Technologically Enhancing DA-CPR to Address Community Responder Deficiencies In Achieving High Quality Bystander CPRL

SITUATION

Singapore has improved in its bystander CPR and associated survival rates over the last 10 years. Since 2015, we have been studying the use of a novel and portable CPR compression feedback device and its impact on the quality of compressions delivered in real cases. Anecdotally, it was observed that while the device tends to improve the quality of delivered compressions on average, some responders reported ignoring the feedback so as not to further harm the cardiac arrest victim. It was clear to the study team that this needed to be addressed along with a need to position ourselves to tackle other challenges community responders may face while responding to out-of-hospital cardiac arrest (OHCA).

Singapore is a small southeast Asian country comprising 278.6 Sq. Miles (or 721.5 sq. km) located just south of Malaysia. We have a population of 5,941,114 and resident population of 3,547,809, which is the number of people living in the country itself. According to the latest published OHCA data, our 2020 OHCA crude incidence rate was 60.4 per 100,000 persons while our age-adjusted rate was 43.3 per 100,000 persons. OHCA survival rate dropped to 4.3% in 2020 compared to 6.2% in 2019. Our Utstein survival rate dropped to 22.2% in 2020 compared to 26.2% in 2019.   And our age-standardized survival rate decreased to 9.5% in 2020 from 14.6% in 2019. We surmise that these are COVID-19-related drops. But our return of spontaneous circulation (ROSC) rate has been falling for the last 3 years.

INTERVENTION(S)

Building upon the lessons learned in the first iteration of our study, the next phase will entail direct collaboration with the Singapore Civil Defence Force (SCDF) and will target our OHCA alert app users vs. the all-comers approach we used in the first phase.   Also, since the next generation of our device will have Bluetooth® capability, we will link these app-enabled responders with our emergency medical services (EMS) dispatchers ("SCDF call-takers") via a cloud-based service in real-time. This technological linking will enable both scene video and compression telemetry to be available to our EMS call-takers and thereby remove the proverbial "blindfold" and enable these call-takers to informedly coach the responders based on what data and video information they see (for example, bowing of the elbows during compressions, or agonal breathing confusion with normal breathing).

This intervention comes under the Resuscitation Academy's 10-step category: Use of smart technologies to extend CPR and identify AED locations. Indeed, what Singapore is doing for this proof-of-concept study is bridging existing technologies to achieve the goal of unblinding the dispatcher and enhancing DA-CPR.   Our study of CPR devices and technologies will collect and transmit data. The bridging technology that links the CPR device with the cloud system also collects compression data with some additional variables. Apart from the video, all other data is not identifiable. Video will be processed to mask faces after the incident, but before archiving.

The uses of technology will be obvious. Our SCDF collaborators will report uses to us while there will be independent indicators that the system was triggered. There are run-in, mid-point, and final stage reporting events built-in. The key process measures we aim to monitor include such things as the responders' uptake and linking activities for proper setup, technological stability of the system, and time to first compression to name a few. Potential barriers include the data security and authorisations needed for full implementation, responders' hesitance to engage with the technologies, and potential delays to first compression we might see.

What is driving the enthusiasm for this project is the all-out spirit of the Singapore community to help in OHCA cases, and a desire to see our rates improve. We have good indications of solid buy-in from SCDF, but there is a bit more road to be covered. And, Singapore has a unique opportunity to be a "first-of" which is a note of national pride which we hope to leverage.

We have had to cobble together different funding sources to provide the needed resources for this study. Our funders include government and foundation sources. We expect to launch this study by Q1 of 2023 and will likely close the study at the end of 2024.

ESTIMATE LIFESAVING IMPACT

Singapore will be able to contribute to the OHCA literature by reporting the quality of bystander CPR at the earliest link in the chain-of-survival sequence. This quality data will help researchers and interventionalists tune their training to achieve better community-based responses to OHCA and compression quality on average. Singapore has begun plateauing in its bystander CPR rate at the 60% mark, so the challenge for us is how we now improve the average quality of compressions delivered.

We hope to show the OHCA community 1) what is happening at the earliest point of community responder intervention, 2) how we improve compression quality (if needed), 3) how we sustain the quality (we hypothesize that our intervention will delay or stave off fatiguing a bit), and 4) whether all this technological intervention can be done with minimal delay but with measurable improvements. The primary outcome measure we will monitor and analyze is our in-the-field ROSC rates to see whether these improve with our intervention cases vs. standard cases.

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