

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 (CA). 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 has not yet been validated. The aim of this study was to determine the effectiveness of simple DACPR training for lay rescuers.

Methods We conducted a DACPR simulation pilot study. Participants who were non-health-care professionals with no CPR training within 1 year prior to this study were recruited from Nara Medical University hospital. The participants were randomly assigned to one of two 90-minute adult basic life support (BLS) training course groups : DACPR Group (standard adult BLS training plus an additional 10-minute DACPR training) or Standard Group (standard adult BLS training only). In DACPR Group, participants practiced DACPR through role-playing of a dispatcher and an emergency caller. Six months after the training, all subjects were asked to perform a 2-minute CPR simulation under instructions given by off-duty dispatchers.

Results Out of the 66 participants, 59 completed the simulation (30 from the DACPR Group and 29 from the Standard Group). 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 in addition to standard CPR training can result in a modest improvement in the time to initiate CPR. Future studies are now required to examine the effect of DACPR training on survival of sudden CA.

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. Bystander CPR, however, is initiated only 10-40% in the US, Europe, and Asia^{2,4,5}.

Dispatchers can help untrained emergency callers identify CA and instruct them to start prompt chest compression⁶. It is reported that dispatch-assisted CPR (DACPR) may double the frequency of CPR initiation by bystanders⁷. Familiarizing laypersons with DACPR may allow lay rescuers to perform CPR more quickly. However, the effectiveness of adding DACPR training to standard CPR training, in terms of strengthening bystander CPR, has not been deeply investigated.

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

Methods

Study design

We conducted a parallel randomized pilot study to compare DACPR quality among participants from two CPR trainings: a standard CPR training and a standard CPR training with an additional DACPR training. We recruited non-health care professionals with no CPR training experience within 1 year prior to this study from Nara Medical University hospital.

CPR trainings

The training sessions were held at Nara Medical University. The first cohort was given standard adult basic life support (BLS) training (Standard Group) while the second cohort was given standard adult BLS training with an additional 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-minutes. The participants were assigned to one of the adult BLS trainings randomly scheduled based on a computer program. The training sessions took place in a room at the University, where a maximum of 10 people can learn CPR. All the participants were blinded to their allocations. Six months after the trainings, all participants were invited to the DACPR simulation via phone.

DACPR Simulation

We conducted DACPR simulation 6 months after the training. In this simulation, the 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) lying on a hard floor and a cordless extension phone on a small table. Neither an AED nor other rescuers were present for this simulation. After being given a list of simple instructions (Appendix 1), the participants entered the room as if they happened to find someone (CPR manikin) unconscious on the floor; they then performed CPR under the instruction of dispatchers. Nine dispatchers with at least 1 year of emergency dispatch experience took part in this simulation. All dispatchers were blinded to the participants' allocations between the two cohorts. The study dispatchers provided CPR instructions along with the standard DACPR guidelines prepared by the Japanese Fire and Disaster Management Agency⁸ after giving the simulation instruction (Appendix 2). The study participants and dispatchers communicated through a closed telephone line system for emergency call training. The study investigators recorded the time and ensured that 2 minutes was kept for each simulation. After performing the simulation, each participant 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®. All simulations were recorded on video cameras (SONY HDR-AS 200V). The following time intervals were measured: 1) the call to identify the need for CPR, 2) the call to start CPR instruction, and 3) the call to start the first chest compression. The outcome of this study was the effect of DACPR on: time interval between call receipt and the first chest compression, and the quality of chest compressions.

Statistics

Since this study was a pilot study, the target sample size was 30 in each group with reference to the previous studies⁹⁻¹⁴.

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).

Results

A total of 66 participants, aged 20s to 50s, were recruited and randomly assigned to the study groups (N=34; 17 males, DACPR group and N=32; 15 males, Standard group). After 6 months, 59 participants completed the DACPR simulation (N=30; 15 males, DACPR group and N=29; 13 males, Standard group, Figure 1). 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 (23.5 seconds vs 27 seconds, $p=0.187$; and 79.5 seconds vs 93 seconds, $p=0.069$, respectively). The median time intervals between the call receipt and the start of chest compressions was significantly faster in the DACPR group (108 seconds) compared to the Standard group (129 seconds, $p=0.042$).

Discussion

In this simulation study, participants from the DACPR training group demonstrated faster initiation of CPR 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 seconds vs 129 seconds, $p=0.042$). Kim *et al.* conducted a similar randomized simulation study to compare the effects of DACPR training to standard CPR training on the quality of DACPR. Consistently, Kim *et al.* also found that participants who underwent DACPR training started chest compressions 20 seconds faster than those who underwent standard CPR training, in a simulation that occurred 6 months after the initial training⁹. A possible explanation for this time reduction is that participants in the DACPR group were more familiar with the dispatcher instructions for CPR. For Standard CPR group participants, this DACPR simulation was their first experience to follow the instruction. Whether this 21-second reduction in the start of CPR represents a meaningful change in terms of the clinical outcomes of CA now warrants investigation. Studies have shown that it takes 3 to 4 minutes to start CPR when callers receive dispatch instruction in real life situations^{15,16}. 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 CPR¹⁷.

