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## Time trend, willingness and knowledge of law enforcement agencies officers to act as first responders in out-of-hospital cardiac arrests

### *Tendencia temporal, disposición y conocimientos de los agentes de las fuerzas del orden público para actuar en paradas cardiacas extrahospitalarias*

**To the Editor,**

Time between the onset of cardiorespiratory arrest and cardiopulmonary resuscitation (CPR) is a key prognostic factor, with survival rates decreasing by 5% to 10% for each minute of delay.[1] In out-of-hospital cardiac arrests (OHCA), immediate CPR usually depends on bystander action.[2]

Law enforcement agencies (LEA) have more units and are more geographically dispersed than emergency medical services. In addition, during workdays they are usually ready to act when on patrol. Consequently, they are frequently first responders in emergencies. In the United States, police or firefighters initiated CPR in 31.8% of OHCA.[3] In Spain, only 24.1% of Local Police and 11.2% of Civil Guard officers had ever performed CPR in real-life situations.[4] However, although CPR training is included in the training plan for LEAs in Spain, there are no regulations for periodic refresher courses. Conversely, in most high-income countries, LEAs are integrated within emergency systems and dual mobilization is encouraged. Studies have found favorable results in survival and neurological outcomes when CPR was initiated by properly trained LEA officers.[3]

Considering these data, we were interested in determining the time trend for the rates of LEA intervention in OHCA and in estimating officers' knowledge of this procedure and willingness to act as first responders. To achieve these objectives, we first conducted a retrospective study of activations and LEA interventions in emergencies involving OHCA from 2016 to 2019, with the permission of the Clinical Research Ethics Committee of Asturias (Spain). Cases of OHCA were identified using registers from the Coordinating Center for Emergencies of Asturias (Spain) and were later linked to medical records of the emergency department to determine whether LEA were simultaneously dispatched. We also classified LEA interventions according to activator. Nevertheless, limitations of the study were that the records did not allow us to determine the specific LEA activated (National Police, Local Police or Civil Guard) or identify situations where LEA officers were the first activated emergency medical units to arrive.

Second, we performed a cross-sectional study among Local Police and Civil Guard officers of Asturias to describe training, knowledge of CPR, and willingness to perform this procedure (2017 to 2019). All participants provided informed consent and the study protocol was approved by the Clinical Research Ethics Committee of Asturias (Spain). The Local Police cover mainly urban areas whereas the Civil Guard cover rural settings. The National Police Agency was also invited as their agents are potentially first responder in urban areas, but refused to participate, which constituted another limitation. Finally, the study involved 1183 officers (67.0% from the Civil Guard). Officers were surveyed using a questionnaire that included CPR training intervals (never, $>$ 2 years, $\leq$ 2 years since the last course); willingness to act in OHCA, based on responses to 4 questions (responses were summed to obtain a 4-point scale, with higher values indicating higher willingness); and knowledge of CPR, which was summarized in 9 questions based on the 2015 international recommendations for adults (responses were translated to a 10-point scale, with 10 representing highest knowledge). The questionnaire was designed by a mixed panel of experts in out-of-hospital emergencies and psychometric evaluation.[4]

The frequency of LEA activation in emergencies involving OHCA is shown in table 1. Although the number of OHCA alerts remained stable during the study period, there was an increasing trend in the activation of LEA agents ($P$ trend = .003). This increase was due to increased demand from mobile emergency units, which requested support from LEAs in 5.10% of OHCAs in 2016 and 13.4% in 2019. In

**Table 1**
Trend in LEA intervention in emergencies with OHCA

| | 2016 | 2017 | 2018 | 2019 | Total | *P*-trend |
|---|---|---|---|---|---|---|
| *Total alerts* | 9378 | 9024 | 9000 | 9743 | 37 145 | |
| *Alerts for OHCA, n (%)* | 545 (5.81) | 540 (5.98) | 540 (6.00) | 561 (5.76) | 2,186 (5.88) | .861 |
| *LEA activation, n (%)* | 152 (27.9) | 256 (28.9) | 164 (30.3) | 175 (31.2) | 647 (29.6) | .003 |
| By CCE | 116 (21.5) | 98 (18.1) | 100 (17.8) | 438 (20.0) | 0.044 | .004 |
| By MEU | 40 (7.40) | 66 (12.2) | 75 (13.4) | 209 (9.60) | 0.024 | .024 |

CCE, Coordinating Center for Emergencies; LEA, low enforcement agencies; MEU, mobile emergency unit; OHCA, out-of-hospital cardiac arrest.

