

Availability of automated external defibrillators in the city of Warsaw – status for May 2009

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Abstract

Background: The most frequent cause of sudden cardiac arrest (SCA) is ventricular fibrillation and ventricular tachycardia. Despite many efforts the prognosis in this patient group is poor. According to the European Resuscitation Council (ERC) recommendations, early defibrillation, preferably in the first 3-5 min, is a key link in the Chain of Survival after SCA. With an increasing number of available automated external defibrillators (AED) time from SCA to defibrillation may be reduced, thus resulting in the improvement of patients' prognosis. Therefore, the ERC recommends providing AED in public locations with a high incidence of cardiac arrests.

Aim: Estimation of the availability of AED in the city of Warsaw.

Methods: Automated external defibrillators were identified according to the information from the City Hall, public services, foundations, companies and own research and knowledge. The AED presence was confirmed by phone at the potential locations and random locations were visited.

Results: By 15 May 2009, 117 AED had been reported in 83 points in the city of Warsaw. The number of AED was the highest in the Śródmieście (29) and Włochy (28) districts. On average, there was one AED per 14 706 citizens (0.68 per 10 000 citizens) and per 4.24 km² (2.26 per 10 km²). The highest ratio of the number of AED per 10 000 citizens was observed in the Włochy (7.06) and Śródmieście (2.25) districts, the lowest – in the Targówek (0.16), Wawer (0.15) and Bemowo (0.09) districts. The highest ratio of the number of AED per 10 km² were in the Śródmieście (18.63), Włochy (9.78) and Żoliborz (5.9) districts, the lowest – in the Wilanów (0.27) and Wawer (0.13) districts.

Conclusions: The number of AED in the city of Warsaw should be increased, additional demonstrations of AED proper usage and AED promotion should be organised. It is necessary to provide easy access to the devices. Significant differences in the number of AED can be observed between the districts. Neither authorities nor public services are aware of the number of AED in the city of Warsaw.

Key words: automated external defibrillator, sudden cardiac arrest, the city of Warsaw

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Introduction

Sudden cardiac arrest (SCA) is the key cause of death in the population [1, 2]. Despite many efforts, out-of-hospital SCA is still associated with a very poor prognosis: only 1-5% of subjects survive to hospital discharge [3, 4]. Ventricular fibrillation and ventricular tachycardia are considered to be the most frequent conditions leading to SCA [1, 5-7]. According to the guidelines of the European Resuscitation Council (ERC) in those cases immediate defibrillation is recommended (Figure 1) [8, 9]. Defibrillation is most efficient if performed within 3-5 min from the SCA onset, each minute of delay reduces the probability of survival to discharge by 10-15%. [8]. Therefore, efforts are justified to improve the quality of cardiopulmonary

resuscitation (CPR) delivered by bystanders, while the average time from the emergency call to the ambulance arrival to a patient with a life-threatening condition in Poland is over 10 min. This may be improved by providing wide access to automated external defibrillators (AED). These devices are easy to use. Thanks to graphic and voice instructions, a shock can be delivered by a rescuer with no medical background. Multiple studies confirmed that witness presence and use of AED significantly improve prognosis after SCA [1, 1-13]. According to the ERC recommendations, AED should be placed in widely available public locations with an incidence of cardiac arrests of more than 1 case in 2 years [8].

The aim of this study was to identify distribution of AED within the city of Warsaw. We intended to assess the

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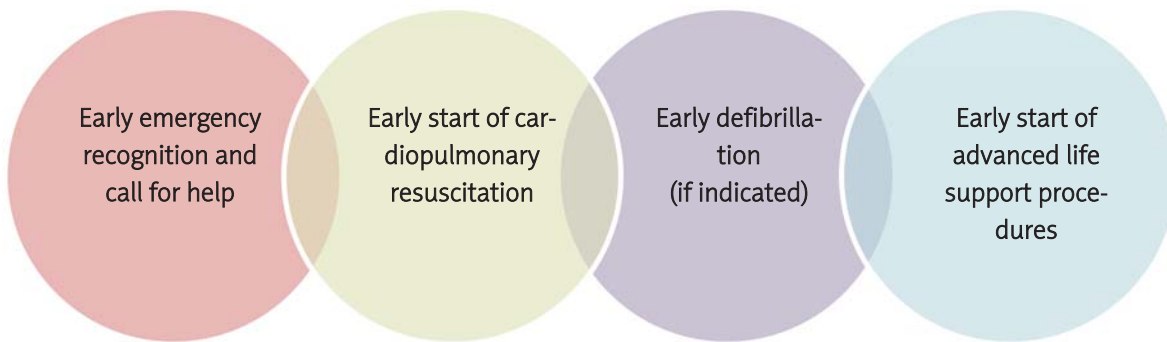


Figure 1. Chain of Survival. Modified from the European Resuscitation Council [9]

accessibility of AED for non-medical rescuers in different districts of Warsaw.

