Original article

Survival and Neurologic Outcome After Out-of-hospital Cardiac Arrest. Results of the Andalusian Out-of-hospital Cardiopulmonary Arrest Registry

CrossMark

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ABSTRACT

Introduction and objectives: There is a paucity of data on prehospital cardiac arrest in Spain. Our aim was to describe the incidence, patient characteristics, and outcomes of out-of-hospital emergency care for this event.
Methods: We conducted a retrospective analysis of a prospective registry of cardiopulmonary arrest handled by an out-of-hospital emergency service between January 2008 and December 2012. The registry included all patients considered to have a cardiac etiology as the cause of arrest, with a descriptive analysis performed of general patient characteristics and factors associated with good neurologic outcome at hospital discharge.
Results: A total of 4072 patients were included, with an estimated incidence of 14.6 events per 100 000 inhabitants and year; 72.6% were men. The mean age was 62.0 ± 15.8 years, 58.6% of cases occurred in the home, 25% of patients had initial defibrillable rhythm, 28.8% of patients arrived with a pulse at the hospital (58.3% of the group with defibrillable rhythm), and 10.2% were discharged with good neurologic outcome. The variables associated with this recovery were: witnessed arrest (P = .04), arrest witnessed by emergency team (P = .005), previous life support (P = .04), initial defibrillable rhythm (P = .0001), and performance of a coronary interventional procedure (P = .0001).
Conclusions: More than half the cases of sudden cardiac arrest occur at home, and the population was found to be relatively young. Although recovery was satisfactory in 1 out of every 10 patients, there is a need for improvement in the phase prior to emergency team arrival. Coronary interventional procedures had an impact on patient prognosis.

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Supervivencia y estado neurológico tras muerte súbita cardiaca extrahospitalaria. Resultados del Registro Andaluz de Parada Cardiorrespiratoria Extrahospitalaria

RESUMEN

Introducción y objetivos: No hay demasiados datos sobre la muerte súbita prehospitalaria en España. El objetivo es describir su incidencia, las características de los pacientes y los resultados de su atención por un servicio de emergencias extrahospitalario.
Métodos: Análisis retrospectivo de un registro prospectivo de parada cardiorrespiratoria atendida por un servicio de emergencias extrahospitalario entre enero de 2008 y diciembre de 2012. Se incluyó a todos los pacientes con estimación de etiología cardiaca como causa de la parada. Se realizó análisis descriptivo de las características generales de los pacientes y de los factores asociados con alta hospitalaria con buen estado neurológico.
Resultados: Se incluyó a 4.072 pacientes, con una incidencia estimada de 14,6 eventos por 100.000 habitantes y año, el 72,6% varones. La media de edad era 62,0 ± 15,8 años. El 58,6% de los casos ocurrieron en domicilio. El 25% de los pacientes tenían un ritmo inicial desfibrilable. El 28,8% de los pacientes llegaron con pulso al hospital, el 58,3% del grupo con ritmo desfibrilable. El 10,2% recibió el alta en buen estado neurológico. Las variables asociadas con esta recuperación fueron: parada presenciada (p = 0,04), parada

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presenciada por el equipo de emergencias (p = 0,005), realización previa de soporte vital (p = 0,04), ritmo inicial desfibrilable (p = 0,0001) y realización de intervencionismo coronario (p = 0,0001).
Conclusiones: Más de la mitad de los casos de muerte súbita ocurren en el domicilio. Afectan a una población relativamente joven. Aunque 1 de cada 10 pacientes tuvo una recuperación satisfactoria, la fase previa a la llegada de los equipos de emergencias debe mejorar. El intervencionismo coronario tuvo gran impacto en el pronóstico de los pacientes.

