The Effect of ten-minute dispatch-assisted cardiopulmonary resuscitation training: a randomized simulation pilot study

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Abstract

Background Immediate bystander cardiopulmonary resuscitation (CPR) is essential for survival from sudden cardiac arrest. Current CPR guidelines recommend that dispatchers assist lay rescuers performing CPR (dispatch-assisted CPR: DACPR), which can double the frequency of bystander CPR. Laypersons, however, are not familiar with receiving CPR instructions from dispatchers. DACPR training can be beneficial for lay rescuers, but this needs to be validated. The aim of this study was to determine the effectiveness of brief DACPR training for lay rescuers in addition to a standard CPR training course.

Methods We conducted a randomized DACPR simulation pilot study. Participants with no CPR training within 1 year prior to this study were assigned randomly to one of two 90-minute CPR training courses (DACPR Group: a standard CPR course including DACPR training for 10 minutes or Standard Group: a standard CPR course with a simple lecture of dispatchers' role). In the DACPR Group, participants practiced DACPR through role-playing of a dispatcher and an emergency caller. Six months after the training, the subjects in both groups performed CPR for 2 minutes under instruction by off-duty dispatchers.

Results Out of the 66 participants, 59 (DACPR Group; 30, Standard Group; 29) completed the simulation. The CPR quality was similar between the two groups. However, the median time interval between call receipt and the first dispatch-assisted compression was faster in the DACPR group (108 s vs. 129 s, $p = 0.042$).

Conclusions This brief DACPR training can be effective for lay rescuers to start chest compressions more quickly.

Background

Sudden cardiac arrest (CA) is a leading cause of death in industrialized nations. Bystander cardiopulmonary resuscitation (CPR) can increase chance of survival from out-of-hospital CA (OHCA)[1–3]. The proportion of CA in which bystander CPR is administered, however, remains 10 to 40% in most communities[2,4,5].

Dispatchers can help untrained emergency callers identify CA and start chest compression via phone[6]. It is reported that dispatch-assisted CPR (DACPR) can double the frequency of bystander CPR[7]. Familiarizing laypersons with DACPR may allow lay rescuers to perform CPR more quickly. However, the effect of DACPR training for lay rescuers in addition to standard CPR training is not well investigated.

In order to highlight the effect of DACRP training for lay rescuers, we conducted a randomized pilot study for DACPR training.

Results

A total of 66 participants in their 20 s to 50 s were recruited and randomly assigned to the study groups (N = 34; DACPR group and N = 32; Standard group). After 6 months, 59 participants completed DACPR simulation (DACPR group; N = 30, 15 males and Standard group; N = 29, 13 males, Fig. 1). No major accidents occurred during the simulation. The results are shown in Table 1. The overall chest compression performances were similar between the two groups. The average compression depth in both groups did not meet the recommended standard of 5 cm. The median time intervals between call and dispatchers' recognition of CA, and call to the start of CPR instruction were prompt in both groups, but relatively faster in the DACPR group (23.5seconds vs 27seconds; p = 0.187 and 79.5seconds vs 93seconds: p = 0.069, respectively). Median time intervals between call receipt and start of chest compressions was significantly faster in the DACPR group (108 s vs 129 s, p = 0.042).

Discussion

In this simulation study, participants who were randomly assigned to the DACPR training group demonstrated faster CPR performance with dispatcher instructions six months after training, when compared to the standard CPR training group. This result indicates that this brief DACPR training for lay rescuers has a potential benefit on CPR education.

The median time interval from call to first chest compression was 21 seconds faster in the DACPR group than in the Standard CPR group (108 s vs 129 s, p = 0.042). Kim TH et al. conducted a randomized simulation study to compare the effect of DACPR training to standard CPR training. They showed a similar result that participants of DACPR training started chest compressions 20 seconds faster in simulation 6 months after the training[8]. A possible explanation for this time reduction is because participants in the DACPR group were confident enough to follow dispatcher instruction for CPR. For Standard CPR group participants, this DACPR simulation was their first experience to follow the instruction. The question begs answering, does this 21-second reduction in the start of CPR represent a meaningful change in the outcome of CA? Studies have shown that it can take 3 to 4 minutes to start CPR when callers receive dispatch instruction in real life situations[9,10]. DACPR training for lay rescuers might be of clinical significance since the chance of survival with good neurological outcome for sudden CA victims decreases by 7–10% every minute without CPR[11].

Other key elements of chest compression such as median depth, rate, fraction, and the proportion of correct hand positions were similar in the two groups. Among these key elements, chest compression depth was suboptimal in both groups. Most CPR simulation studies show that the quality of layperson performed chest compression rarely meets the recommended standard[12,13], even with dispatch assistance[8, 14]. Studies showed that using simplified dispatch instruction for CPR to coach participants "push as hard as you can" could provide deeper compression when compared to standard CPR instructions, but the results of depth in these studies were still suboptimal[15 – 17]. Dispatch CPR instruction to achieve optimal chest compression depths needs further studies.