Methods

Public buildings, widely accessible places, shopping centres, museums, hotels, skyscrapers etc. were scanned for the devices. Hospitals and outpatient services were excluded from the study.

All devices were identified on the basis of the information obtained from the Crisis Management and Safety Department of the Warsaw City Hall, Warsaw Metropolitan Police, Warsaw Headquarters of the City Guard, National Fire Brigade Headquarters, Great Orchestra of Christmas Charity Foundation, Medtronic Poland

company as well as own research and knowledge. It has to be emphasised that each of mentioned organisations had only partial knowledge about AED locations. The presence of AED in indicated locations was verified by phone or in person in random locations.

All AED locations were showed on the map of Warsaw and then the numbers of AED per 10 000 citizens and per 10 sq. km were calculated for the whole city and for certain districts according to the data from the Central Statistical Office [14]. To compare obtained data with the results for other Polish cities that published their lists of AED, demographic data from the Central Statistical Office were obtained [15].

The data regarding all AED identified by 15 May 2009 are presented below. We continue to search for the new AED provided and we keep verifying devices that were already spotted.

At first, data were published during the celebrations of the 200th anniversary of medicine teaching (10 May 2009) in Warsaw and during the 13th Picnic of Polish Radio and the Copernicus Science Centre (30 May 2009). All visitors could appreciate a list of AED locations and be trained to use AED.

Results

By 15 May 2009, 117 devices had been identified and reported in 83 points in Warsaw. Locations included the City Hall, district offices, eight underground stations, museums (National Museum, Museum of Technology, The Royal Castle), shopping centres (e.g. Arkadia, Galeria Mokotów), some sports and recreational centres (e.g. Warszawianka Sports Centre), district police headquarters and district fire brigade headquarters. Most of AED were located at the Fryderyk Chopin airport. There were 25 devices distributed there according to the following principle: time needed to get from any point at the airport to the nearest AED and back should not exceed 90 s.

Emergency police patrols and the units of the City Transportation Company had at least 10 AED that could be used at the scene of the accident.

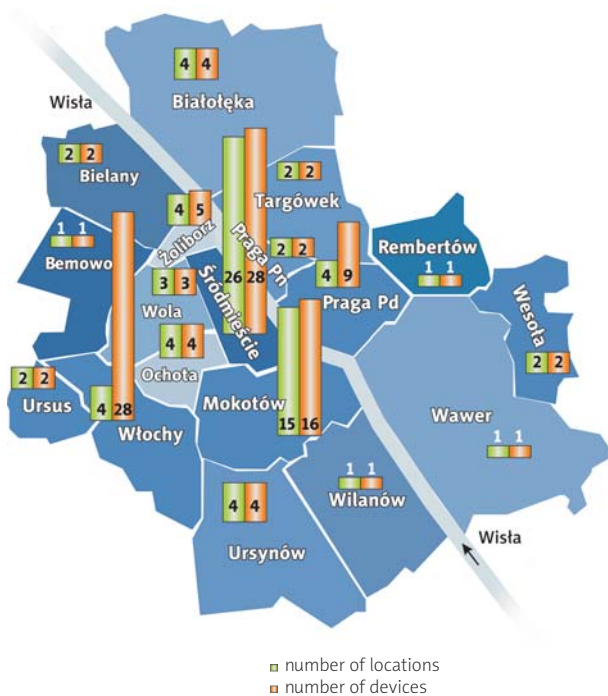


Figure 2. Number of AED and AED locations in Warsaw districts

Table I. Number of AED and their locations in Warsaw districts, ratios of the number of AED per 10 000 citizens and per 10 km². Leading districts in every category are bolded

