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Hands-only cardiopulmonary resuscitation and public access defibrillation, the need for cardio-protected areas implementation in Mexico

RCP sólo con las manos y DEA de acceso público, la necesidad de implementar áreas cardio-protegidas en México

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Palabras clave: *Reanimación cardiopulmonar, desfibrilador externo automático, paro cardiaco súbito, muerte súbita.*

ABSTRACT

Sudden cardiac arrest (SCA) is one of the main worldwide health problems. It is estimated that it is responsible for 30% of cardiovascular deaths and up to 20% of total adult mortality. The chance of survival for a SCA victim is related to the timely interventions after the event in the first 5 minutes there is a greater chance of survival of the victims. Hands-only cardiopulmonary resuscitation (CPR) and public access automated external defibrillator (AED) use, are so far the best strategy to increase the victim's survival in an out-of-hospital setting. In this work, the meaningful role of hands-only CPR and public access AED to increase the SCA victim's survival in the community are reviewed, as well as the importance of implementing cardio-protected areas in Mexico.

RESUMEN

El paro cardiaco súbito (PCS) es uno de los mayores problemas de salud a nivel mundial. Se estima que es responsable de 30% de mortalidad cardiovascular y de 20% de la mortalidad total en los adultos. La posibilidad de recuperación para una víctima de PCS depende del tiempo en que se inicie la atención posterior a ocurrido el evento, en los primeros cinco minutos se tiene mayor posibilidad de supervivencia de las víctimas. La reanimación cardiopulmonar (RCP) sólo con las manos y el uso de desfibrilador externo automático (DEA) de acceso público son la mejor estrategia para lograr proporcionar atención temprana y mejorar la supervivencia de las víctimas de un PCS dentro y fuera de un hospital. En el presente artículo se revisa la importancia de la RCP sólo con las manos y del uso de DEA de acceso público para mejorar la supervivencia de las víctimas de PCS en la comunidad, así como la importancia de implementar áreas cardio-protegidas en México.

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INTRODUCTION

Sudden cardiac arrest (SCA) is one of the main worldwide health problems. It is estimated that there are almost 5.3 million cases every year,[1] thus being responsible for 30% of the cardiovascular deaths and 20% of the total global adult mortality.[2] Most of SCA patients end-up as sudden death (SD) victims, and this outcome is frequently among subjects that do not benefit from early CPR and AED.[3] Currrently, more patients show non-shockable rhythms such as asystole or pulseles electric activity (PEA) as the cause of SCA at home, where almost 80% of the community cardiac arrests occur.[4] Nonetheless, SCA might also be related to a shockable rhythm as ventricular fibrillation (VF) or pulseless ventricular tachycardia (pVT) that are regularly encountered in the out-of-home place setting or related to sports activities. This represents nearly 20% of the community's SCA events among children and adults.[5,6] At the present time, the chance of survival for SCA victims is less than 10%,[7,8] but this can be significantly improved among victims with a shockable rhythm (VF, pVT) that are early treated with CPR and AED.[8,9]

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Hands-only CPR and «chain of survival» in the community

It has been demonstrated that hands-only CPR in the community is as effective as CPR with compressions and ventilation support,[10] thus making it the preferred method among lay-persons.[11,12] Usually, the out-of-hospital care sequence for SCA is initiated with the early detection of the victim, emergency medical services activation (call 911 in Mexico), asking for an AED and start CPR, with particular emphasis on chest compressions and use of the AED as soon as it is available *(Table 1)*. When a SCA victim with a shockable rhythm is treated within the first two minutes after the cardiac arrest, the survival rates might go as high as 71% with an adequate neurological recovery.[13] In Mexico, several efforts have been made in different communities to improve SCA survival. For example, in the city of Querétaro, several massive CPR public training sessions have been organized since 2008 to date. The survival rate of patients went from 0% to an initial marginal improvement in survival.[14,15]

Public access AED

In large populations, the Hands-only CPR and early defibrillation (AED) training programs have shown to be effective because they encourage the community's implication in early CPR and AED administration and reduce mortality rates.[16] This is particularly evident among SCA victims with shockable rhythms in sports centers or units that have readily available AED's and public CPR training.[17] In order to protect more population, strategic places are chosen to locate public AED's, and the devices are also included in different emergency vehicles so the SCA victims can be treated sooner.[18] A local analysis showed that first responder units (police cars, for example) equipped with AED could lower the financial costs per life saved from 5.8 million pesos to 0.5 million pesos when compared with advanced life support ambulances. This is a way to optimize the resources and personnel use.[19] Some countries have reported that by-stander CPR and AED use prior to the emergency medical services arrival has increased and that there is a higher community participation in resuscitation maneuvers, thus reducing mortality, increasing survival rates and improving the neurologic outcomes of the SCA victims. Those results emphasize the training programs meaningfulness and are a stimulus to continue training and promoting community based-CPR and AED use.[13,20]

Table 1: SCA victim attention in the community, Hands-only CPR and public access AED.

