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Clinical paper

Lay persons alerted by mobile application system initiate earlier cardio-pulmonary resuscitation: A comparison with SMS-based system notification☆

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ABSTRACT

Aim: We compared the time to initiation of cardiopulmonary resuscitation (CPR) by lay responders and/or first responders alerted either via Short Message Service (SMS) or by using a mobile application-based alert system (APP).
Methods: The Ticino Registry of Cardiac Arrest collects all data about out-of-hospital cardiac arrests (OHCAs) occurring in the Canton of Ticino. At the time of a bystander's call, the EMS dispatcher sends one ambulance and alerts the first-responders network made up of police officers or fire brigade equipped with an automatic external defibrillator, the so called "traditional" first responders, and – if the scene was considered safe – lay responders as well. We evaluated the time from call to arrival of traditional first responders and/or lay responders when alerted either via SMS or the new developed mobile APP.
Results: Over the study period 593 OHCAs have occurred. Notification to the first responders network was sent via SMS in 198 cases and via mobile APP in 134 cases. Median time to first responder/lay responder arrival on scene was significantly reduced by the APP-based system (3.5 [2.8–5.2]) compared to the SMS-based system (5.6 [4.2–8.5] min, p 0.0001). The proportion of lay responders arriving first on the scene significantly increased (70% vs. 15%, $p < 0.01$) with the APP. Earlier arrival of a first responder or of a lay responder determined a higher survival rate.
Conclusions: The mobile APP system is highly efficient in the recruitment of first responders, significantly reducing the time to the initiation of CPR thus increasing survival rates.

Introduction

Successful resuscitation for victims of out-of-hospital cardiac arrest is very time sensitive. Early initiated cardiopulmonary resuscitation (CPR) before the arrival of emergency-medical-services (EMS) personnel plays a key role in increasing the chance of survival.[1] However, the initiatives to increase the number of early initiated CPR are costly and the effectiveness of training unselected lay responders in CPR is quite uncertain.[2,3] Moreover, several communities have adopted a dual-dispatching EMS system which recruits lay responders who are trained in CPR to assist out-of-hospital cardiac arrest victims as well as "traditional" first responder groups (i.e. fire and police vehicles).[4–5]

First responders network may be alerted by short message service (SMS) or by using more advanced telecommunication technologies such as a mobile application (APP).[5,6]

There are no data on the efficiency of an SMS-based or APP-based system in effectively recruiting first responders or lay responders, and whether the time of first responder/lay responder—initiated CPR is influenced by the technology used to notify these volunteers. In the Swiss Canton of Ticino, we have a three-tier response system: EMS, police/fire first responders, lay responders. The first and lay responders have been traditionally alerted via SMS. Starting

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from 2014, a mobile APP-based alert system has been introduced to notify an OHCA occurrence. This mobile APP is available for both first and lay responders. Our goal was to evaluate the time between a bystander phone call to EMS provider and the arrival of first responders and/or lay responders when alerted either via SMS or the new APP-based alert system.

Methods

Emergency medical system and first responders alert

A single EMS system serves the Canton of Ticino. This region has a population of 350.363 inhabitants (2014) and encompasses a territory of more than 2.800 km^2 in the Southern part of Switzerland. This region presents significant geographic challenges as the territory consists of mountains, valleys, and lakes. About 49% of the population consists of men, and overall 21% is over the age of 65.[7] By December 31st 2015, 65,327 people (16.4% of the resident population) had completed a Basic Life Support-Defibrillation (BLS-D) course.

A national emergency telephone number, 144, is connected to the regional dispatching centre of the EMS. In the Swiss Canton of Ticino, the EMS dispatch centre is managed by three operators during the daytime (7.00 A.M.–8.00 P.M.) and by two operators during night time (9.00 P.M.–6.00 A.M.). The EMS dispatcher manages all emergencies based upon the medical priority dispatch system. When a cardiac arrest is suspected, assisted triage and life support are dispatched and medical assistance is initiated until an ambulance arrives. The EMS dispatcher send the ambulance and, in parallel, notifies the alert to the traditional first-responders. They are police officers and fire brigade, trained in BLS-D and equipped with an AED. If conditions are regarded as safe by the EMS Dispatcher (according to information on the circumstances and the position of the victim obtained by the caller), the lay responders are notified as well. The latter are mostly lay persons but can include off-duty healthcare providers (i.e. physicians, nurses, CPR course graduates). Their training includes the standard Swiss Resuscitation Council Basic Life Support (ERC BLS)/AED course for lay rescuers that complies with the recommendations of the European Resuscitation Council.[8]

Text message responders and APP-users

To be part of the Ticino first responder network, an adult has to be trained and certified in the standard ERC BLS/AED course. Registration takes place via an online database in which they can enter their contact information including mobile phone number and specifications of their BLS certificate. Biannual retraining is required.