District	Number of spots with AED	Number of AED	Population	Ratio of AED/10 000 citizens	Area [km ²]	Ratio of AED/10 km ²
Bemowo	1	1	110 960	0.09	25.0	0.40
Białołęka	4	4	85 972	0.47	73.0	0.55
Bielany	2	3	134 167	0.22	32.3	0.93
Mokotów	15	16	225 914	0.71	35.4	4.52
Ochota	4	4	89 661	0.45	9.7	4.12
Praga Południe	4	9	183 125	0.49	22.4	4.02
Praga Północ	2	2	72 058	0.28	11.4	1.75
Rembertów	1	1	23 144	0.43	19.3	0.52
Śródmieście	27	29	129 142	2.25	15.6	18.63
Targówek	2	2	122 922	0.16	24.2	0.83
Ursus	2	2	49 567	0.40	9.4	2.14
Ursynów	4	4	147 676	0.27	43.8	0.91
Wawer	1	1	68 815	0.15	79.7	0.13
Wesoła	2	2	22 314	0.90	22.9	0.87
Wilanów	1	1	17 806	0.56	36.7	0.27
Włochy	4	28	39 651	7.06	28.6	9.78
Wola	3	3	138 444	0.22	19.3	1.56
Żoliborz	4	5	48 443	1.03	8.5	5.90
Warsaw globally						
	83	117	1 709 781	0.68	517.2	2.26

The number of AED in individual districts varied significantly. The majority of the devices were located in the Śródmieście district (29 devices in 27 spots), in the Włochy district (28 devices in 4 spots including the Fryderyk Chopin airport) and in the Mokotów district (16 devices in 15 spots). The fewest devices were in the districts of Bemowo, Rembertów, Wawer and Wilanów (one device each, Figure 2, Table I).

According to the statistical data regarding demographics and the city area, the number of AED per 10 000 citizens was 0.68 (1 AED/14,706 citizens, Table I), and the number of AED per 10 km² was 2.26 (1 AED/4.24 km²). The highest ratio of AED/10 000 citizens was observed in the districts of Włochy (7.06), Śródmieście (2.25) and Żoliborz (1.03) and the lowest – in Targówek (0.16), Wawer (0.15) and Bemowo (0.09) districts. The highest ratio of AED/10 km² was found in the districts of Śródmieście (18.63), Włochy (9.78) and Żoliborz (5.9) and the lowest ratio – in the districts of Bemowo (0.4), Wilanów (0.27) and Wawer (0.13).

Discussion

Our study is the first attempt to report on the distribution of AED devices in Warsaw. Among Polish cities only Bydgoszcz and Kraków published the number and locations of AED within their borders [16, 17]. Access to

AED in Warsaw (1 AED/14 706 citizens) turned out to be lower than in Bydgoszcz (1 AED/8003 citizens) but much better than in Kraków (1 AED/54 032 citizens).

The distribution of AED varies much within Warsaw. There is a high concentration of the devices in the city centre (Śródmieście district) contrary to the outskirts of Warsaw (Figure 2, Table I). This situation may be justified by better access to the devices around workplaces and tourist attractions where the SCA is highly likely to occur. What is more, heavy traffic within the city centre additionally impedes ambulance arrival at the scene of the accident. Scientists from the US analysing prognosis after SCA in large cities (New York, Chicago) explain the low survival of subjects at the level below 2% with traffic congestion or presence of skyscrapers [4, 18]. However, there is unarguably insufficient access to AED in many places.

According to the ERC recommendations, areas of heavy traffic should be exceptionally well-provided with access to AED [8]. There is worrisome shortage of these devices in the city of Warsaw. There is no AED at train stations, many shopping centres and hotels. It is presumed that public access to AED in the above locations could result in saving several to a dozen of human lives within a few years [19]. Jorgenson and co-workers have estimated that

the incidence of AED usage in public places (offices, shopping centres, recreational centres) reaches even 11% in one year [12]. The cause of those devices not being installed should be established and public access to AED should be promoted especially that it seems to be justified by cost-effectiveness analyses [20].

Another problem occurring during our visits to the areas where the presence of AED had been confirmed by phone was the lack of common knowledge about the exact location of the device among staff members as well as security guards. Occasionally the time needed to find the device exceeded 15 min. This was mainly due insufficient device labelling, staff's fright of damaging an expensive device and AED location in the area of limited access. It should be, however, emphasised that in many cases, AED were correctly marked, exposed, staff was well-informed about their location and trained to use them (had basic life support course done).

To sum up, publishing the record of AED locations may contribute to the improvement of citizens' safety [13]. Also it can indicate to the city authorities where a shortage of those devices occurs. It seems that with a relevant promotion campaign, getting listed as a location requiring access to AED could encourage providing certain spot or institution with the device (such attempt was made in Kraków) [16]. The lack of consistent knowledge among the city authorities, police, city and fire brigade regarding the number and distribution of AED in Warsaw requires a full record of all devices to be developed.

