Using a Smartwatch with Real-Time Feedback Instructions Improves the Delivery of High-Quality Cardiopulmonary Resuscitation

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INTRODUCTION

High-quality cardiopulmonary resuscitation (CPR) affects survival after cardiac arrest. We aimed to investigate whether CPR quality can be improved by providing a smartwatch for healthcare professionals with real-time feedback instructions during resuscitation.

METHODS

An smartwatch app providing real-time audio (**Figure 1**) and visual feedback (**Figure 2**) was developed for use in an Android Wear with a built-in speaker [1]. Emergency Department (ED) professionals (of ACLS-certified doctors and nurses) were recruited and randomly allocated to either the interventional group wearing a smartwatch with the preinstalled app, to a control group without the intervention. All participants were asked to perform a two-minute CPR on a Resusci Anne QCPR training manikin using the 30:2 compression-ventilation ratio. Beat-to-beat chest compression rate (CCR) and depth (CCD) were recorded using Laerdal PC SkillReporting software (**Figure 3**).

Primary outcomes were CCR and CCD (mean±SD) measured on the manikin. Secondary outcome was the percentage (median and IQR) of chest compressions meeting both the guideline-recommended rate (100-120 min-1) and depth (50-60 mm) of high-quality CPR during the 2-minute period. Differences between groups were evaluated with the t-test or the Mann-Whitney U-test depending on the distribution.

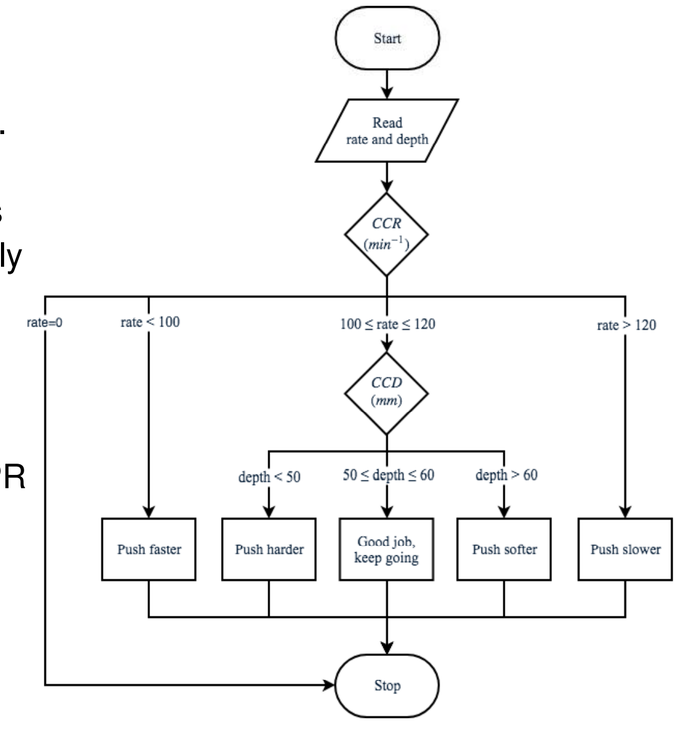

Figure 1. The audio feedback flowchart.

RESULTS

32 ED professionals were recruited in this preliminary trial. 15 people were assigned to the interventional and 17 to the control group. The compression rates (min-1) were significantly higher (but above the guideline recommendation) in the control group (123.9±15.1) than the interventional group (109.0±4.5) (P<0.05). The compression depths (mm) had significant difference between the interventional (50.0±7.0) and the control groups (41.6±7.6) (P<0.05). The percentage (%) of high-quality CPR was significantly higher in interventional (median 45.1, IQR 7.9-64.4) than in control group (median 0.0, IQR 0.0-0.2) (P<0.05).

CONCLUSIONS

Without real-time feedback, chest compressions tend to be too fast and too shallow. CPR quality may be improved with the assistance of a smartwatch providing real-time feedback instructions in a simulated environment.

Figure 2. Real time visual feedback displaying CCR and CCD with distinct color shown on the screen of the smartwatch.

Figure 3. A researcher wearing an Android Wear (ASUS ZenWatch 2) with pre-installed app is performing compression-only CPR on a manikin.

REFERENCET

1. Lu TC, Chen Y, Ho TW, *et al.* A Novel Chest Compression Depth Estimation Algorithm Based on a Smartwatch for High-Quality Cardiopulmonary Resuscitation. Poster Session Presented at the AHA Resuscitation Science Symposium (ReSS); 2017 November 11-15; Anaheim, CA, USA.