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Clinical paper

Time delays to reach dispatch centres in different regions in Europe. Are we losing the window of opportunity? — The EUROCALL study☆

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ABSTRACT

Aim: In out of hospital cardiac arrest (OHCA) a single rescuer should start with Cardiopulmonary Resuscitation (CPR) immediately after calling the Emergency Medical Communication Centre (EMCC). The start of CPR may be delayed considerably if the total time to connect to the dispatcher at the EMCC (TT-EMCC) is prolonged. EUROCALL aimed to investigate the TT-EMCC and its components in several European regions using different calling procedures.

Methods: EUROCALL is a prospective, multicentre randomised study that was performed in April 2013. Conducted from a landline or a mobile phone, calls were randomly allocated to day and time of the call, and to those connecting directly to the EMCC (1-step procedure) and those that needed to be diverted before connecting to the EMCC (2-step procedure).

Results: Twenty-one EMCC's from 11 countries participated in the study. For the 1878 1-step calls, median times were: time from dial to first ringtone 3.7 s (IQR 1.0–5.2) and time from first ringtone to response by call-taker 6.4 s (IQR 2.9–13.5). The median TT-EMCC was 11.7 s (IQR 8.7–18.5). For the 1550 2-step calls, median times were: time to first ringtone 4.0 s (IQR 2.4–5.2), from first ringtone to first call-taker 7 s (IQR 4.6–11.9) and from first call-taker to EMCC 18.7 s (IQR 13.4–29.9). Median TT-EMCC was 33.2 s (IQR 24.7–46.1) and was significantly longer than the TT-EMCC that was observed with the 1-step procedure ($P < 0.0001$). Significant differences existed among participating regions between and within different countries both for 1-step and 2-step procedures. No significant differences existed in TT-EMCC between landlines and mobile lines.

Conclusion: TT-EMCC was significantly shorter in a 1-step procedure compared to a 2-step procedure. We found regional differences between countries but also within countries. This may be relevant in cases of OHCA and other situations where patient outcome is critically time-dependent.

Introduction

Sudden cardiac arrest is a leading cause of death in Europe. Each year Emergency Medical Services (EMS) respond to between 24 and 186 out-of-hospital cardiac arrest OHCA per 100 000 inhabitants.[1–3] The chain of survival describes the critical steps in the treatment of a cardiac arrest.[4] The first step, early recognition

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and calling for an ambulance, is critical to initiate the activation of local and dispatched rescuers. If the dispatcher does not recognize a call regarding a cardiac arrest, three months survival is only 5% whereas if it is recognized as such, 3 months survival is 14%.[5] Early bystander Cardiopulmonary Resuscitation (CPR) is a critical second step: patients receiving bystander CPR within 2 min after the collapse have an odds ratio for survival to one month of 8.3 as compared to 2.9 if CPR was started later.[6]

The next step is equally important, as for every minute of delay from collapse to defibrillation, chances for survival decrease by 10%.[7–10]

In case of OHCA the current CPR guidelines recommend for a single rescuer to first call the Emergency Medical Communication Centre (EMCC) and to start CPR immediately thereafter.[11] In case of a single rescuer, therefore, the start of CPR may be delayed considerably if the total time to connect to the dispatcher at the EMCC (TT-EMCC) is prolonged.[12]

The Council of the European Union (EU) introduced the uniform emergency telephone number 112 in 1991 in order to make emergency care more accessible for all citizens.[13] The operational conditions of emergency calls differs between European countries. In some countries 112 is the national number for all emergencies. Other countries have separate national emergency numbers for police, fire and/or ambulance services and there the number 112 is available as a secondary emergency number but its use for alerting EMS is variable. In these countries a call to 112 is either diverted to the corresponding national telephone number or to the final call-taker with responsibility for EMS response vehicle dispatch.[14]

TT-EMCC is measured in many systems of care, but its components are rarely reported. The aim of the EUROCALL study was to investigate these components of TT-EMCC in several regions in Europe, also taking into consideration the differences in handling a call between countries and regions.

TT-EMCC was investigated in calls that connected directly to the EMCC (1-step procedure), either using the uniform European 112 emergency number or using a local number, and in calls that did not connect directly but were diverted to the EMCC (2-step procedure).

