each rapidly instigated link is essential to try and obtain a RoSC. The sooner the ambulance service is called (to deliver Advanced Life Support), Cardio-Pulmonary Resuscitation (CPR) commenced and the sooner an AED is used, the more likely it is the patient will survive (1, 4-10, 16).

One of the main technological developments has involved defibrillators. Since the 1950's the technology has evolved from larger machines (operated only by doctors) into portable hand-held units that anyone can use. The aim of this technology was to empower minimally trained responders or untrained bystanders to shock the OHCA patient before an ambulance arrives. With the pads attached, the voice-prompts and visual displays shows the bystander what to do next (1, 16). The AED has since been described as the single most important development in the treatment of OHCA in the last 30 years. These visual/voice prompts should be combined with over-the-phone verbal guidance from the 999-ambulance call-taker. This is especially important in countries where there is low CPR literacy amongst the public. Even with CPR, survival is said to diminish as much as 10% for every 60 second delay in defibrillation. Survival rates seemed to be slightly improving around 2010 but the impact of mobile phones, over-the-phone CPR advice, advances in technology and AED availability has done little to improve survival. Public Access Defibrillator site (PADs) proliferation has meant that the first three links of this chain has become applicable to those who witness an OHCA. Many more lives could be saved if continuous CPR is started sooner and rapid defibrillation initiated more often (17). Currently less than 10% of OHCA patients will receive a bystander defibrillation attempt (2). Link 3 (early defibrillation) is therefore a crucial link in the Chain of survival (4-10, 12, 16).

Despite the fact most OHCA incidents occur in residential areas, the most common location for PADs has been in public places. This includes locations with large footfall such as shopping centres, airports and sports arena.
There also appears to be an ongoing disparity between the chosen PADs locations, 999 deployments and actual AED usage by bystanders (6, 9).
If most OHCAs occur at home in certain age groups, with links 1-2 initiated by a partner, there may be no-one to implement link 3 before an ambulance arrives.

Table 1

1: Recognise a OHCA is occurring and telephone 999
2: Early, continuous Cardiopulmonary Resuscitation (CPR)
3: Early defibrillation with an Automated External Defibrillator
4: Advanced Life Support to stabilize and transport the patient

Reference: Save a Life Cymru 2023 (1)

The Circuit

A national defibrillator network (NDN, the Circuit) was launched by the British Heart Foundation (BHF) in 2020 (18). Two, free to use websites were created in partnership with the Resuscitation Council UK, the Association of UK Ambulance Officers and St John Ambulance. The Circuit enables defibrillator owners to create a free account and upload details of their AED/s. This enables National Health Service (NHS) ambulance services to visualise if that defibrillator is "emergency ready" at any time during a 24-hour period. If the OHCA is within 500 meters, the call taker can then advise on deployment during the 999-call. The BHF "Defibfinder" website also allows anyone to search for their nearest registered AEDs by postcode anywhere in the UK.

Developments in Wales

It is evident that further ongoing review and analysis related to the effectiveness of these interventions is required. Recognising this, the Welsh Government (12) developed an OHCA plan with aims to improve survivorship in Wales:

- Educational programmes in relation to CPR and PADs
- Defibrillator registration, maintenance and accessibility
- Rehabilitation and after-care for those who experience/encounter OHCA
- Relevant research and development programmes.

In support, the quasi-governmental organisation Save a Life Cymru (*SaLC,* NHS Wales Executive - Cardiovascular network) was launched in October 2018 to establish and/or develop such programmes. SaLC employs a range of clinicians and academics with support teams to mobilise the knowledge collated from across the relevant public health bodies and replicate best practices to fulfil the OHCA plan for Wales (12). The SaLC research hub is based in Cardiff Metropolitan University. Developing partnerships with multiple organisations, a memorandum of understanding was also developed with the membership organisation, One Voice Wales (OVW). OVW represents 649 of the 732 Town and Community Councils (T&CC) in Wales. It offers a diverse range of services including training, lobbying, environmental, human resources and legal advice (19). The aim of the partnership was to implement the WG government OHCA plan objectives within OVW.

As part of this programme SaLC sponsored the secondment of a Senior nurse from an NHS Wales Health Board as a Doctoral researcher. Following the OHCA plan, this centred around CPR and AED awareness, AED procurement, maintenance and promoting Circuit registry. Publicising the role across Wales gave an opportunity to address any immediate enquires and clinical support required. Apart from email and telephone support, there was introductory sessions for all area Committee meetings and included a national OVW conference. A free community CPR/AED awareness and demonstration session was also developed for members of the public in community halls across Wales. Identifying the status of PADs across the OVW membership was considered an important objective towards the development of formal sector-wide guidance document.

