Epidemiologic differences between cardiac arrests attended in the home and in public locations in the Basque Country

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Objective: To analyze the characteristics of cardiac arrests that emergency responders evaluated for resuscitation in the home in comparison with those attended in public locations.
Methods: Observational study carried out in the Basque Country, Spain. Clinical data were collected for cardiac arrest patients evaluated for resuscitation by responders from basic life support services over a period of 18 months. Epidemiologic characteristics were compared between arrests occurring in the home vs in a public location. The relation between exposure factors and event location was explored by performing multiple regression analysis.
Results: A total of 1050 cardiac arrests were analyzed; 71.4% were attended in the home and 28.6% in a public location (*P*<.001). Cardiac arrest in the home was associated with women (OR, 1.76; *P*=.002), older age (*P*<.001), response time, a lower frequency of attempt to resuscitate before the responders arrived (OR, 2.27; *P*<.001), higher frequency of nonshockable rhythm (OR, 2.29; *P*<.001), and failure of resuscitation maneuvers (OR, 2.33; *P*<.001).
Conclusions: Out-of-hospital cardiac arrests occur mainly in the home. Home cardiac arrests are associated with a larger number of factors related to failure to resuscitate. Many intrinsic and extrinsic differences distinguish cardiac arrests in the home from those that occur in public places. To maximize the possibility of successful resuscitation, different strategies should be used in responding to events in the 2 locations. [Emergencias 2014;26:125-128]

Keywords: Out-of-hospital cardiac arrest. Cardiopulmonary resuscitation. Emergency health services. Ventricular fibrillation. Defibrillators. Survival.

Introduction

It is estimated that only 60% of out-of-hospital cardiac arrests (OHCA) are attended by emergency medical services (EMS)[1], and the chances of survival are very low, a situation which has remained virtually unchanged during the past 30 years[2]. The appearance of automated external defibrillators (AEDs) available to non-medical personnel represents a step forward in the management of ventricular tachyarrhythmias[3] caused by CA, but most events occur at home or where such devices are not immediately available[4,5]. The objective of this paper was to compare epidemiologic variables between CA patients attended in the home and in public locations.

Method

We performed an observational study of OHCA patients in the Basque Country between July 2009 and December 2010. We included all situations of CA occurring in the home or in a public location and undergoing resuscitation attempts by basic life support (BLS) teams, usually supported by advanced life support (ALS) units. "Home" was considered the patient's usual or temporary place of residence and "public location" as public roads and highways, buildings with public access, recreational areas or workplaces. Events attended by ALS teams alone or occurring in health centers were not included.

Data were extracted, in accord with the legal

requirements[6], from the centralized database of OHCA run by Emergentziak-Osakidetza and clinical documentation provided by employees of BLS units integrated in the emergency network, using a standard form based on the Utstein style. Data collection included sex and age, presumed etiology of CA, electrocardiographic rhythm after AED application, the presence of witnesses to the event, any resuscitation attempt (coordinating center telephone-guided chest compressions) before BLS arrival, previous heart disease or known cardiovascular risk factors, response intervals and immediate survival after life support maneuvers. The study variable was whether the CA occurred at home.

Mann Whitney U test was used in the analysis of quantitative variables, expressed as median (Me) and interquartile range (IQR). For the association between qualitative variables, Z or chi-square tests were used. Differences with a P value <0.05 were considered statistically significant. In order to measure the magnitude of the association between different exposure factors and the study variable, the odds ratio (OR) was calculated using a multivariate analysis with a binary logistic regression model which included those variables that showed statistical significance in the bivariate analysis. Analyses were performed using SPSS v18 and Open Epi.

Results

We extracted from the database a total of 750 CA events occurring in the home and 300 in public locations (71.4% vs 28.6%, P <0.001). Of the cases in public locations, 204 (68%) occurred on a street/road, 26 (8.7%) in the workplace, 8 (2.7%) in sporting areas and the rest (62 cases, 20.7%) in other non-specified locations.

Statistically significant differences in age (p <0.001) were observed, higher in the home CA group (76 years, IQR 62-83) than the public CA group (63; IQR 47-75). The CA in the street in front of the home predominated In patients under 65 years of age, OHCA occurred more frequently out of the home. In those aged ≥80 years, OHCA occurred more frequently at home (Figure 1).

