



The automatic external defibrillators records: another useful resource to take into consideration to create a national registry of out of hospital cardiac arrest in Mexico

Keywords:

automated external defibrillator, out of hospital cardiac arrest, cardio protected areas, Mexico.

Palabras clave:

desfibrilador automático externo, paro cardíaco extrahospitalario, espacios cardioprotectados, México.

Los registros del desfibrilador automático externo: otro punto a considerar para la creación de un registro nacional de paro cardíaco extrahospitalario en México

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ABSTRACT

The increased use of the Automated External Defibrillator (AED) and the creation of cardio protected areas in the world and in Mexico contribute to increased survival rates after Out of Hospital Cardiac Arrest (OHCA). When used, the AED records not only the heart rhythm, but also information about Cardiopulmonary Resuscitation (CPR) in the unconscious victim. This data could be important and useful for further diagnosis and treatment. However, there are also some legal questions regarding the use of this information and how it should be managed. To this purpose we suggest the creation of a National Registry of Out-of-Hospital Cardiac Arrest (RENAPACE, for its acronym in Spanish) to handle the AED data. That information could serve for several purposes: 1. Guarantee the availability of data in Mexico for the care of patients who survive an episode of OHCA. 2. To monitor the quality in the use of the AED. 3. Scientific research. 4. To help create a more concise registry of the cause of death and push to include the term «sudden cardiac death» in death certificates. Creating a national AED registry requires, medical and political will and could confront economical, political, legal and organizational problems to address. There are some cities in Mexico developing this program.

RESUMEN

El aumento de los espacios cardioprotectados y del uso del desfibrilador automático externo (AED, por sus siglas en inglés) en México y en el mundo ha contribuido a mejorar la supervivencia en el paro cardíaco extra hospitalario (OHCA, por sus siglas en inglés). El AED graba el ritmo detectado en la víctima además de información de la reanimación cardiopulmonar (CPR, por sus siglas en inglés). Esta información puede ser importante y de utilidad para el diagnóstico y tratamiento de casos futuros. Sin embargo, hay algunos problemas legales en cuanto el uso de la información y cómo deben manejarse los datos registrados en el AED. Por esta razón sugerimos la creación de un Registro Nacional de Paro Cardíaco Extra Hospitalario (RENAPACE). Este tendrá el propósito de: 1. Ayudar a mejorar y tener acceso a los datos nacionales de los pacientes que sufren y sobreviven a un OHCA. 2. Mejorar la calidad del monitoreo al respecto. 3. Hacer investigación científica al respecto. 4. Documentar con mayor precisión la causa de muerte e impulsar la inclusión del término «muerte súbita cardíaca» en los certificados de defunción en México. La creación de este registro de AED y RENAPACE requiere de voluntad médica y política y tendrá que afrontar y superar problemas económicos, políticos, legales y organizacionales para lograrse. En México varias ciudades han iniciado a implementar este programa.

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Received:
02/16/2024
Accepted:
07/10/2024

How to cite: Álvarez-de la Cadena-Sillas J, Asensio-Lafuente E, Rodríguez-Reyes H, Urzúa-González A, Martínez-Duncker D. The automatic external defibrillators records: another useful resource to take into consideration to create a national registry of out of hospital cardiac arrest in Mexico. Cardiovasc Metab Sci. 2024; 35 (3): 111-115. <https://dx.doi.org/10.35366/117829>



INTRODUCTION

Out of Hospital Cardiac Arrest (OHCA) and Sudden Cardiac Death (SCD), represent approximately 20% of total deaths in adults.¹⁻⁴ In developed countries as the United States of America and the European Union, the mortality rate is calculated between 41-155 cases for every 100,000 habitants/year in the population older than 45 years.⁵⁻⁷

Patients who suffer an event of SCD secondary to a shockable rhythm, either tachycardia or ventricular fibrillation, and receive early defibrillation have an increased survival rate of 49.5% compared to 32.4% among those who do not receive it.⁸ In the survivors' group, 56% received early defibrillation with an Automatic External Defibrillator (AED).⁹ This indicates the importance of early defibrillation in the treatment of SCD. Successful Cardiopulmonary Resuscitation (CPR) during an OHCA requires the intervention of a community trained in hands only CPR.¹⁰ They must activate the survival chain, detect the OHCA, notify the emergency system and if necessary, apply and use of the AED.¹¹ It is important that the general population is aware about and trained in Hands only CPR. Frequently the first responder of an OHCA is a person unrelated with the health system.^{6,12} That witness is the ideal person to initiate CPR-By (bystander CPR) and it is the single factor with most impact on the survival rate of the victim. Family members have also been identified as an essential element to witness and initiate CPR, that will probably be performed with more emphasis than by any other bystander. Family member CPR has been associated with more than a two-fold increase in survival rates compared with delayed CPR by the Emergency Medical System (EMS).¹³ An AED can be used in an effective way by the first responders or bystanders witnessing an OHCA. The stored data in the AED are underutilized and could potentially help improve its use and the CPR quality by any people. This record is also useful taking into account the increase in the number of AEDs in Mexico in recent years.