Methods

A OVW survey in relation to relevant aspects of the OHCA plan was developed to create baseline data for the sector. An objective was also to establish contact points for the (four) newly employed regional SaLC Community Coordinators who support each region of Wales.

The Microsoft XL spreadsheet survey was written to encompass questions with regard to each member council PAD sites (if any). Commensurate with the Welsh Language Act all work was written in Welsh and English (20). These documents were also peer reviewed internally within Save a Life Cymru (including a Welsh-speaking campaigns manager) and with a bilingual OVW Policy advisor.

The survey included usual funding sources of AED pads and batteries, hours of availability and Circuit registry. The survey aimed to establish if each T&CC AED had a "Guardian" on the Circuit and local (anecdotal) knowledge of any 999 dispatches to a nearby OHCAs.

On 1st February 2023 a joint letter was sent out with a covering email to the whole of the OVW membership. This was signed by the CEO of OVW and the SaLC Chair. The purpose of this letter was to inform recipients in relation to the purpose of the survey and offer support towards completion where needed. The 12-week deadline was advised.

By week 4 only 118 responses had been received, so an updated letter was sent out again to encourage participation from those who may have missed or forgotten the survey. Once the data were received and collated the production of the results were formatted by data analysts working for SaLC.

For ease of understanding this was presented as standard numerical and bar/pie charts formats. Further analytical review was requested from an Advanced Improvement Analyst at Improvement Cymru (Quality, Safety and Improvement NHS Wales Executive). The feedback concluded that the original data presentation was sufficient. The need to use any further statistical testing for such baseline data was not yet applicable. This was due further survey replication being required to compare any changes in new data from the original outcomes.

Results

By the closing date of the survey there were 272 returns from the membership (42% of 649). These results are statistically significant (ME= 5%, CI = 95%). Respondents who answered questions as "unknown" or left the answer section/s blank were quantified and removed from within each set of results. There were 661 AEDs reported across Wales but 39 T&CCs identified zero AEDs in their remit.