When CA was assisted out of a residential place there was a higher frequency of male patients (p <0.001), witnesses (p <0.001), bystanders who initiated some form of resuscitation before BLS arrival (p <0.001) and ventricular tachyarrhythmia defibrillation (p <0.001) (Table 1). Furthermore, these patients showed a higher rate of immediate survival after resuscitation (p <0.001).

Response intervals were significantly higher in the events that occurred at home (Table 2). However, in situations where resuscitation efforts were successful, no differences (p = 0.1) were found in time required from the start of life support techniques until the return of spontaneous circulation in both scenarios.

On introducing the variables with statistical significance in bivariate logistic regression analysis (Table 3), the variable "presence of witnesses to the CA" was left out of the model (p = 0.08). The factors most strongly associated with home location of the CA were failure of resuscitation (OR 2.33, 95% CI 1.53 to 3.54) and presentation of a non-shockable arrhythmia after AED application (OR 22.29, 95% CI 1.56 to 3.37).

Discussion

In line with the international reports, OHCA in the Basque Country occurs more frequently in the home than elsewhere and there is a higher proportion of factors associated with immediate failure of resuscitation efforts[7]. Unfortunately, there are few studies on this in other Spanish communities, making it difficult to compare results.

In OHCA occurring at home we observed a low rate of bystander attempts at resuscitation and, in general, greater response time of medical BLS teams, both being key links in the chain of survival. The latter could be explained by difficult access to homes in urbanized areas by the emergency medical services (EMS) especially in large cities. In addition, we observed differences in times between am-

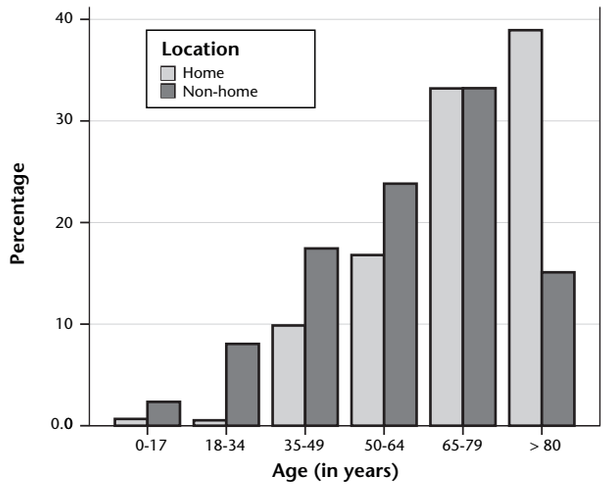

Figure 1. Age ranges by location of cardiorespiratory arrest.

Table 1. Epidemiological characteristics of out-of-hospital cardiac arrest events studied according to location

	Home n (%)	Public location n (%)	p
Male sex	443 (59.1)	231 (77)	< 0.001
Age <65 years	209 (27.9)	154 (51.6)	< 0.001
Presumed cardiac etiology	174 (54.7)	95 (56.5)	0.7
Witnesses	555 (74)	247 (82.3)	0.004
Pre-EMS resuscitation attempted	114 (16.2)	111 (39.9)	< 0.001
Shockable ECG rhythm	91 (12.2)	99 (33.3)	< 0.001
Previous heart disease	223 (42.5)	59 (40.4)	0.66
CV Risk Factors	408 (75)	100 (68)	0.09
Initial recovery after CPR	79 (10.5)	86 (28.7)	< 0.001
Interval "EMS activation <10 minutes – starting LS maneuvers"*	167 (24.7)	108 (40.1)	< 0.001

EMS: emergency medical services; CV: cardiovascular; CPR: cardiopulmonary resuscitation; LS: life support. *The time of EMS activation corresponds to the time the call was received by the Coordinating Center.

bulance arrival and initial contact with the patient, AED application and life support maneuvers, probably due to the time needed to walk from the ambulance to the home of the victim.

We also noted that the highest number of resuscitation attempts were performed in older patients with a higher probability of chronic diseases or poorer states of health states. This group was more often treated at home, especially from the eighth decade of life, but did not present higher proportions of known heart disease or cardiovascular risk factors compared to patients attended in public locations.

Male gender was associated with a higher overall prevalence of CA[8], but when this variable is compared in terms of location, we found that the proportion of men attended at home was lower than for women[9,10].