We also investigated differences in TT-EMCC using a landline versus a mobile phone and in relation to the day and time of the call.

Methods

Setting and study question

EUROCALL was a prospective, one month, multicentre randomised study that was conducted from April 1 to April 30, 2013. The European Resuscitation Council (ERC) supported the study.

EMCCs were recruited after an open invitation to the national representatives of countries in the General Assembly of the ERC. EMCCs from 11 countries participated.

The main goal of the study was to measure the components of the time delay to reach the dispatcher at the EMCC that sends an EMS response team to a medical emergency. These time intervals were studied in calls that reached the EMCC directly (1-step procedure, either using the uniform European emergency number 112 or using the local number) and in calls where a call-taker from 112 or from the local number was reached first, and was connected to the EMCC after triage (2-step procedure). The components of the TT-EMCC were: (1) time from dialling to first ringtone and (2) time from first ringtone to call taken by EMCC. This second interval may consist of 1 or 2 intervals: time from first ringtone to first call-taker and time from first call-taker to call taken by EMCC (Fig. 1).

Study design

Planned study calls were distributed over a period of 30 days with six calls over each 24 h for a total of 180 calls to each EMCC. Using a pilot sample of 42 calls per region performed within a week in Athens (Greece), Nicosia (Cyprus), Iasi (Romania) and Novi Sad (Serbia), we calculated that 180 calls to each EMCC were required to measure TT-EMCC with a precision of 10 s. The diurnal variation of the number of research calls was estimated using a sample of 4246 consecutive calls conducted in a week in Novi Sad (Serbia), showing that the ratio between day calls and night calls (between midnight and 6 AM) was about 5:1. Therefore, each day was divided in four 6-h periods (0–6 h, 6–12 h, 12–18 h and 18–24 h) with one call to be performed between midnight and 6 AM and five calls distributed at random over the three other 6-h periods. The time and process (1 vs. 2 step and mobile vs. landline) to perform a call were determined using a random number generator (using the "RANDBETWEEN" function of Microsoft Excel 2008 for Mac version 12.3.6). Each call could be performed at any moment within a prescribed 1-h interval and the exact time had to be recorded. If a call was missed, it could be conducted on the same day and time during another study week. An abandoned call was defined as a call that ended before a conversation occurred.

In regions where both possibilities were available, the calls were stratified for 1-step calls or 2-step calls. The calls were also randomised to be performed with a landline telephone or with a mobile phone.

An online timer was used to measure the successive time intervals and to store these measurements on a computer file (http://online-stopwatch.chronme.com/). Only when an internet connection was not available when a call was to be performed, the stopwatch of a mobile phone/smartphone was used as an alternative.

Before the start of the study all participating EMCCs were informed about the project. For each participating EMCC, the telephone calls were made by the local investigator who was responsible for data collection and quality, and also for ensuring approval from local authorities. One co-investigator could assist each local investigator. If, at any time during a 2-step research call, a dispatcher questioned the reason for the call, the investigators immediately disclosed that this was a test call was on behalf of the EUROCALL study and connection to the dispatcher at the EMCC was requested. After reaching the EMCC and the time measurement of that call was completed, the true nature of the call was revealed by the caller, in order to avoid actual activation of the EMS.

Written approval for participation in the study was obtained from the appropriate authorities for each participating EMCC. As no patients and no interventions were involved, ethical approval was waived in all regions except in Finland–Turku (ETMK:45/1802/2013, 19-3-2013) and in Poland (Cracow, Poznan, Rzeszow and Wroclaw) (KBET/32/B/2013, 28-2-2013).

Statistical analysis

Continuous variables are summarised as median (interquartile range IQR). Categorical data are expressed as percentages. Missing data were excluded from the analysis.

The TT-EMCC and its various components did not have a normal distribution as they were skewed to the left; therefore distribution-free statistics were used. For continuous variables between-group differences for two groups the Mann–Whitney U test was used. Differences in case of more than two groups were tested using Kruskal–Wallis (KW) Analysis of Variance (H statistics). Between-group differences for categorical data were tested using the Chi-square test. P-values <0.05 were considered statistically significant.

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