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Short paper

Passive ultra-brief video training improves performance of compression-only cardiopulmonary resuscitation☆

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ABSTRACT

Background: Bystander compression-only cardiopulmonary resuscitation (CPR) improves survival after out-of-hospital cardiac arrest. To broaden CPR training, 1–2 min ultra-brief videos have been disseminated via the Internet and television. Our objective was to determine whether participants passively exposed to a televised ultra-brief video perform CPR better than unexposed controls.

Methods: This before-and-after study was conducted with non-patients in an urban Emergency Department waiting room. The intervention was an ultra-brief CPR training video displayed via closed-circuit television 3–6 times/hour. Participants were unaware of the study and not told to watch the video. Pre-intervention, no video was displayed. Participants were asked to demonstrate compression-only CPR on a manikin. Performance was scored based on critical actions: check for responsiveness, call for help, begin compressions immediately, and correct hand placement, compression rate and depth. The primary outcome was the proportion of participants who performed all actions correctly.

Results: There were 50 control and 50 exposed participants. Mean age was 37, 51% were African-American, 52% were female, and 10% self-reported current CPR certification. There were no statistically significant differences in baseline characteristics between groups. The number of participants who performed all actions correctly was 0 (0%) control vs. 10 (20%) exposed (difference 20%, 95% confidence interval [CI] 8.9–31.1%, $p < 0.001$). Correct compression rate and depth were 11 (22%) control vs. 22 (44%) exposed (22%, 95% CI 4.1–39.9%, $p = 0.019$), and 5 (10%) control vs. 15 (30%) exposed (20%, 95% CI 4.8-35.2%, $p = 0.012$), respectively.

Conclusion: Passive ultra-brief video training is associated with improved performance of compression-only CPR.

Introduction

Out-of-hospital cardiac arrest is a major public health crisis, with an annual incidence of 395,000 in the United States [1]. Bystander cardiopulmonary resuscitation (CPR) can significantly improve the likelihood of survival after cardiac arrest by maintaining blood flow to vital organs until the arrival of trained medical professionals. However, only 41% of patients in cardiac arrest receive bystander CPR [1]. In addition, only 3% of the population is trained in how to perform bystander CPR annually [1].

Traditional CPR courses require a significant time commitment and are poorly targeted to those individuals most likely to witness a cardiac arrest event [1,2]. As such, shortened 30-min courses have been developed that have demonstrated equivalent efficacy in training bystanders to perform CPR correctly [3]. When compared to traditional courses that include mouth-to-mouth breathing, compression-only CPR has equivalent efficacy in achieving survival after cardiac arrest [4]. Thus, brief compression-only bystander CPR courses have been advocated for as a means to increase rates of bystander CPR and improve survival [5,6].

Ultra-brief videos have recently been introduced as a means to more broadly disseminate CPR training. These 1–2-minute videos briefly teach how to perform compression-only CPR and emphasize its importance in improving survival. Preliminary studies have demonstrated efficacy for ultra-brief videos when used as teaching adjuncts within an educational framework [7,8]. Taking this a step further, the American Heart Association has developed a national

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television and Internet advertising campaign using similar videos [9]. However, no evidence currently exists demonstrating that passive exposure to an ultra-brief video, removed from an explicit educational experience, improves bystander CPR.

The objective of this study was to determine if non-patients passively exposed to an ultra-brief CPR training video shown intermittently on an Emergency Department (ED) waiting room television would perform compression-only CPR better than unexposed controls.

Methods

Study design and setting

This was a prospective controlled before-and-after study conducted in 2013 in the waiting room of a large, urban, academic ED that sees 90,000 patients annually. Institutional Review Board approval was obtained (#2013-0158). Informed consent was obtained from all participants.

Conducting this study in an ED waiting room provided a feasible way to ensure passive exposure to an ultra-brief video. In addition, ED visits provide an opportunity to reach vulnerable segments of the population, and provide a "teachable moment" whereby new information may be received and retained [10]. National organizations explicitly support using the ED for public health interventions [10].