Abbreviations

CPA: cardiopulmonary arrest
CPC: Cerebral Performance Category
ET: emergency team
PCI: percutaneous coronary intervention
SCD: sudden cardiac death

INTRODUCTION

Cardiovascular diseases are the main cause of death in Spain.[1] Among them, there are high rates of ischemic heart disease with sudden cardiac death (SCD) as the most common form of death.[2,3] Overall estimates of the incidence of cardiopulmonary arrest (CPA) in general and of SCD in particular vary widely in every country,[4] mainly because the estimates are based on calculations that use different information sources, which can entail a certain margin of error.[5] Similar to incidence, survival after out-of-hospital CPA varies considerably between countries with similar health care structures.[6,7] Consequently, it is not uncommon to express CPA incidence and outcomes in relation to out-of-hospital emergency service care.[8]

Around 8 out of every 10 sudden cardiac arrests are known to be of cardiac etiology (or more generally, cardiovascular) and could be labeled as SCD.[9,10] Hence, out-of-hospital CPAs are traditionally always attributed to a cardiac etiology unless a specific cause is clearly identified.[11]

Although some general results on out-of-hospital CPA in Spain have been published in recent years,[12–14] there is no known figure on the true incidence of SCD in Spain. Information is also lacking on the final outcomes of patients who had an out-of-hospital CPA of possible cardiovascular cause.

The aim of this study was to describe the incidence and characteristics of out-of-hospital SCD seen by emergency teams (ETs) and the outcomes at hospital discharge in terms of survival and neurologic outcome.

METHODS

A retrospective analysis was conducted of a continuous registry of patients attended by out-of-hospital ETs for CPA between January 2008 and December 2012. The characteristics and methodology of the registry have been described previously.[13] Briefly, the *Registro Andaluz de Parada Cardiaca Extrahospitalaria* (Andalusian Registry of Out-of-hospital Cardiac Arrest) is a prospective, ongoing registry of CPA cases seen by ETs of the *Empresa Pública de Emergencias Sanitarias de Andalucía* (EPES, Public Health Emergency Company of Andalusia). This public health service handles out-of-hospital health emergencies in Andalusia, with an actual catchment population of 5 575 128 inhabitants (67.14% of the population, as the total for Andalusia is 8 302 923). Its ETs have an on-board physician.

Inclusion Criteria and Methods

The registry is included in the EPES general information system. The information system is a real-time record of all calls and responses provided throughout Andalusia. The information system meets the legal requirements for personal data security and protection set forth in the Spanish legislation. The cardiopulmonary arrest registry automatically includes all cases in which the medical history of the encounter includes a diagnosis of CPA or ventricular fibrillation (ICD-9 [International Classification of Diseases, Ninth Revision, Clinical Modification]). These codes are recorded in the information system and are the link for automatic inclusion of the case. Along with the case, a series of variables are automatically recorded in the information system. Other variables are manually entered in the database by accessing the electronic medical records. The variables collected include epidemiology variables, prehospital event and care, hospitalization (use of hypothermia and percutaneous coronary intervention [PCI]), and final outcome, including neurologic outcome. The variables were defined using the Utstein model.[11]

In-hospital follow-up of patients was performed using the unified electronic medical record of the *Servicio Andaluz de Salud*. Follow-up at discharge was performed by a standard telephone survey, centralized for all of Andalusia, from an EPES coordination center. The survey asked patients for consent to an interview and to use of their data. Access to the national death certificate center of the Spanish Ministry of Health is requested every year.

Quality Assurance

Patients were included according to a design intended to minimize professional intervention and to avoid inclusion and interpretation biases. The database includes internal controls to minimize transcription errors. Every 6 months, the EPES quality system audits a representative sample of medical records to check the diagnosis and degree of completion of key CPA variables.

Statistical Analysis

A descriptive analysis was performed by measures of central tendency and measures of scatter for quantitative variables and by absolute and relative distribution frequency for qualitative variables. A univariate analysis was used to compare the individual effect of each variable on the possibility of arriving with a pulse at the hospital and of good neurologic outcome at hospital discharge, expressed as Cerebral Performance Category grades 1 and 2[15] (CPC 1-2). The Student t test was used to compare the means, and the chi-square and Fisher tests were used for categorical variables. A multivariable logistic regression analysis was performed using CPC 1-2 at hospital discharge as a dependent variable. Variables with a P value $< .1$ in the bivariate analysis and less than 5% of losses were included by the forward stepwise method, also including the odds ratio (OR) and the respective 95% confidence intervals (95%CI). Significance was set at $P < .05$ for the various analyses.