This study has substantial limitations. First, in the nature of pilot study, the sample size is small, and the study results are difficult to generalize. Second, this simulation was conducted at 6 months after training, long term retention of DACPR skills after 12 or 24 months were not investigated. Remote DACPR performance was not clear in this study. Finally, participants were relatively young. Elderly people may not be able to perform prompt DACPR because of their physical limitations[18].

Conclusions

This pilot study suggests that a 10-minute DACPR training in addition to standard CPR training can be beneficial in terms of more effective DACPR provision. Further studies are required to validate this point.

Methods

Study design

We conducted a parallel randomized pilot study to compare DACPR quality of participants from two CPR trainings: a standard CPR training and a brief DACPR training in addition to a standard training. We recruited non-health care providers with no CPR training experience within one year prior to this study.

CPR trainings

The training sessions were held at Nara Medical University. The first cohort were given a standard CPR training including automated external defibrillator (AED) usage (Standard Group). The second cohort were given a standard CPR with a 10-minute DACPR training (DACPR Group). In the DACPR Group, participants learned DACPR through caller-dispatcher role playing with CPR manikins and a template for CPR instruction at the end of the training. Both training courses were 90-minute in length. Participants were assigned randomly one of the CPR trainings scheduled by study investigators. All the participants were blinded to their allocations until the end of the training. Six months after the trainings, all participants were invited to the DACPR simulation via phone.

DACPR Simulation

We conducted a simulation of DACPR six months after the trainings. In this simulation, participants performed a single rescuer scenario in a small room at Nara Medical University. In this room, there was a manikin (Laerdal Resusci Anne manikin with Skill Reporting System) on the hard surface floor and a cordless extension phone on a small table. Neither an AED nor other rescuers were available in this simulation. After being given a list of simple instructions (Appendix 1), participants entered the room and perform CPR under instruction by dispatchers. Nine dispatchers with at least one year of experience took part in this simulation. All dispatchers were blinded to participants' allocations between the two cohorts.

Dispatchers were instructed not to ask the address, not to instruct the participant to perform rescue breathing, and strictly instructed to tell the participant to activate the speaker phone function and continue chest compression instruction for 2 minutes (Appendix 2). Dispatchers provided instruction following the standard DACPR instruction provided by Japanese Fire and Disaster Management Agency[19]. Each participant performed two-minute DACPR simulation and was offered a $10 value gift card as an incentive for the simulation.

Data collection and outcome

Data for chest compression performance (mean depth [mm], mean rate [cpm: compression per minute], hand position [%]) were collected through the Laerdal Skill Reporting System®. Data regarding time intervals of call to identification of the need for CPR, start of CPR instruction, and start of chest compression were recorded by video cameras (SONY HDR - AS200V). The outcome of this study was the quality of DACPR: time interval between call receipt and the first chest compression, and the quality of chest compressions.

For characteristics of participants, only approximate age such as 20s or 30s, and gender were obtained. In order to collect enough participants, data regarding exact age, height, weight, and education levels could not be obtained.

Statistics

Since this study was a pilot study, the sample size was set to about 30 in each group with reference to the previous studies[8, 12-16].

Continuous variables were described as median and interquartile range (IQR) and categorical variables were described as number (percentages). We used Mann-Whitney U test for continuous variables and chi-square test for categorical variables. Two-tailed p values less than 0.05 were considered as significant. Data analysis was done by SPSS ver. 22.0 (SPSS inc., Chicago, IL. USA).

Abbreviations

CA, cardiac arrest

OHCA, out-of-hospital cardiac arrest

CPR, cardiopulmonary resuscitation

DACPR, dispatch-assisted cardiopulmonary resuscitation

EMS, emergency medical services

Declarations

Ethics approval and consent to participate

This study was approved by the ethical committee of Nara Medical University.

All participants were informed about this study and written consents were obtained.

Consent for publication

Not Applicable

Availability of data and materials

The datasets used in the current study is available from the corresponding author on reasonable request.

Competing interests

There are no competing interests to declare in this study.

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Authors' contributions

HF and HA conducted study design. HF and TS conducted trainings and simulations. HA performed statistical analysis. HF prepared this manuscript. HF, HA, TK and FB finalized the manuscript. All authors accepted the final version.

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Tables

Table 1. Chest compression qualities

	DACPR Group (N = 30)		Standard Group (N = 29)		p value
Correct hand position (>90%), n (%)	23	(76.7)	21	(72.4)	0.708¶
Compression depth, mm	41.5	(35.8–49.0)	45	(34.0–51.0)	0.504*
Compression rate, cpm	99	(77.8–108.3)	104	(91.0–106.5)	0.727*
Compression fraction, %	100	(97.9–100.0)	100	(97.9–100.0)	0.873*

Continuous values are expressed as median (interquartile). ¶Chi-square test. *Mann-Whitney U test. CA, cardiac arrest; DACPR, dispatch-assisted cardiopulmonary resuscitation; cpm, compressions per minute.