**Table 2**
Training, knowledge of CPR and willingness to act among law enforcement officers

| | Total | Local Police | Civil Guard |
|---|---|---|---|
| *Participants, No.* | 1183 | 390 | 793 |
| *Response rate, %* | 49.9 | 54.1 | 48.1 |
| *Characteristics* | | | |
| Male sex | 1105 (93.4) | 367 (94.1) | 738 (93.1) |
| Age | 44.6 ± 7.64 | 47.1 ± 8.04 | 43.4 ± 6.96 |
| Experience > 20 y | 659 (55.7) | 221 (56.7) | 438 (55.2) |
| Work in headquarter | 167 (14.1) | 55 (14.1) | 112 (14.1) |
| *CPR training* | 769 (65.0) | 313 (80.3) | 456 (57.5) |
| *Time since the last course* | | | |
| Never | 414 (35.0) | 77 (19.7) | 337 (42.5) |
| > 2 y previously | 407 (34.4) | 142 (36.4) | 265 (33.4) |
| ≤ 2 y | 362 (30.6) | 171 (43.9) | 191 (24.1) |
| *Willingness to perform CPR* | 2.52 (1.08) | 2.80 (1.06) | 2.38 (1.07) |
| *Willingness to perform CPR* | | | |
| 0-1 point (null/scarce) | 237 (20.0) | 50 (12.8) | 187 (23.6) |
| 2-3 points (medium/high) | 703 (59.4) | 220 (56.4) | 483 (60.9) |
| 4 points (complete) | 243 (20.6) | 120 (30.8) | 123 (15.5) |
| *CPR knowledge* | 5.48 (2.04) | 6.07 (1.90) | 5.19 (2.04) |
| *CPR knowledge* | | | |
| < 5 points (low) | 476 (40.2) | 105 (26.9) | 371 (46.8) |
| 5-6.9 points (medium) | 471 (39.8) | 178 (45.7) | 293 (37.0) |
| ≥ 7 points (high) | 236 (19.9) | 107 (27.4) | 129 (16.2) |

CPR, cardiopulmonary resuscitation.
Unless otherwise indicated, the data are expressed as No. (%) or mean ± standard deviation.

contrast, 35% of the LEAs had never received training and only 30.6% had been trained within the 2 years prior to the survey (table 2), which is considered the cutoff point for the minimum training intervals. In addition, the percentage of LEA officers fully willing to act as first responders and with considerable knowledge of CPR was around 20%. All indicators were worse among Civil Guard officers compared with the Local Police.

To improve survival rates, the CARES Surveillance Group has called for greater deployment of police officers as first responders. The group has also proposed investigating the potential for increasing their intervention in OHCA and identifying the factors that may impede or facilitate this implementation.[3] A first step to increase the supply and use of LEA in emergencies is to increase the demand. In our time series, demand from mobile emergency unit physicians significantly increased, suggesting that the activation of officers is perceived by health care providers as an opportunity to achieve better outcomes, both for patient survival and for safety. The main strength of this proposal is related to response time, because, when LEA officers are dual dispatched, they arrive before the mobile emergency units in 30% of cases.[5] Moreover, evidence from a systematic review and other subsequent primary studies suggest that time to defibrillation decreases and survival from OHCA increases when LEA officers are adequately trained in CPR and resourced.[3,6] Among the most important barriers is the lack of self-efficacy of LEA officers to perform CPR, hindering their support to the medical response in OHCA. Improving self-efficacy, ie, the perceived capability that CPR skills can be performed in real situations, involves strengthening training. Consequently, officers should not only receive training in CPR at baseline when they enter the police academy, but should also undergo periodic refresher courses and, if possible, carry out joint courses with mobile emergency units to improve coordinated action. According to our previous research conducted in Spain, only the group of LEA officers who had been trained within the previous 2 years were willing to perform CPR and had adequate knowlege of the procedure.[4]

In summary, LEA activations in OHCA cases could be on the increase in Spain. However, there is a need to improve willingness to act and knowledge of CPR. Therefore, proper training and periodic CPR refresher courses for LEA agents is an urgent requirement. Moreover, given that in practice there is a trend toward dual dispatching of officers and health care workers, combined performance training could benefit both groups of professionals and the public at large.

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All authors have made substantial contributions to the manuscript. I. Pérez-Regueiro, P. Menéndez-Angulo and A. Lana conceived and designed the study. I. Pérez-Regueiro, L. Carcedo-Argüelles, R. Guinea-Rivera and P. Menéndez-Angulo collected the data. L. Carcedo-Argüelles and A. Lana conducted the statistical analyses. I. Pérez-Regueiro and A. Lana drafted the original manuscript. L. Carcedo-Argüelles, P. Menéndez-Angulo and R. Guinea-Rivera revised the article for important intellectual content. All authors approved the final version submitted to the journal. A. Lana is guarantor.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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## STEMI code cancelation after telematic assessment: patient characteristics and prognosis