Participants

To be included, participants had to be ≥18-years-old and present in our ED waiting room. Participants were excluded if they (1) were waiting or registering for medical care, (2) self-reported an inability to perform chest compressions, or (3) had previously been enrolled into this study. We specifically excluded ED patients to avoid delaying medical care. A consecutive sampling method was used during the time periods when the research coordinator was available.

Intervention

During the pre-intervention period, no information on CPR was provided. During the intervention period, an ultra-brief CPR training video was displayed on a single, large, closed-circuit television centrally located in the waiting room. This television is visible to the majority of the waiting room and has both audio and subtitles. The ultra-brief video was from the American Heart Association's "Hands-Only CPR" campaign and was slightly over 1-min in length [9]. The ultra-brief video was shown 3–6 times per hour. The average length of stay for patients in the ED was 6 h.

It is important to note that the study intervention was passive exposure to the ultra-brief video. Participants were not told to watch the video, nor were participants aware of an ongoing CPR study until the time of enrollment. After enrollment, participants were not given an opportunity to rewatch the ultra-brief video. Given the study design, there was no validated way to quantify the degree to which an individual non-patient participant was passively exposed to the ultra-brief video (e.g. intensely watched the video one time, casually heard the audio ten times).

Data collection

After enrollment, participants were taken to a semi-private area where demographics and self-reported data on prior experience with CPR were collected. Participants were then asked to explain what they should do if someone collapsed in front of them and to demonstrate compression-only CPR on a training manikin for one minute. CPR performance was evaluated by a single research coordinator, trained in Good Clinical Practice and guideline compliant CPR, using a structured tool to assess for the following critical actions taught by the ultra-brief video:

(1) Check for responsiveness
(2) Call for help
(3) Begin compressions immediately (<10 s from the previous action)
(4) Correct hand placement (hands interlocked in the center of the chest)
(5) Correct compression rate (90–110 compressions per minute measured with a stopwatch; the recommended rate was 100 at the time of study design)
(6) Correct compression depth (>50% of compressions that produced an audible click at 5 cm on the training manikin)

We specifically used a basic manikin (Resusci Anne Torso, Laerdal, Norway) to facilitate rapid assessment of CPR skills. We could not blind participants to the audible click for compression depth, but participants were not told its significance. No real-time feedback was provided.

Outcomes

The primary outcome of the study was the proportion of participants who performed all six critical actions correctly. Secondary outcomes were the proportion of participants who performed each individual action correctly. A 10-point Likert scale was used to assess willingness to performing CPR (10 = most willing). We determined *a priori* that 50 participants per study arm (100 total) would be needed to detect a difference of ±9% in the primary outcome with 95% confidence.

Statistical analysis

Continuous data were summarized using mean and standard deviation, while categorical data were summarized as percentages. Effect sizes and 95% confidence intervals were calculated. Differences between groups were assessed using the Independent Samples *T*-Test, Fisher's Exact Test, or Chi-Square Test, as appropriate. Statistical analyses were conducted using SPSS 21.0 (IBM Corporation, Armonk, NY).

Results

100 people were enrolled (Fig. 1). Baseline demographics and data on prior experience with CPR are shown in Table 1. There were no statistically significant differences between the two groups. Seventeen total participants recalled specifically watching the video, with one in the control group.

Primary and secondary outcomes are shown in Table 2. Participants passively exposed to the ultra-brief video demonstrated a statistically significant improvement in the primary outcome compared to the control group. Perfect compression-only CPR increased from 0% to 20%. For secondary outcomes, exposed participants demonstrated statistically significant improvements in the chest compression rate and depth. Only one participant, who was in the intervention group, had a compression rate >110 per minute. A subgroup analysis of the exposed participants stratified by self-reported previous CPR training demonstrated improvement in the primary outcome with prior training, but was non-significant (difference 16%, 95% confidence interval −5.7% to 37.7%, p = 0.157).