WHAT IS THE CLINICAL VALUE OF THE AED DATA?

When EMS take over CPR, they always check the patient's heart rhythm and pulse. In the absence of a shockable rhythm, the possibility that an earlier defibrillation administered by the AED has been successful arises. Sometimes there's even recovery of spontaneous circulation (ROSC), but the AED does not have a mean to display what happened before EMS arrived. These data, including the Electrocardiogram (ECG) records from the AED, are saved in the equipment but there is a special procedure to obtain them. Homma et al found that in 11-13% of OHCA cases, the initial rhythm treated by the AED was stored. That memory retrieval procedure is the only way to have access to the ECG and therapies received by the patient. Nonetheless, a very important step is to transfer the captured data to the EMS and Hospital responsible for the patient's treatment, and that is not always achieved.¹⁴ What happens when the information that the patient was defibrillated for a shockable rhythm like ventricular fibrillation is not available? The physician will not know the cause and subsequently, the patient's condition would be difficult to stabilize because of a lacking proper diagnosis. A syncope, for instance, may not be recognized as cardiac arrest or as an aborted SCD. If the ECG recorded in the AED is not known, the patient potentially may not receive the right treatment, such as an implantable cardioverter-defibrillator (secondary prevention) and the possibility of a new SCD event could still be present.

Sometimes, even knowing the AED delivered a shock probably due to ventricular fibrillation, errors in the diagnosis and treatment could happen.¹⁵ For these reasons, AED/ECG data records should always be analyzed to enhance clinical decision-making. Knowledge about the information stored in an AED is a useful tool to provide correct diagnosis and clinical decision making on patients who survive a SCD event. Also, the AED registers the resuscitation procedures, i.e. chest compressions and ventilations aside from heart rhythm and delivery of the defibrillation shocks, as shown in [Figure 1](#).

