

Effect of Dispatcher-Assisted Cardiopulmonary Resuscitation Program and Location of Out-of-Hospital Cardiac Arrest on Survival and Neurologic Outcome

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Study objective: We study the effect of a nationwide dispatcher-assisted cardiopulmonary resuscitation (CPR) program on out-of-hospital cardiac arrest outcomes by arrest location (public and private settings).

Methods: All emergency medical services (EMS)-treated adults in Korea with out-of-hospital cardiac arrests of cardiac cause were enrolled between 2012 and 2013, excluding cases witnessed by EMS providers and those with unknown outcomes. Exposure was bystander CPR categorized into 3 groups: bystander CPR with dispatcher assistance, bystander CPR without dispatcher assistance, and no bystander CPR. The endpoint was good neurologic recovery at discharge. Multivariable logistic regression analysis was performed. The final model with an interaction term was evaluated to compare the effects across settings.

Results: A total of 37,924 patients (31.1% bystander CPR with dispatcher assistance, 14.3% bystander CPR without dispatcher assistance, and 54.6% no bystander CPR) were included in the final analysis. The total bystander CPR rate increased from 30.9% in quarter 1 (2012) to 55.7% in quarter 4 (2014). Bystander CPR with and without dispatcher assistance was more likely to result in higher survival with good neurologic recovery (4.8% and 5.2%, respectively) compared with no bystander CPR (2.1%). The adjusted odds ratios for good neurologic recovery were 1.50 (95% confidence interval [CI] 1.30 to 1.74) in bystander CPR with dispatcher assistance and 1.34 (95% CI 1.12 to 1.60) in bystander CPR without it compared with no bystander CPR. For arrests in private settings, the adjusted odds ratios were 1.58 (95% CI 1.30 to 1.92) in bystander CPR with dispatcher assistance and 1.28 (95% CI 0.98 to 1.67) in bystander CPR without it; in public settings, the adjusted odds ratios were 1.41 (95% CI 1.14 to 1.75) and 1.37 (95% CI 1.08 to 1.72), respectively.

Conclusion: Bystander CPR regardless of dispatcher assistance was associated with improved neurologic recovery after out-of-hospital cardiac arrest. However, for out-of-hospital cardiac arrest cases in private settings, bystander CPR was associated with improved neurologic recovery only when dispatcher assistance was provided. [Ann Emerg Med. 2016;■:1-10.]

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INTRODUCTION

Background

Out-of-hospital cardiac arrest, with high incidence and low survival rate, is one of the most important public health issues.¹⁻³ Emergency medical services (EMS) aim to respond to dispatch calls as timely as possible, and despite efforts to improve response times, they cannot respond immediately to all cardiac arrest cases because of high call volumes or traffic congestion.⁴ Therefore, there is a need to increase the rate of bystander cardiopulmonary

resuscitation (CPR), one of the key components in the chain of survival, to provide early CPR before EMS arrival.⁵

A dispatcher-assisted CPR program enables a layperson to perform CPR; dispatchers instruct untrained bystanders to remove barriers and start CPR and assist trained bystanders in recalling CPR procedure and promote proper chest compression.⁶⁻⁸ Implementation of dispatcher-assisted CPR programs increases bystander CPR rates and improves outcomes after out-of-hospital cardiac arrest.^{5,9-11} For successful implementation, standardized dispatcher

Editor's Capsule Summary*What is already known on this topic*

By providing instructions over the telephone, emergency medical dispatchers can facilitate bystander cardiopulmonary resuscitation (CPR) for victims of sudden cardiac arrest.

What question this study addressed

How does dispatcher-assisted bystander CPR affect outcomes when out-of-hospital cardiac arrest occurs in public versus private settings?

What this study adds to our knowledge

Among 37,924 cardiac arrests, dispatcher-assisted CPR was associated with an increase of bystander CPR from 31% to 56%. Bystander CPR in public settings was associated with increased odds of good neurologic recovery, but in private settings only if also associated with dispatcher assistance.

How this is relevant to clinical practice

The study emphasizes the importance of providing instructions to facilitate bystander CPR before emergency medical services arrival, especially when the victim is in a private setting and even when the bystander might have CPR training.

education and quality assurance processes should be included in the programs.⁵ Some EMS systems have already adopted these programs and reported increased bystander CPR rates within a relatively short time.¹² However, characteristics of bystanders who provide CPR, such as age, sex, and previous CPR training, may influence outcomes for patients with out-of-hospital cardiac arrest.^{13,14} One proxy factor that characterizes bystanders is the arrest location.

Approximately two thirds of out-of-hospital cardiac arrests occur in private settings and have lower survival rates than those in public ones.^{2,3} Previous studies show that multiple bystanders are more likely to be present at public places and to be younger, whereas bystanders at home are more likely to be alone, older, and female members of the family.¹⁵⁻¹⁷ Furthermore, strangers in public places are more likely to perform CPR than family members are.¹⁶⁻¹⁹ No studies comparing the effects of dispatcher-assisted CPR on bystander CPR rate and survival outcomes of out-of-hospital cardiac arrests between private and public arrest locations have been reported, to our knowledge.

We hypothesize that providing CPR instructions by telephone is correlated with an increased frequency of bystander CPR for cardiac arrest victims. Bystander CPR with and without dispatcher assistance was associated with improved survival outcomes of out-of-hospital cardiac arrests, and the effect size would be larger if the arrests were to occur in a private rather than public setting.

MATERIALS AND METHODS

This study was approved by the institutional review boards of the Seoul National University Hospital and the Korea Centers for Disease Control and Prevention.

Study Design and Setting

This was a cross-sectional study using a nationwide prospective EMS out-of-hospital cardiac arrest registry in Korea. The EMS level is basic to intermediate, in which the most qualified emergency medical technicians (EMTs) can perform CPR with an automated external defibrillator, evaluate cardiac rhythms on site, manage advanced airway, and administer intravenous fluids. EMS providers cannot stop CPR unless the patient regains a pulse in the field or during transport to an emergency department (ED); all EMS-assessed patients are therefore transported to the nearest hospital. Sixteen provincial fire departments operate a single-tiered and fire-based EMS system. Fifteen provinces operate a single, unified, province-based central dispatch center, whereas 1 province operates agency-based dispatch centers (N=35). Every dispatch center has 2 levels of dispatchers; primary call dispatchers are charged with detecting out-of-hospital cardiac arrests and handing over the call to medical control dispatchers, who provide CPR instructions. Most primary call dispatchers are firefighters, whereas medical control dispatchers are either EMTs or nurses.²⁰ Medical directors supervise the quality of medical control dispatcher-provided CPR instructions.

A strict, nationwide, quality assurance program for EMS was established in 2011 for 4 major emergency conditions: out-of-hospital cardiac arrest, severe trauma, acute myocardial infarction, and acute stroke. The program now provides feedback to the provincial fire departments, EMS agencies, and individual EMTs. Every year, all EMTs are required to fulfill 20 hours of continuing education to maintain relevant medical skills and knowledge in accordance with the Rescue and Fire EMS Act.

There are approximately 460 EDs in the country, which are designated by the Ministry of Health and Welfare as Levels I through III according to capacity and resource measures, including staffing, equipment, and size of the department. Twenty Level I and 110 Level II EDs provide the highest level of emergency care services in the country.

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