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Clinical paper

Barriers to telephone cardiopulmonary resuscitation in public and residential locations☆

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ABSTRACT

Aim: Emergency medical telecommunicators can play a key role in improving outcomes from out-of-hospital cardiac arrest (OHCA) by providing instructions for cardiopulmonary resuscitation (CPR) to callers. Telecommunicators, however, frequently encounter barriers that obstruct the Telephone CPR (TCPR) process. The nature and frequency of these barriers in public and residential locations have not been well investigated. The aim of this study is to identify the barriers to TCPR in public and residential locations.
Methods: We conducted a retrospective study of audio recordings of EMS-confirmed OHCAs from eight regional 9-1-1 dispatch centers between January 2012 and December 2013.
Results: We reviewed 1850 eligible cases (public location OHCAs: $N = 223$ and residential location OHCAs: $N = 1627$). Telecommunicators less frequently encountered barriers such as inability to calm callers in public than in residential locations (2.1% vs 8.5%, $p = 0.002$) or inability to place victims on a hard flat surface (13.9% vs 25.4%, $p < 0.001$). However, the barrier where callers were not with patients was more frequently observed in public than in residential locations (11.8% vs 2.7%, $p < 0.001$).
Conclusions: This study revealed that barriers to TCPR are distributed differently across public and residential locations. Understanding these differences can aid in the development of strategies to enhance bystander CPR and improve overall patient outcomes.

Introduction

Bystander cardiopulmonary resuscitation (CPR) is a critical intervention for survival from out-of-hospital cardiac arrest (OHCA).[1] Bystander CPR rates, however, remain low[2,3] and survival rates are still disappointing in most communities.[1,4,5] Emergency medical telecommunicators can play a key role in improving outcomes by facilitating early identification of suspected arrests and providing CPR instructions and coaching to callers.[6] Telecommunicator instruction for CPR can double the rate of bystander CPR.[7] Telecommunicators, however, frequently encounter barriers that obstruct Telephone CPR (TCPR). For example, callers may refuse to do CPR, leave the phone, or suffer emotional distress[8,9] or physical limitations.[10–12] These and other barriers were identified through reviews of audio recordings of OHCA 9-1-1 calls in which the majority of OHCAs occur in residential locations. It is reported, however, that patient and rescuer profiles are quite different between public and residential locations.[13–16] This suggests that barriers to TCPR may have different distributions in each OHCA setting, but this issue has not been well documented.

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In this population-based study, we describe the distribution of barriers to TCPR in public and residential locations. A better appreciation of barriers to TCPR can provide additional information for telecommunicator protocols, training and alternative strategies to enhance TCPR provision.

Methods

Study setting

We conducted a retrospective and descriptive study of confirmed OHCA audio recordings from eight regional 9-1-1 dispatch centers participating in The Save Hearts in Arizona Registry and Education (SHARE) Program, a quality-improvement initiative established by the Arizona Department of Health Services in conjunction with the University of Arizona, EMS agencies and hospitals statewide. This program and its results have been reported previously.[17,18] Because OHCA has been designated a major public health problem in Arizona and the objective of SHARE is to improve resuscitation and survival, the data collected were exempt from the Health Insurance Portability and Accountability Act (HIPAA). The Arizona Department of Health Services' Human Subjects Review Board and The University of Arizona Institutional Review Board have approved publication of de-identified data.

The TCPR protocol for telecommunicators in the dispatch centers calls for: (1) compression-only CPR for adult arrests of presumed cardiac origin and (2) chest compression with rescue breathing for other causes of arrest. 9-1-1 telecommunicators are expected to provide CPR instructions if the patient was reported as not conscious and not breathing normally.