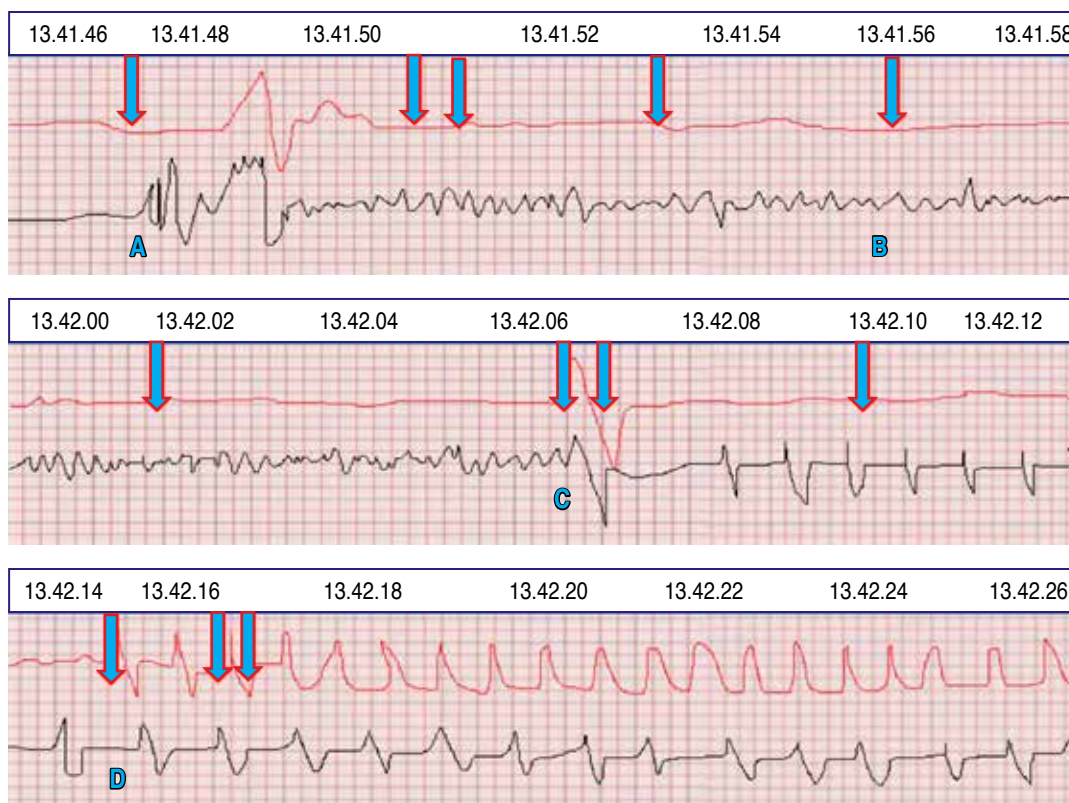


Figure 1: Example of the start of an (AED) registration. I. Started at 13.41.47 at time point A, when the electrodes are connected and seconds later the rhythm analysis starts. II. 13.41.51 The AED analyzes the rhythm. III. After 9 seconds at point B (13.41.56) the AED has detected a shockable rhythm and charges itself. IV. Seven seconds after the AED advice, a shock at time point C (13.42.06) a defibrillation shock was administered. V. At 13.42.08 the heart rhythm has returned to normal. VI. Eight 8 seconds later at time point D (13.42.15), chest compressions are started at a rate approx. 100 per minute (red line). Conclusion from the AED data: 1) The cause of the cardiac arrest was ventricular fibrillation. 2) The first shock reversed the arrhythmia. 3) The rescuer has a good performance.

Modified from: Bak MAR, Blom MT, Koster RW, Ploem MC. Resuscitation with an AED: putting the data to use. *Neth Heart J.* 2021; 29 (4): 179-185.

Unfortunately, in Mexico the analysis of AED data is not done systematically.¹⁶ In the Netherlands, for example, the AED/ECG data are routinely unloaded and stored. The treating physician will then have information about the initial rhythm registered by the AED in an OHCA. This can help the physician to establish the patient's correct diagnosis and treatment.^{17,18} The generalized AED data collection and analysis is not easy and it is expensive, since it involves getting the information from different sites of a community, states etc. It also has to be considered that not all AED models are the same and thus, retrieval systems are not standardized either.¹⁹ A

legislation that allows access to that information is not available in Mexico.

Another concerning issue is that if data is not downloaded within a certain period, it might be deleted, lost to new acquired data, or the device might not record new events because of a full memory. In Mexico the *Ley de Protección de Datos Personales*²⁰ (Personal Data Protection law) safeguards the patient's personal data from being disclosed without her/his permission. In this regard, a legislation that allows the access to specific medical information to better understand and know diagnoses, treatments and thus improves survival rates after OHCA could be useful.

We can then conclude that there are different needs for a new legal frame in our country. These could include the items depicted below and others that might arise ulteriorly:

1. A legislation for cardio-protected areas.^{21,22}
2. Use of the AED data registry²³ (within the RENAPACE) to analyze the patients' information in any type of OHCA.
3. The possibility to use this medical and epidemiological information for public health purposes, patient diagnosis and treatment, as well as for research and investigation.²⁴

The RENAPACE will facilitate access to this information and will point out what data could and should be used. It's important to say that data of a lonely SCD patient will also need a special type of legislation. There is a need for a legal frame and about the rules concerning implementation of cardio protected areas, OHCA registry (RENAPACE), good Samaritan laws, and using and processing a AED as well as its data. This requires an interaction between the government, non-governmental organizations, medical associations and organized (or not) community groups in order to solve logistic, ethical and juridical obstacles to create a legal scenario and structure to collect, store, retrieve and analyze the AED's data for research and emission of public health recommendations or policies.

In Mexico, some places such as Jalisco, Mexico City, Mexico State, Morelos, Nuevo Leon, Puebla, Queretaro, Sonora, Tamaulipas and Yucatan have started community hands-only CPR training and public access defibrillation programs, but unfortunately these efforts have not been implemented nation-wide yet.²⁵ National Programs in Mexico with permanent implementation of hands-only CPR and public access defibrillation can achieve important improvements in public health: 1) They will increase the knowledge and awareness of the general population and health personnel about the importance of SCD and OHCA; 2) they will help to create preventive measures aimed at the population to reduce OHCA and SCD; 3) they may reduce the incidence of OHCA and SCD, and 4) they might improve

the survival rate of the community victims of OHCA.²⁶ These benefits will require a local and national legislation in the context of the cardio protected areas in our country, the need for medical associations to prioritize the patient's overcoming SCD in the context of an OHCA, and finally an optimal use of the AED.

ACKNOWLEDGEMENT

Acknowledgment to Dra. Lillian Hernandez Garcia for assisting in the review and translation of the manuscript.

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Funding: no financial support was received for this study.

Declaration of interests: the authors declare no conflict of interest.

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