Bundled interventions improve bystander CPR, increase out-of-hospital cardiac arrest survival

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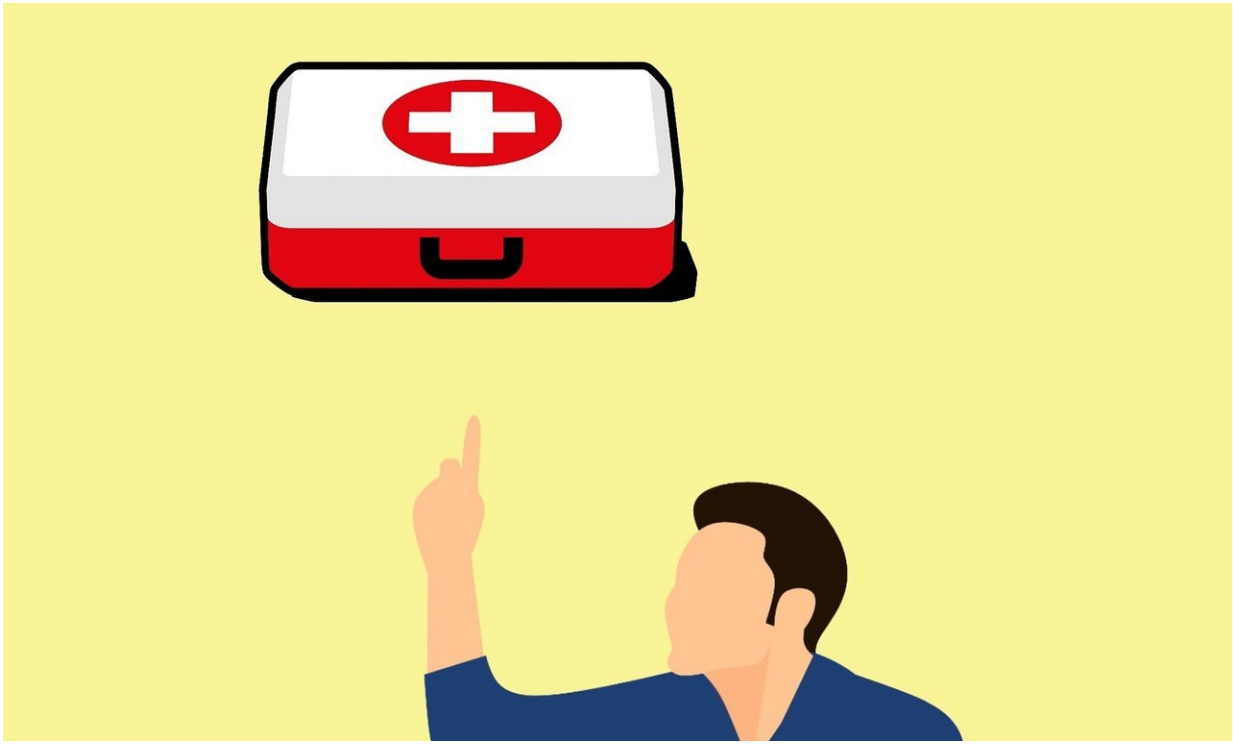

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A new study published in *The Lancet Public Health* found that a series of public health interventions in Singapore cumulatively increased the likelihood of cardiopulmonary resuscitation (CPR) by bystanders during

out-of-hospital cardiac arrests (OHCA) nearly eightfold and survival over threefold, underscoring the importance of such interventions to improve OHCA outcomes.

Sudden cardiac arrest is a serious healthcare concern all over the world. In the United States, over 350,000 cardiac arrests occur outside of a hospital annually, and about 90 percent of the victims die, according to 2015 statistics cited by the American Heart Association. In Singapore, a 2015 study found that about 70 percent of OHCA occurred at home and just over three percent of casualties survived to hospital discharge.

For a victim of sudden cardiac arrest in an out-of-hospital setting, CPR (performed by pushing hard and fast on the center of the chest) by a bystander could save their life. But in many communities around the world, the rate of bystander CPR is low, prompting some health authorities to initiate bystander-focused public health interventions at the community-level to improve this.