Between January 2012 and December 2013, EMS confirmed 3198 OHCAs. Roughly 80% of the audios investigated were from dispatch centers in Maricopa County that drafted their own protocols. The remainder were from dispatch centers outside Maricopa County using various versions of Medical Priority Dispatch or Association of Public-Safety Communications Officials systems. Protocol compliance was not assessed in this study. Cases were excluded if (1) they occurred at health care facilities or nursing homes; (2) the patient was <18 years old; (3) the event resulted from trauma; (4) the event was at a prison; (5) EMS-witnessed the event, and (6) location, bystander CPR or outcome data were missing. To focus on obstacles specific to the TCPR process after the need for CPR was identified, we also excluded cases in which the reviewer was not able to determine possible arrest based on the 2-question sequence for assessing whether the patient was conscious and breathing or breathing normally. The caller-reported criteria telecommunicators used to determine obvious death were not uniform across dispatch centers but included patient color, odor, decomposition, and rigor mortis.

Patient data

In this study, baseline OHCA data based on the Utstein template[19] is comprised of both EMS and hospital records and include: the patient's age, patient's gender, witness status, etiology of cardiac arrest, whether bystander CPR was performed, initial cardiac rhythm, time interval from dispatch-to-hospital arrival, whether there was sustained return of spontaneous circulation, and status at hospital discharge.

TCPR audio recording data

All 9-1-1 recordings were reviewed by program personnel for quality improvement purposes. Data were collected with a standardized review of 9-1-1 recordings described elsewhere.[12] The recognition of CPR need was recorded when a telecommunicator said any of the following in connection with a response to the patient's condition: "CPR," "chest compressions," "compressions," "continuous chest compressions," "Hands-Only CPR," "rescue breaths," "rescue breathing," "ventilations," or "rescue ventilations." TCPR was considered provided if telecommunicators started CPR instructions that resulted in the start of bystander compressions.

In this structured database, barriers to TCPR were identified when TCPR was delayed or not given due to: (1) the caller leaving phone; (2) the caller not being with patient; (3) CPR instructions being refused; (4) caller emotional distress; (5) difficult access to the patient; (6) a language barrier; (7) an inability to place victims on a hard, flat surface, (8) a physical inability to perform CPR, and (9) the caller hanging up the phone before CPR instruction. The barriers were recorded by reviewers when they judged that TCPR was prevented or delayed and some cases may have more than one barrier.

Statistical analysis

To compare the baseline characteristics, TCPR process measures, and the distribution of barriers across public and residential locations, chi-square test was used for categorical variables and Student *t*-test or Wilcoxon rank-sum test for continuous variables. For analysis of TCPR process and barrier distributions, cases in which CPR was in progress were removed from both public and residential locations. All of the tests were two-tailed and a p-value of <0.05 was considered statistically significant. All statistical analyses were performed using the SAS software package, version 9.4 (SAS Institute, Inc., Cary, NC, USA).

Results

Basic characteristics of OHCAs in public and residential locations

We reviewed 1850 eligible cases (public location OHCAs: $N = 223$ and residential locations OHCAs: $N = 1627$, Fig. 1). The basic characteristics of these two groups are shown in Table 1. In public locations, OHCA patients were younger and more commonly male. Witnessed arrests were also more frequent in public locations (65.0% vs 27.8%, $p < 0.001$). The proportion of shockable initial rhythm was higher in the public locations (43.0% vs 20.8%, $p < 0.001$) compared to residential locations. Bystander CPR rates were also higher in public locations (81.6% vs 73.5%, $p = 0.009$), and CPR was more frequently in progress at the time 9-1-1 calls were received when the calls were placed from public locations (16.1% vs 7.8%, $p < 0.001$). Sustained return of spontaneous circulation (ROSC) was more frequent in public locations (38.6% vs 24.9%, $p < 0.001$) and survival to hospital discharge was higher in public locations (23.8% vs 9.5%, $p < 0.001$).

TCPR in public and residential locations

TCPR process measures are described in Table 2. Although telecommunicators frequently recognized the need for CPR in both groups, identification rate for CPR need was lower in public locations (81.9% vs 91.4%, $p < 0.001$). The frequency of TCPR instruction was also lower in public locations (50.5% vs 66.8%, $p < 0.001$) and resulted in a lower TCPR rate in this group (38.5% vs 58.5%, $p < 0.001$).

Distribution of barriers to TCPR

Barriers to TCPR are shown in Table 3. We did not observe significant differences across public and residential locations for

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