Table 2. DACPR time intervals between groups

	DACPR Group (N = 30)		Standard Group (N = 29)		p value*
Call to CA recognition, s	23.5	(14.0 – 41.0)	27	(20.5–42.5)	0.187
Call to instruction, s	79.5	(62.8 – 104.8)	93	(83.0–102.0)	0.069
Call to DACPR, s	108	(89.8 – 136.5)	129	(106.5–148.0)	0.042

Continuous values are expressed as median (interquartile). *Mann-Whitney U test. CA, cardiac arrest; DACPR, dispatch-assisted cardiopulmonary resuscitation.

Figures

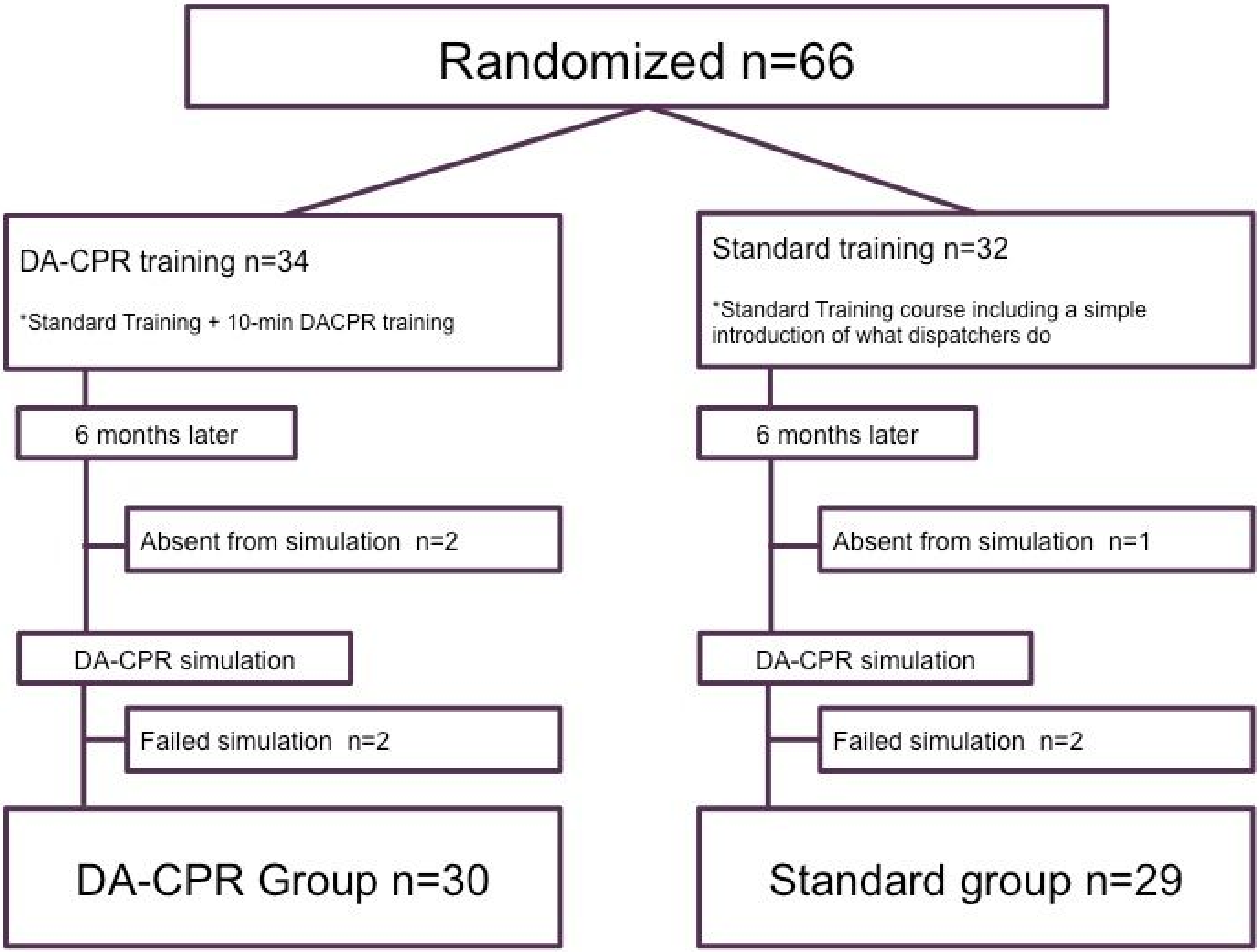

Figure 1

Study population

Supplementary Files

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- Appendix1.docx
- Appendix2.docx