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Treatment and outcome of out-of-hospital cardiac arrest in outpatient health care facilities☆

Peter J. Kudenchuk[a,c,*], Russell Stuart[b], Sofia Husain[c], Carol Fahrenbruch[c], Mickey Eisenberg[a,c]

[a] University of Washington Department of Medicine, Seattle, WA, United States
[b] University of Virginia Health System, Department of Anesthesiology, Charlottesville, VA 22903, United States
[c] King County Emergency Medical Services, Seattle-King County Department of Public Health, Seattle, WA, United States

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ABSTRACT

Aim: We evaluated the frequency and effectiveness of basic and advanced life support (ALS) interventions by medical professionals when out-of-hospital cardiac arrest (OHCA) occurred in ambulatory healthcare clinics before emergency medical services (EMS) arrival.
Methods: Non-traumatic OHCAs in adults were systematically characterized over a 15 year period by their occurrence in clinics, at home, or in non-medical public locations, and outcomes compared between matched cohorts from each group.
Results: Among 7784 patients, 6098 OHCA occurred at home, 1612 in non-medical public locations and 74 in clinics. Compared to non-medical public locations, clinic patients with OHCA were older, more often women and more frequently shocked; clinic arrests were more often witnessed, less likely to be of cardiac cause and to occur before EMS arrival. Compared to home, more clinic arrests were witnessed, occurred after EMS arrival, had bystander CPR, shockable rhythms and were defibrillated. When OHCA occurred before EMS arrival, 51 of 56 clinic patients (91%) received CPR, a defibrillator applied to 23 (41%), 17 (30%) were shocked, 4 (7%) intubated, and 7 (13%) received intravenous medications from facility personnel. Of these, only pre-EMS defibrillator use was associated with improved outcome. Among matched patients, OHCA survival was higher in clinics than at home (42% vs 26%, $p = 0.029$), but comparable to other public locations.
Conclusions: Survival from OHCA in clinics was comparable to non-medical public locations, and higher than at home. Alongside CPR, use of defibrillators was associated with improved survival and worth prioritizing over other interventions before EMS arrival regardless of OHCA location.

Introduction

Out-of-hospital cardiac arrest (OHCA) remains a major cause of worldwide mortality.[1,2] Survival from OHCA depends upon a number of factors, but particularly upon the timely provision of appropriate interventions in the pre-hospital setting.[3–6] The American Heart Association endorses a response to OHCA that includes early cardiopulmonary resuscitation (CPR), early defibrillation, and early advanced life support (ALS),[3,6] emphasizing that the more quickly these services are rendered the better the overall outcome.[3,6,7] Unfortunately, provision of these interventions is often delayed until arrival of emergency medical services (EMS) personnel.

OHCA most commonly occurs in the home, but can take place anywhere including public locations such as a sports arena or in an outpatient health care facility such as a physician's office or clinic.[8,9] OHCA in public locations typically confers a better prognosis than in the home, attributable to a greater likelihood of being witnessed, earlier activation of EMS, healthier patients, bystander-initiated CPR, and public access defibrillation.[10] Presumably survival after OHCA might even be higher when the arrest occurs in an ambulatory clinical setting where medical personnel are already present and initiation of basic and ALS interventions need not be delayed until EMS arrival. Conversely, this benefit could be offset by a presumed illness that prompted the need for outpatient medical attention at the time of OHCA. The aim of this study was to

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* Corresponding author at: University of Washington, Department of Medicine, Division of Cardiology, Box 356422, 1959 NE Pacific Street, Seattle, WA 98195-6422, United States. Fax: +1 206 616 1022.
E-mail address: kudenchu@u.washington.edu (P.J. Kudenchuk).

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characterize OHCA in out-of-hospital healthcare facilities, in other public places, and in the home. We hypothesized that the availability and earlier provision of basic and advanced care by local medical providers to patients with OHCA in a clinical facility would result in improved survival as compared to OHCA in other locations.

Methods

Setting

The EMS of King County Washington serves an area of ~2000 square miles and a population (excluding the city of Seattle) of 1.3 million residents, utilizing a previously described two-tier emergency response system for which an ongoing, comprehensive registry of all OHCA attended by EMS has been maintained since 1976.[11]

Study population

We conducted a retrospective review of all nontraumatic adult OHCA attended by King County EMS (excluding Seattle) between January 1, 1997 and December 31, 2011 where the event occurred in a clinic facility, a non-medical public location or home. We excluded OHCA cases for whom resuscitation was not attempted or ceased early due to obvious lividity or an advance directive.