After the successful launch of the APP-based alert system in May 2014, the rescuers may select whether to receive SMS or APP alerts. The APP can be downloaded free-of-charge at http://www.ticinocuore.ch/it/first-responder onto a mobile device from the Apple App Store or Google Play. On December 31st 2015, 1825 people have downloaded the APP and registered themselves as lay responders.

Text message alert (SMS) system (Fig. 1)

Between January 2006 and May 2014, the first responder network was alerted only via SMS. At the time of an emergency call, the EMS dispatcher activated the first responder network by sending an SMS to a list of registered traditional first responders and

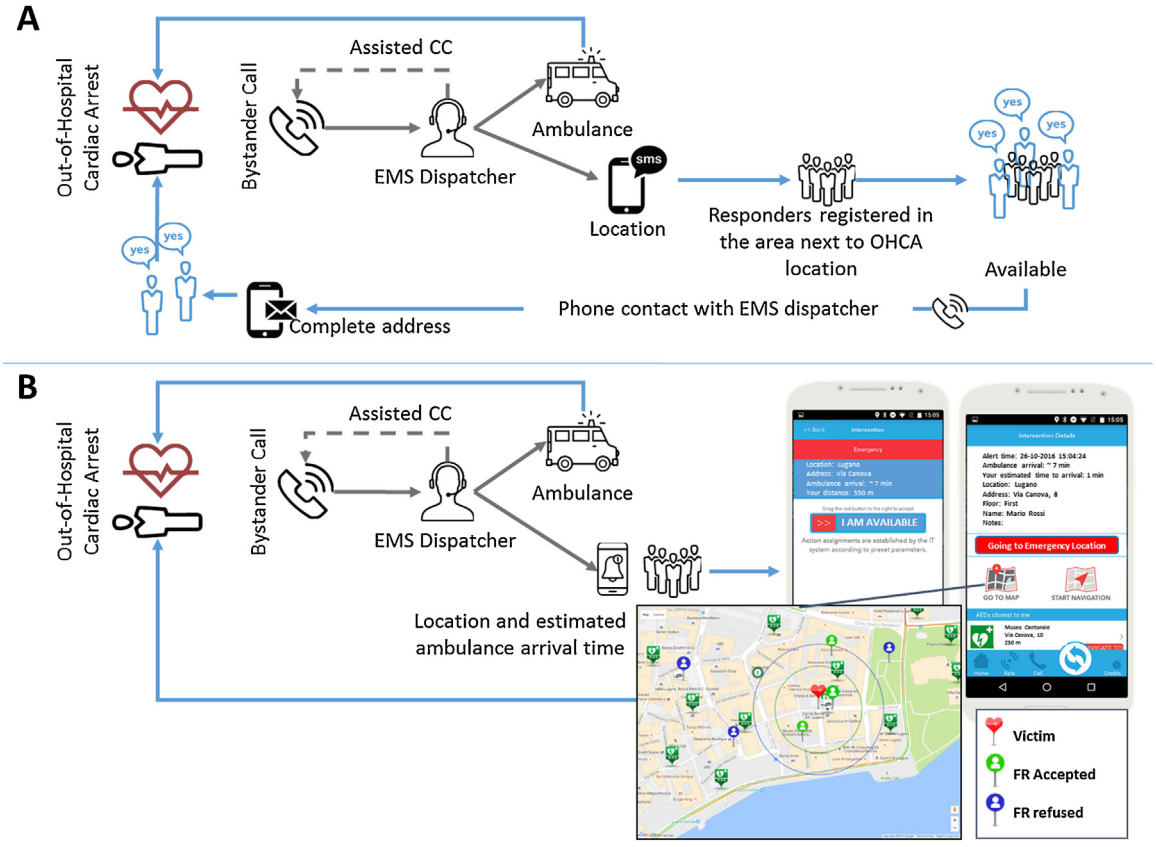

Fig. 1. First responder network alert systems in Swiss Canton Ticino. Panel A: SMS system; panel B: APP system. CC: chest compressions, EMS: emergency medical service, OHCA: out-of-hospital cardiac arrest, FR: first responder.