### *Pacientes con cancelación del código infarto tras valoración telemática: características y pronóstico*

**To the Editor,**

The use of new technologies in ST-segment elevation myocardial infarction (STEMI) networks has been shown to shorten time to reperfusion by improving communication and coordination between physicians responsible for the diagnosis, transfer, and treatment of patients.[1] Technologies such as mobile apps offer several advantages, including a reduction in the number of unnecessary transfers.[1]

The aim of this study was to compare clinical characteristics, electrocardiogram (ECG) patterns triggering infarction code activation, final diagnoses, clinical outcomes, and in-hospital mortality between 2 groups of patients: those who were transferred for emergent percutaneous coronary intervention (PCI) and those whose transfer was canceled. We prospectively analyzed all infarction codes activated in 2022. During these activations, the first medical contact, along with the on-call cardiologist and interventional cardiologist, shared clinical data and ECG results through the ODISEA[2] mobile app. The study was approved by the ethics committee at our hospital; prior informed consent was obtained from all patients involved.

A total of 406 codes were activated through ODISEA during the study period; 284 transfers (70%) were completed (transfer group) and 122 (30%) were canceled (cancellation group). The decision to cancel a transfer was made jointly by the on-call cardiology team and the first medical contact.

The characteristics of the cancellation and transfer groups are summarized in table 1. Patients whose transfers were canceled were more likely to be women (38.5% vs 24%, $P = .004$) and to have a history of hypertension (70% vs 55%, $P = .003$), dyslipidemia (54.1% vs 39.1%, $P = .005$), and previous ischemic heart disease (21.3% vs 10.9%, $P = .006$).

The ECG patterns for patients in the cancellation group are shown in figure 1A. The most common patterns were ST-segment depression and intraventricular conduction disorders (complete left bundle branch block, complete right bundle branch block, and pacemaker rhythms).

All patients in the cancellation group were transferred to a regional or tertiary care hospital. The choice of hospital was agreed on by the parties involved and determined by the perceived severity. Almost half of these patients (46%) were discharged directly from the emergency department. Of those admitted to hospital, one-third were scheduled for PCI. Coronary artery lesions were more common in this group than in the emergent PCI group (31.7% vs 9.6%, $P = .001$).

Most patients (90.5%) who underwent emergent PCI were diagnosed with acute coronary syndrome (ACS) (83.5% had STEMI, 6.3% non–ST-elevation myocardial infarction [NSTEMI], and 0.7% unstable angina). Just 32.8% of patients in the cancellation group had a final diagnosis of ACS (2.5% were diagnosed with STEMI, 27% with NSTEMI, and 3.3% with unstable angina). The final diagnoses of patients whose transfers were canceled are shown in figure 1B. The most common diagnoses were ACS (32.8%) and nonspecific chest pain (22.9%).

In-hospital mortality varied significantly between the groups, with a higher percentage of deaths occurring in the cancellation group (11.4% vs 4.2% in the transfer group, $P = .001$). Most deaths in patients with canceled transfers (79%) were due to nonischemic causes: sepsis (26.6%), aortic dissection (17.7%), pulmonary thromboembolism (17.7%), neurologic disorders (17.7%), and cancer (17.7%).

We have described the characteristics and clinical outcomes of patients with suspected STEMI whose transfer was canceled by the care team members based on information transmitted through the mobile ODISEA app.

The cancellation rate in our series was high (30%), which is consistent with previously reported rates.[3,4] Pretransfer cancellation is common in clinical practice but requires the use of a communication platform that meets a series of requisites: the ability to share information quickly in compliance with data protection laws, a feature enabling the parties involved to agree on the cancellation (chat box), and the capability to record case information for subsequent follow-up. All these features are included in the ODISEA app, allowing us to integrate a STEMI communication platform into our infarction code program for the first time and enabling the characterization of patients with canceled transfers.

Rates of inappropriate cancellations (corresponding to patients with acute occlusion of the culprit artery) are seldom reported in clinical trials, despite the importance of this information. The cancellation rate in our series was 2.5% (3 patients, all with difficult-to-interpret ECG patterns). Although cancellation of activations deemed inappropriate is common practice, there is a risk that a small proportion of patients will have an actual STEMI. In a report on 886 cardiac catheterization laboratory cancellations, Lange et al.[4] detected 9 inappropriate cancellations (1%), all in patients with an acute occlusion subsequently detected by PCI. Promising results have been reported for machine learning algorithms that can predict STEMI on ECG.[5] This technology could help reduce human error.

The cancellation group was characterized by high comorbidity, perceived severity, difficult-to-interpret ECGs, and heterogeneous final diagnoses, ranging from nonserious conditions to conditions with high in-hospital mortality. The in-hospital mortality rate in our series was 11.4%. Similarly high short- and long-term rates have been described in other reports of canceled activations.[3,4]