1. Acknowledge the SCA victim (sudden collapse, non-responsive, does not move, does not breathe, is pale or cyanotic)
2. Call the local Emergency Medical Services number (Mexico 911), ask for an AED and put the call on speaker to receive assistance from the dispatcher
3. Initiate chest compressions in the center of the chest, between both nipples, at a 100 to 120 compressions per minute rate, with 5 to 6 cm depth, or 4-5 cm in children until an AED is available or EMS assistance arrives
4. Fast use of the AED
   A. Open and follow the instructions in the AED
   B. Place the chest patches as indicated, remember to use pediatric patches in children less than 8 years-old. Do not touch the victim while the AED analyzes the rhythm
   C. If a shock is required, the AED will indicate it
   D. Remember to say «stand back» and assure that no one touches the victim before applying the shock
   E. Push the blinking button to administer a shock
5. Re-start chest compressions until the patient regains consciousness, EMS assistance arrives or until the AED indicates it

SCA = Sudden Cardiac Arrest; CPR = Cardiopulmonar Resuscitation; AED = Automatic External Defibrillator; EMS = Emergency Medical System.

Table 2: Prehospital interventions and survival in the city of Querétaro of victims of out-of-hospital cardiac arrest, registered with the Utstein-Style methodology.[15,19]

	* ↓ 2006	* 1 ↓ 2009	2013	* ↓ 2017	2018	* ↓ 2019
				2		
n	147	204	79	62	68	68
CPR prior to EMS arrival (%)	2.0	10.8	44.4	NA	NA	NA
CPR by police (%)	NA	NA	1.5	24.5	18.4	24.2
Defibrillation by police (%)	NA	NA	NA	2.0	0	1.6
Patients with shockable rhythms (%)	NA	9.6	1.5	0	7.7	10.0
ROSC (%)	30.0	1.85	20.3	24.0	42.3	29.8
Survival (%)	0	0	2.5	6.45	4.4	1.47

* Change of the municipal goverment. 1. Medical Emergencies Regulator Center Start of operations (2011). 2. Querétero «Cardioprotected» City.
CPR = Cardio-Pulmonary Resuscitation; EMS = Emergency Medical Services; ROSC = Return Of Spontaneous Circulation; NA = non available.

Hands-only CPR and AED use Program in Mexico

Some Mexican States have already implemented «cardio-protected» areas with community hands-only CPR training and public access defibrillation, but the programs have not been implemented nation-wide yet. This is why it is important to promote the cardio-protected areas implementation in schools, large buildings, hotels, business centers, bus terminals, airports, malls, retirement facilities, residential clusters, sports centers, gyms, emergency medical units, medical offices units and so on. Any place with a potential to gather more than 500 people at a time, should ideally be a cardio-protected area. In this regard, it could also be useful to have every emergency services vehicle equipped with an AED. We believe that the best way to achieve cardio-protection in our country is to implement generalized Hands-only CPR training and to place AED's in public places in a pattern similar to the present fire extinguisher placement legislation. This is a way to stimulate the public and private authorities participation, considering that they are the mainstay for the complete population's protection. In Mexico we do not have comprehensive statistics on the incidence of SD. According to a preliminary study with a low number of interventions, in Querétaro, the one-year survival rate after implementation of CPR training for the public (while obtaining their driver's license and through repeated training in public events) and police officers, and after equipping some police cars with AED, has raised from 0% to 6.4% in a ten year-period *(Table 2)*.[15,19] Nonetheless, it is important to establish a public health policy that ensures the continuity of the training efforts in order to maintain and increase the survival rate of these patients. A nation-wide permanent implementation of the hands-only CPR and public access defibrillation programs could promote several health improvements such as: 1) Increase the awareness and understanding of the general population and healthcare personal about this important problem, 2) Favor more preventive behaviors in the population in order to avoid a SCA, 3) Reduce the incidence of SCA and SD, and 4) Improve the survival rate of SCA victims in the community.

CONCLUSIONS

SCA remains a main public health concern worldwide. Early Hands-only CPR and public access defibrillation performed by lay-persons

might significantly increase the victim's survival, especially among victims with a shockable rhythm. Nonetheless, those early interventions require large community based Hands-only CPR programs and enough AEDs available in public areas with certain features, mainly, any place that can gather 500 people or more at the same time. To achieve full coverage of the population, it is necessary the implementation of AEDs be a requirement as is the current normativity about the use of fire extinguisher in our country, which would allow the participation of all sectors (public and private), and we could achieve improvements in several important aspects of health in our population.

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