Definitions

OHCA was defined as evidence of circulatory arrest necessitating the need for CPR and/or defibrillation. Out-of-hospital health care facilities (heretofore referred to as clinics) in this study were defined as being one of the following: medical, surgical, dental, chiropractic, acupuncture or naturopathic outpatient practices, urgent care clinics, and physical therapy or drug rehabilitation facilities. Nursing homes, dialysis centers, ambulances and any facility physically located within a hospital were excluded given the special circumstances that might apply to cardiac arrest events and patients encountered in such facilities.[12–16]

Non-medical public locations were defined as: the work place, businesses, shopping malls, community centers, schools, public transportation terminals such as airports, and other public enclosed locations such as recreational centers and sports arenas. Home was defined as a private residence, including multifamily dwellings. ALS care was defined as inclusive of vascular access, medications and/or endotracheal intubation. The primary outcome measures of this study were: return of spontaneous circulation (ROSC), admission to hospital, and survival to hospital discharge.

Analysis

Data were abstracted from all available clinical information including dispatch reports, prehospital and abstracted hospital records and death certificates, from which information was extracted pertaining to patient demographics, arrest location, presenting cardiac arrest rhythm, treatments rendered prior to arrival of EMS, bystander CPR, EMS response intervals (arbitrarily set to 0 when OHCA occurred after EMS arrival), EMS treatments, and outcome. Arrest etiology was determined from all available information sources. In cases where OHCA occurred in a clinic prior to EMS arrival, we specifically evaluated the specific interim treatments that patients received from clinic staff and their association with outcome. These included endotracheal intubation, establishing vascular access, medication administration, application of a defibrillator and receipt of shock.

In addition to characterizing all study patients, cases of OHCA that occurred in a clinic setting were matched with those occurring in the home, and in a non-medical public location using one-to-one probabilistic matching methods. We matched cases based on: age (±15 years), gender, cardiac etiology of arrest, provision of bystander CPR, whether the arrest took place before or after EMS arrival, whether or not OHCA occurred before or after the 2005 American Heart Association guideline change, the response interval from call to EMS arrival (±7 min), and whether or not the initial arrest rhythm was shockable.

Statistics

Chi-square tests were performed to compare dichotomized variables in our three non-matched groups and to compare treatment outcomes between groups. Fischer's exact tests were used when

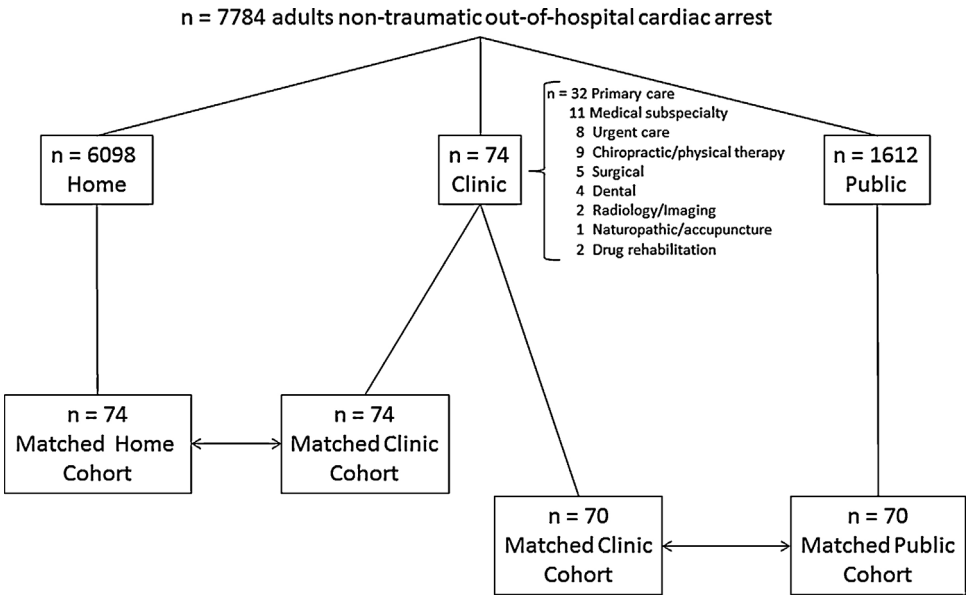

Fig. 1. Study patients are depicted by the location of out-of-hospital cardiac arrest in the home, an ambulatory health care facility ("clinic"), or public (non-medical) location. Patients with cardiac arrest in clinic were matched to patients in whom cardiac arrest occurred at home ($n = 74$) and to patients in whom cardiac arrest occurred in a non-medical public location ($n = 70$).