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. Several simulation studies on layperson CPR training have shown that the quality of chest compressions rarely meet the recommended standard^{10,11}, even with dispatch assistance^{9,12}. Dispatch CPR instruction to achieve optimal chest compression depths needs further studies.

This study has several limitations. First, the sample size is small and the results are difficult to generalize. Second, this simulation was conducted at just 6 months after training; as such, the long-term effects of DACPR training remain to be investigated. Future studies that look at skill retention after 12 months or the effect of repeated DACPR training are thus warranted. Finally, the findings of our study might not be generalized to the entire population as our study cohort predominantly included young participants in their 20s to 50s. Most CA patients and callers are likely to be elderly in residential settings¹⁸ and might not be able to perform DACPR promptly.

Conclusion

This pilot study suggests that DACPR training for 10 minutes in addition to standard CPR training can result in a modest improvement in the time to initiate CPR. Future studies are now required to examine the effect of DACPR training on survival of sudden CA.

List Of 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

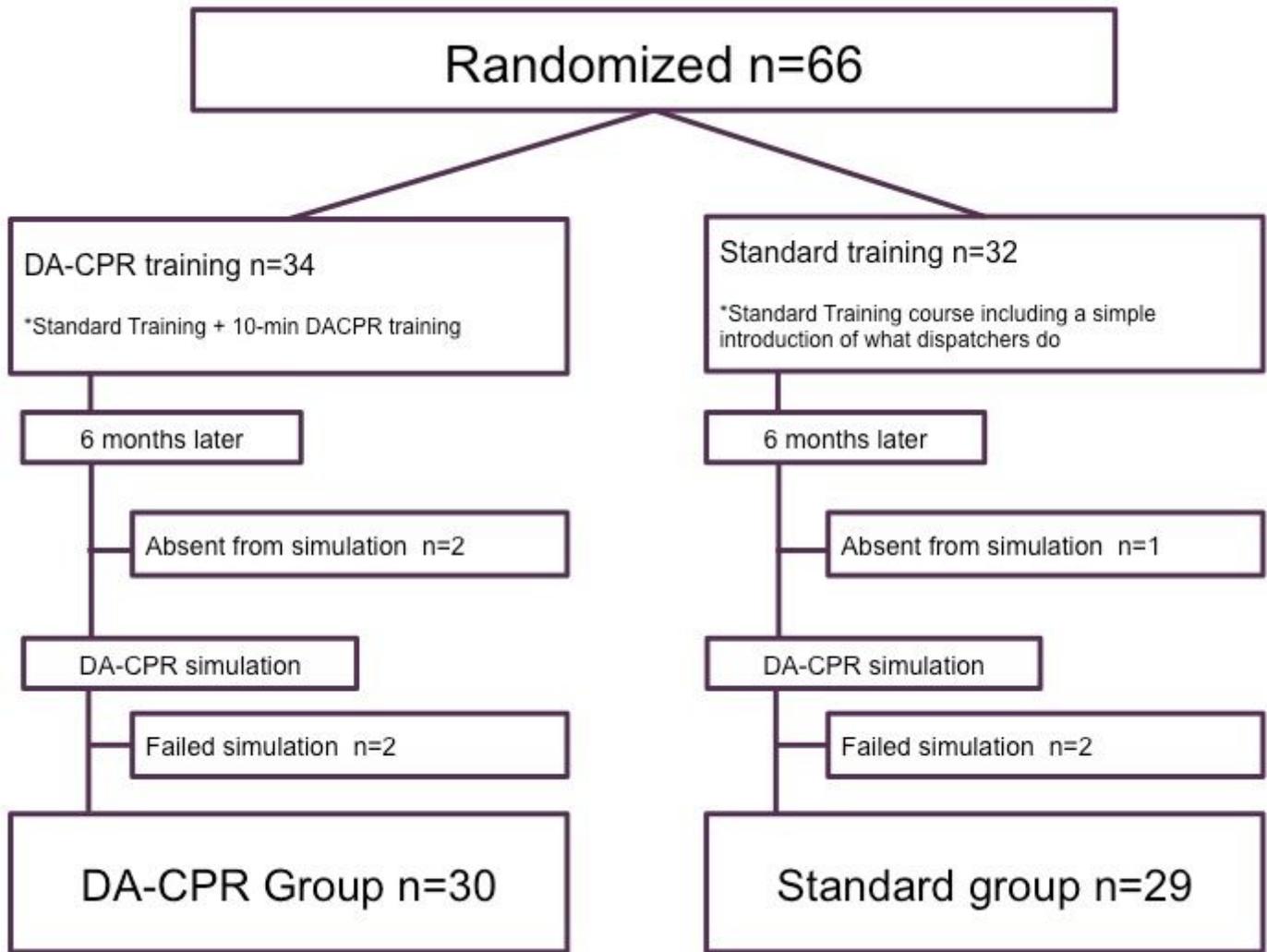


Figure 1

Study population

Supplementary Files

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- [Appendix1.docx](#)
- [Appendix2.docx](#)