The rate of pulseless ventricular tachyarrhythmia in this series was low (18.2%), and below the rates

Table 2. Response intervals depending on the location of-hospital cardiac arrest (minutes: seconds)

	Home Me (IQR)	Public location Me (IQR)	p
EMS activation* arrival on the scene	10:00 (7:00-14:00)	9:00 (6:00-12:00)	< 0.001
Arrival initial LS maneuvers	5:00 (3:00-7:00)	3:00 (2:00-5:00)	< 0.001
Initial LS maneuvers ROSC	12:30 (5:30-22:00)	16:00 (12:15-26:00)	0.1
EMS activation* initial LS maneuvers	13:00 (10:00-18:00)	10:00 (5:00-14:00)	< 0.001

Me: median; IQR, interquartile range; EMS: emergency medical services; LS: life support; ROSC: recovery of spontaneous circulation. *The time of EMS activation corresponds to the time the call was received by the Coordinating Center.

Table 3. Estimates of risk (Odds Ratio, OR) adjusted using a binary logistic regression model for the study variable "CA event occurring at home"

	β	p	Adjusted OR
Failure of LS maneuvers	0.846	< 0.001	2.33 (1.53-3.54)
Non-shockable initial rhythm	0.830	< 0.001	2.29 (1.56-3.37)
No previous attempts at CPR	0.819	< 0.001	2.27 (1.58-3.25)
Age ≥ 65 years	0.683	< 0.001	1.98 (1.42-2.76)
Female sex	0.569	0.002	1.76 (1.23-2.53)
Interval to LS ≥10 minutes	0.533	0.003	1.70 (1.20-2.41)

CPR: cardiopulmonary resuscitation; LS: life support.

reported in other national studies[11-13]. As recently reported by other European authors[14], higher prevalence rates of shockable arrhythmias have been associated with non-home locations.

The main limitation of this study is the lack of clinical data on OHCA assisted exclusively by ALS teams. However, since the criteria applied to not activate a BLS unit until ALS arrival ("double response" care strategy) correspond to purely logistical issues (such as non-availability near the scene), not clinical, we believe the sample was representative of OHCA in our area. We would also highlight the lack of follow-up of patients resuscitated, and therefore we do not know how they fared beyond transfer to the hospital emergency department. This is due to difficulties in accessing data by basic life support resources. CPR was attempted more frequently in patient homes, even when not indicated due to presumed futility, which could introduce a potential bias, one that has also been reported in other similar studies.

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Diferencias epidemiológicas entre las paradas cardiorrespiratorias asistidas en el domicilio y la vía pública en el País Vasco

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Objetivos: Comprar las diferencias epidemiológicas existentes entre las paradas cardiorrespiratorias (PCR) extrahospitalarias consideradas para reanimación acaecidas en la vía pública y en el domicilio.
Método: Estudio observacional circunscrito al País Vasco. Se recogió información clínica sobre los pacientes en PCR considerados para reanimación asistidos por unidades de soporte vital básico durante 18 meses y se determinaron las diferencias epidemiológicas en función de la localización del evento. Se analizó mediante regresión multivariante la asociación entre "localización domiciliaria de la PCR" y distintos factores de exposición.
Resultados: Se revisaron 1.050 PCR, el 71,4% se produjo en el domicilio y el 28,6% fuera de él ($p < 0,001$). La PCR domiciliaria se asoció al sexo femenino (OR = 1,76; $p = 0,002$), edades superiores ($p < 0,001$), mayor tiempo de respuesta de los equipos de emergencias, menor tasa de intentos de reanimación antes de la llegada del recurso asistencial (OR = 2,27; $p < 0,001$), mayor presencia de ritmos no desfibrilables (OR = 2,29; $p < 0,001$) y mayor fracaso de las maniobras de reanimación (OR = 2,33; $p < 0,001$).
Conclusiones: Las PCR extrahospitalarias se localizan principalmente en el hogar y presentan mayor cantidad de factores asociados al fracaso de los intentos de reanimación. Existen múltiples diferencias, intrínsecas y extrínsecas, en función de la localización de la PCR, por lo que son precisas estrategias diferenciadas para maximizar la posibilidades de éxito tras la reanimación. [Emergencias 2014;26:125-128]

Palabras clave: Paro cardiaco extrahospitalario. Resucitación cardiopulmonar. Servicios médicos de urgencia. Fibrilación ventricular. Desfibriladores. Supervivencia.