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## Selected Topics: Prehospital Care

### VALIDATION OF A DISPATCH PROTOCOL WITH CONTINUOUS QUALITY CONTROL FOR CARDIAC ARREST: A BEFORE-AND-AFTER STUDY AT A CITY FIRE DEPARTMENT-BASED DISPATCH CENTER

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**Abstract—Background:** An optimized protocol to help dispatchers identify potential cases of cardiac arrest and provide phone instructions for cardiopulmonary resuscitation (CPR) may increase the provision of bystander CPR, further improving the survival rate and neurological outcomes. **Objective:** We assessed a revised dispatcher-assisted (DA)-CPR protocol with a continuous quality-improvement feature in a county fire department-based emergency medical services system. **Methods:** This was a before-and-after intervention prospective study conducted in Taoyuan City, Taiwan. The participants were out-of-hospital cardiac arrest (OHCA) patients from November 2014 to February 2016. Interventional quality control started in August 2015. Approximately 10% of the telephone calls from these OHCA patients were reviewed. **Results:** In total, 66 and 64 cases were included in the before- and after-intervention groups, respectively. No significant differences were observed in sex, age, day, and time of events, or languages spoken by the callers. After the intervention, we found significant improvements in the rates at which cardiac arrests were recognized (54.5% vs. 68.8%;  $p = 0.007$ ) and normal breathing was checked (51.5% vs. 76.6%,  $p = 0.003$ ). Moreover, the frequency with which DA-CPR

was provided by the dispatchers improved significantly (50.0% vs. 72.7%;  $p = 0.046$ ). Significant improvement in patient outcomes was observed with regard to 24-h survival (7.6% vs. 20.3%,  $p = 0.036$ ) but not with regard to survival to discharge (3.0% vs. 10.9%,  $p = 0.076$ ). **Conclusions:** The study found this DA-CPR protocol, which includes continuous quality control, is promising as it improved the successful recognition of cardiac arrests. © 2017 Elsevier Inc. All rights reserved.

**Keywords—**cardiopulmonary resuscitation; cardiac arrest; dispatcher; chest compression

#### INTRODUCTION

Out-of-hospital cardiac arrest (OHCA) is a major concern not only within the emergency medical services (EMS) system but also within the global public health community more generally (1). Although the incidence and outcome of OHCA vary worldwide, the overall survival rate of OHCA does not exceed 8% and, despite intense efforts, has not improved markedly in decades (2,3). A large systematic review and meta-analysis indicated that the promotion of bystander cardiopulmonary resuscitation (CPR) may improve the survival rate of witnessed

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arrests (3). A 10-year nationwide study indicated that the rate of bystander CPR was associated with a significant improvement in OHCA survival (4). Guidelines published in 2015 emphasized the importance of the early identification of possible cardiac arrests by dispatchers and the provision of CPR instructions to callers (5).

In the study region, once a bystander calls a local emergency number, which is connected directly to a dispatch center, the EMS system is activated. Dispatchers collect information about the location and cause of the incident and the number of patients. Dispatchers are also expected to identify critical cases. If a potential cardiac arrest is identified, the dispatcher may instruct the caller to perform CPR on the patient. The implementation of such dispatcher-assisted (DA)-CPR in an EMS system may increase the provision of bystander CPR, further improving the survival rate and neurological outcomes of OHCA (6–9). DA-CPR quality should be monitored with feedback to further improve performance. High-quality DA-CPR consists of the early identification of cardiac arrests and immediate provision of CPR instructions to callers, resulting in the efficient delivery of the first chest compression to the patient. Indeed, high-quality DA-CPR has been associated with an increase in bystander CPR and improvements in OHCA outcomes (10,11). A functional DA-CPR protocol and continuous quality-improvement (CQI) project may improve DA-CPR performance, thus providing higher-quality DA-CPR (12). The implementation of routine training and educational programs for dispatchers can minimize cases of delayed identification and improve DA-CPR performance (10,12,13).

Taoyuan City, a municipality in Taiwan, has been examining a DA-CPR protocol since 2014. In July 2014, the dispatch center of the Taoyuan City Fire Department (TYFD) revised its DA-CPR protocol and simultaneously started a CQI project. The use of a comprehensive and ongoing quality-improvement program is widely considered to be a key contributor to high-quality DA-CPR that may enhance the performance of dispatchers.

### *Study Goal*

The goal of this investigation was to examine the effects of a DA-CPR protocol, which included a CQI feature, implemented in the context of a city fire department-based EMS system. The results of this investigation may guide the future development and implementation of DA-CPR.

## METHODS

### *Study Design and Setting*

This before-and-after study, which was conducted during a 15-month (November 1, 2014 to February 29, 2016)

period in Taoyuan City, Taiwan, was approved by the Hospital Ethics Committee (104-2875B). The study protocol was reviewed and exempted from the requirement to obtain informed consent.

Taoyuan City is a municipality in Taiwan with approximately 2,111,000 residents and a population density of 1730 persons per square kilometer (including both urban and rural areas). Taoyuan City has 39 EMS agencies; a single dispatch center receives telephone calls for EMS, rescue, and fire events throughout the year and dispatches personnel and ambulances for emergency responses. The two medical directors of the TYFD establish the protocols and hold monthly quality-control meetings.

During this study, a duty nurse was available from 8:00 AM to 10:00 PM on weekdays. During these hours, the duty nurse provided medical instructions on the telephone whenever the dispatchers identified a critical case. When the nurse was not available, the dispatchers provided phone instructions. All incoming calls were recorded for quality-control and legal purposes. According to statistical data from the TYFD, approximately 90,000 calls were answered annually, including 70,000 (80%) calls for EMS.

### *Participant Selection*

The study cohort consisted of patients aged older than 18 years diagnosed by on-site EMS personnel with non-traumatic cardiac arrest during the study period. Patients who presented with signs of death, such as having been decapitated, incinerated, decomposed, or displaying signs of rigor mortis, received no resuscitation or transportation in the field, were not registered in this study. Patients who were presumed to have experienced traumatic cardiac arrest, those who had incomplete records, and those who developed cardiac arrest during EMS transportation were excluded. Callers who were not on site, third-party calls, and patients who remained conscious at the time of the call were also excluded.

### *Intervention and Control*

A protocol developed to improve DA-CPR performance was implemented in July 2014. The medical directors of the TYFD created the original protocol, which included descriptive text only, after discussion with senior nurses and dispatchers. The original protocol mainly referred to the telephone-assisted CPR instructions by the Arizona Department of Health Services (9).

Original protocol:

- I. After receiving incoming calls, ask the following 2 questions as soon as possible.

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