In our opinion, not only should we aim at increasing the number of AED but also at popularising them. These devices are easy to use and dedicated to be used commonly (by people with no medical background) [21]. Thus, it seems inappropriate to mark those devices suggesting that they can be used only by trained medical staff. Our experience shows that local media, happenings and training courses in basic life support can help spread knowledge about AED distribution. Furthermore, it is possible to identify the location of the rescuer and indicate the nearest AED by means of mobile technology. It can be presumed that introducing such technologies will not only improve the knowledge about the distribution of AED but will be also useful during resuscitation.

Conclusions

We should aim at increasing the number of AED in the city of Warsaw, especially in the areas of heavy traffic and high probability of device usage.

The results of our study confirm the necessity to unify and standardise labelling of AED as well as the need to train staff members to use and locate devices in spots where they are already available. All efforts should be made to provide the widest access to AED.

The fact that the city authorities, police, city guards and fire brigade have only limited knowledge about distribution of AED justifies our attempt to create a full record of all devices in the city of Warsaw. It is necessary to continuously update and promote these data since it seems that wide knowledge about AED distribution can improve citizens' safety.

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Dostępność automatycznych zewnętrznych defibrylatorów na terenie miasta Warszawy – stan na maj 2009 roku

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Streszczenie

Wstęp: Najczęstszą przyczyną nagłego zatrzymania krążenia (ang. *sudden cardiac arrest*, SCA) jest migotanie komór lub częstoskurcz komorowy. Mimo wielu starań rokowanie w grupie chorych z pozaszpitalnym SCA pozostaje bardzo złe. Zgodnie z rekomendacjami Europejskiej Rady Resuscytacji (*European Resuscitation Council*, ERC), elementem skutecznego postępowania jest szybka defibrylacja, najlepiej w ciągu pierwszych 3–5 min. Dzięki rozpowszechnieniu automatycznych zewnętrznych defibrylatorów (ang. *automated external defibrillator*, AED) czas od SCA do defibrylacji może ulec skróceniu, co może skutkować poprawą rokowania w tej grupie chorych. Na tej podstawie ERC zaleca rozmieszczanie AED w szeroko dostępnych miejscach publicznych.

Cel: Ocena dostępności AED na terenie Warszawy.

Metody: Poszukiwaniami AED objęto szeroko dostępne miejsca publiczne, m.in. budynki użyteczności publicznej. Urządzenia zlokalizowano na podstawie informacji uzyskanych z Urzędu Miasta, od służb publicznych, fundacji i firm prywatnych, na podstawie własnych poszukiwań i wiedzy. Informacje potwierdzano telefonicznie w ustalonym miejscu lokalizacji AED, a w losowo wybranych lokalizacjach weryfikowano dostępność urządzenia naocznie.

Wyniki: Na terenie miasta do dnia 15 maja 2009 r. zlokalizowano 117 urządzeń typu AED w 83 punktach. Najwięcej urządzeń znajdowało się na terenie dzielnic Śródmieście (29 urządzeń) i Włochy (28). Średnio jedno urządzenie przypadało na 14 706 mieszkańców Warszawy (0,68/10 000 mieszkańców) i 4,24 km² (2,26/10 km²). Najwięcej AED na 10 tys. mieszkańców przypadało w dzielnicach: Włochy (7,06) i Śródmieście (2,25), najmniej – Targówek (0,16), Wawer (0,15) i Bemowo (0,09). Najwięcej AED na 10 km² znajdowało się w dzielnicach Śródmieście (18,63), Włochy (9,78) i Żoliborz (5,9), najmniej – Wilanów (0,27) i Wawer (0,13).

Wnioski: Należy dążyć do dalszego zwiększania liczby AED, organizować pokazy i szkolenia z zakresu ich prawidłowego użycia oraz intensyfikować działania mające na celu promocję tego typu urządzeń. Konieczne jest podjęcie kroków w celu umożliwienia jak najszerszego dostępu do AED. Dostrzega się wyraźne różnice w liczbie urządzeń w poszczególnych dzielnicach. Fakt posiadania przez jednostki administracyjne jedynie częściowych informacji o rozmieszczeniu AED potwierdza zasadność przeprowadzonej próby zlokalizowania i skatalogowania wszystkich AED na terenie Warszawy.

Słowa kluczowe: automatyczny zewnętrzny defibrylator, nagłe zatrzymanie krążenia, miasto stołeczne Warszawa

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