The study by researchers at Duke-NUS Medical School (Singapore), Duke University (Durham, NC, U.S.), Singapore Health Services (SingHealth), the Singapore Civil Defence Force (SCDF) and the Singapore Ministry of Health's Unit for Prehospital Emergency Care (UPEC) found that three national public health interventions in the city-state increased the rate of bystander CPR more than twofold. These measures included 1) dispatch-assisted CPR, 2) CPR and automated external defibrillator (AED) training, and 3) a first responder mobile application, known as myResponder, which alerts volunteer first responders trained in CPR to give life-saving assistance when they are in close proximity to someone experiencing cardiac arrest, before paramedics arrive on the scene.

"Our findings clearly showed that a bundled, national, bystander-focused public health intervention increased the chances of laypeople performing

bystander CPR," said Assistant Professor Audrey L. Blewer, an epidemiologist and resuscitation scientist in the Department of Family Medicine and Community Health at Duke University School of Medicine—the study's lead and corresponding author. "While we were unable to examine the individual effect of the interventions, the study suggests the importance of bundling interventions, especially for the public, to improve outcomes for OHCA."

While previous studies have shown the independent impact of such interventions on bystander CPR, no study has examined the cumulative impact of each added bystander intervention on bystander CPR. In this research, which focused on a population cohort from Singapore, data were analyzed from national bystander intervention programs from 2011–2016. Analysis was done on 6,788 patients with a mean age of 67, among whom 68 percent were male and 65 percent were of Chinese ethnicity.

When the likelihood of bystander CPR was modeled, it was seen that, with each added intervention, the predicted probability of receiving bystander CPR increased. Moreover, when all three measures were adopted and bundled in a national bystander-focused public health intervention strategy, it increased the likelihood of layperson CPR over twofold.

In the nationally gathered datasets that were analyzed in this research, it was seen that, in general, bystander CPR was administered in nearly half (48 percent) of OHCA events. With the implementation of dispatch-assisted CPR, the likelihood of bystander CPR increased. Additional implementation of CPR and AED training further increased the likelihood of bystander CPR. Finally, the addition of the myResponder mobile application to the intervention strategies resulted in nearly eight times increased likelihood of bystander CPR compared to no intervention.

In this population, when all three measures were adopted, the likelihood of survival increased more than threefold, compared to no intervention. Variations were seen in the predicted bystander CPR probability and survival rate after adopting each of these measures for residential versus non-residential settings.

"Understanding the impact of public health interventions helps inform strategies to increase bystander CPR and targeted initiatives to improve survival from OHCA," said Prof Marcus Ong, senior author of the study, who is Director of the Health Services and Systems Research Programme at Duke-NUS Medical School, and Senior Consultant at the Department of Emergency Medicine in Singapore General Hospital. "Importantly, our findings show that the increased likelihood of bystander CPR resulting from the bundled interventions was associated with increased survival."

As next steps, the team will continue to work with the relevant partners to build on robust quality and assurance measures, and ensure adherence to the protocol and resuscitation process metrics. Additionally, Singapore's health authorities continue to optimize the dispatch-assisted CPR protocol to improve outcomes and survival from OHCA. Future work may consider taking aspects of the Singapore protocol and implementing it in other locations, such as across Asia and urban cities in the U.S..

The Ministry of Education in Singapore requires that school-aged children are taught CPR in physical education classes. In addition to this requirement, Singapore offers free CPR and AED training to schools, community-based groups, and workplaces, which removes one of the known barriers to CPR training—specifically, cost and access to the course.

Prof Ong, who is also Director of SingHealth's Health Services Research

Center, and Medical Director of UPEC and Senior Consultant at the Ministry of Health, Hospital Services Division, added, "Over the last 10 years, we have been advocating for the immediate application of chest compressions and the use of an AED during an OHCA. Patients stand a much better chance—up to 50 percent—of survival if those interventions are performed. Studies like this allow us to enhance our public health systems and save more lives in the process."

More information: Audrey L Blewer et al. Impact of bystander-focused public health interventions on cardiopulmonary resuscitation and survival: a cohort study, *The Lancet Public Health* (2020). DOI: 10.1016/S2468-2667(20)30140-7

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