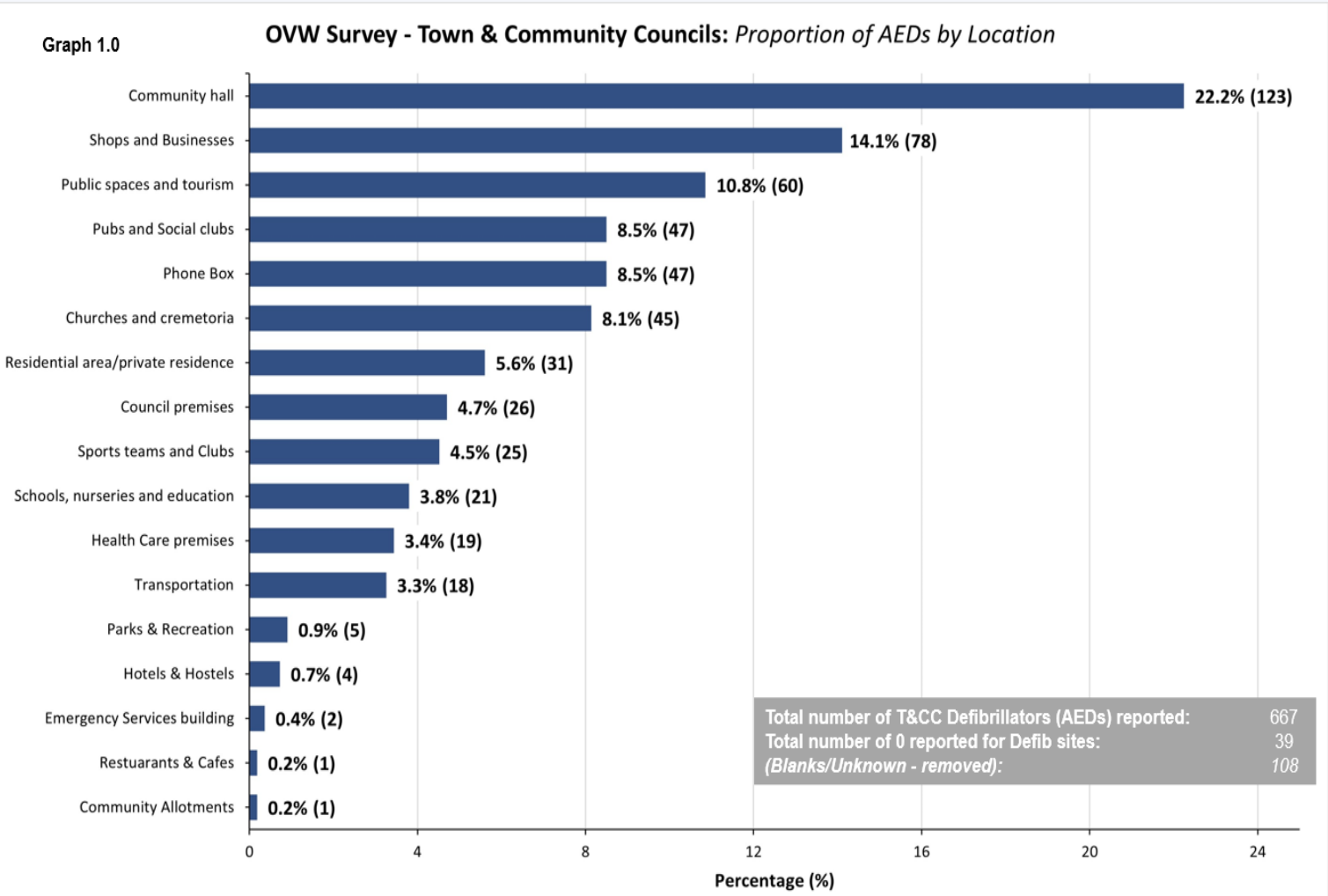
Geographical locations

Instead of a single set of pan-Wales data, the locations were ranked into all 7 NHS Wales University Health Board (UHB) areas (100%). This was important for the SaLC regional coordinators for targeted support. The largest responses were from the North (Betsi Cadwaladr UHB, 27.2%), West (Hywel Dda UHB, 23.9%) and

Mid-Wales (Powys Teaching HB, 16.2%). Unitary authorities are not represented within the OVW membership and this may account for lower response rates from HB areas with co-located cities and county borough councils. These included the Cardiff and the Vale UHB (6.6%), Swansea Bay UHB (7.7%) and the Aneurin Bevan UHB (13.6%). The lowest response rate was from the Cwm Taff UHB area (4.8%).
These T&CCs are supporting the financial (consumable) requirements of 661 PADs (nearly 80% of those who responded to that question).

AED locations within the community
There was a wide variety in types of location where the T&CC AEDs were situated (Graph 1.0). These seemed to rank in order where a T&CC are assumed to have most influence on successful placement. Often the respondent identified that the Guardian was a member of the council (often the Clerk) but at non-council premises sites it was often a non-council member.
The most frequent sites included 22.2% (123) located at community/village halls with 10.8% at public spaces and tourism (60). These ranked third across all 7 Health boards. The support of the T&CCs at sites not usually associated within a council's remit ranged from 78 (14.1%) at shops and businesses (ranking second) through to clinical locations (pharmacies, GP practices) combined with emergency services premises (3.8%, 21).
Conversely, there was lower representation at potential sites where a council could easily identify and develop a PADs within their remit. This included council buildings, phone boxes and lamp posts. Lower PAD sites were noted at garden allotments and restaurant/cafés.

Graph 1.0


OVW Survey - Town & Community Councils: Proportion of AEDs by Location
Community hall
22.2% (123)
Shops and Businesses
14.1% (78)
Public spaces and tourism
10.8% (60)
Pubs and Social clubs
8.5% (47)
Phone Box
8.5% (47)
Churches and cremetoria
8.1% (45)
Residential area/private residence
5.6% (31)
Council premises
4.7% (26)
Sports teams and Clubs
4.5% (25)
Schools, nurseries and education
3.8% (21)
Health Care premises
3.4% (19)
Transportation
3.3% (18)
Parks & Recreation
0.9% (5)
Hotels & Hostels
0.7% (4)
Emergency Services building
0.4% (2)
Restuarants & Cafes
0.2% (1)
Community Allotments
0.2% (1)
0
4
8
12
16
20
24
Percentage (%)
Total number of T&CC Defibrillators (AEDs) reported: 667
Total number of 0 reported for Defib sites: 39
(Blanks/Unknown - removed): 108

Pads and Batteries
Following the purchase of any external wall-mounted cabinets and/or AEDs to go in them, ongoing consumable funding is required to keep them *emergency ready*. These include various types of batteries and the self-adhesive electrode pads. These currently range between £70-270 respectively and expiry dates vary depending on purchase dates.
Despite the current financial situation many councils face, the survey respondents demonstrated that few sites received any NHS or charitable support. Electrode pads were re-supplied by NHS Wales (Welsh Ambulance Service or WG/NHS funding) on 54 occasions (10.7%) and charities on 29 occasions (5.8%). The Councils funded them on 367 occasions (73.1%) and other/unknown funding sources were listed for 37 sites (7.4%). This question was left blank 159 times.
Batteries were also supplied by Councils 384 times (76.3%) the NHS only supplied 54 (10.7%) batteries and charitable funds 42 (8.3%) batteries. Other sources were not named for 42 (8.3%) cases of battery re-supply. This section was left blank 158 times.

Circuit NDN readiness for 999 deployments
Of the 661 AEDs identified, the total number of AEDs reported to be registered on the Circuit was 493 (74.6%). A named guardian email was known in 417 (63.1%) cases and many were responsible for multiple AEDs in that T&CCs remit.
The question was blank or the guardian contact was unknown in 244 responses (36.9%). There were 94.7% (467) responses received that had a status of 999 emergency ready at site. Only 26 (5.3%) were reported as not emergency ready (168 blanks or unknown statuses removed).

Reported use on patients (deployments)
Specific AEDs had reportedly been used during 177 (37%) OHCA incidents, whilst 199 (63%) respondents said they/it had not. There were 345 blanks or unknown statuses that were removed prior to calculating the data. These results greatly exceed the evidence from the BHF (17) that confirmed less than 1 in 10 PADs are deployed (10%).

Discussion
These data have now been developed into an all-Wales guidance document for the OVW membership. After reviewing these results more research is recommended especially in relation to PADs deployments and patient outcomes. The results were submitted for additional analysis but the data did not yet lend themselves to statistical testing. With this single survey the lack of comparative returns meant that the data was not very representative so testing may have been misleading. It was considered more worthwhile in evaluating this data as a baseline and to recommend the continuation of the same survey in future. Descriptive statistics could outline reasoning towards various future interventions. The review concluded that there is a requirement for further (repeated) follow up surveys towards evidencing any quality

improvements. If similar surveys where undertaken it might be possible to compare survey results using statistical testing to assess is anything has changed. For example, a consideration could be given to testing the differing Health board areas. This may establish if there are significant geographical differences in the numbers of PADs, Circuit registrations and 999 deployments. This would be achieved by standardising Health board size and establishing reported AEDs per location area. Any relevant changes could also give rise to further research questions to test. This might include the clinical and cost effectiveness of community-based AEDs/PADs compared to local First Responder schemes. This is regardless if such schemes are paid (such as emergency services or health professional co-responders) or with voluntary trained lay-rescuers (11-12, 21-22).

Repeated surveys may also improve response rates from within the membership and consequently the data may increase awareness in relation to Circuit registration and also potential sources of support and funding. Promotion of Circuit registration should aim for as near to 100% emergency ready status as possible in OVW. Further data may elucidate barriers preventing this goal including human factors, geographical placements and financial issues. Community/village halls are often centred in residential areas and T&CC's should focus on these, phone boxes, lamp-posts and other sites more likely to be in their remit as opposed to clinical/emergency services sites. Planning for AED replacement and consumables funding should continue within the sector, whilst any consumable equipment that has been used on a patient should be re-supplied via NHS Wales. This should be undertaken by SaLC coordinators as soon as possible after an incident.

With the current lack of accurate data surrounding the impact of PADs on OHCA survival in Wales, each Circuit deployment should be reviewed. To achieve this, retrospective case studies are required with appropriate collaboration between the relevant organisations. This includes formal data sharing arrangements and ethical approvals to gather data from PADs guardians, the BHF, SaLC, the Welsh Ambulance Service and the Health Boards. Improving OHCA survivorship should be considered a matter of great importance for all those involved with public health and local government planning.

Acknowledgements (including declarations)

With thanks to the following:

Professor Len Nokes (Chair, Save a Life Cymru)

Dr Mikel Mellick
(Director of Study, Save a Life Cymru Research Hub, Cardiff Metropolitan University)

Mr Jamie Sullivan
(Senior Data Analyst, Public Health Wales, Cardiovascular Network, NHS Executive)

Jessica Pang
(Advanced Improvement Analyst, Improvement Cymru, NHS Executive)

Thanks to One Voice Wales and Save a Life Cymru and also to the Town & Community Council staff who took the time to complete/return the survey.

Statements of ethical approval, funding and competing interests.

This was an internal audit using non-patient data, so no ethical approval was sought. Consent was obvious by way of completion and return. Consent was requested at the end of the survey spreadsheet to establish if the clerk and / or guardian email address could be shared with Save a Life Cymru regional coordinators. This ensured points of contact for further NHS support if required (192 respondents).
Only the email and council locations of consenting respondents were forward to the SaLC team. Ninety two percent consented for data-sharing to receive such support. Details were redacted from the final report (8%).
Save a Life Cymru funded the secondment and programme of academic work streams within OVW. There are no other potential conflicts of interests apart from the unpaid PADs volunteering role of the author. (**Words:** 3000)

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