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Editorial

Improving CPR in communities: Understanding the importance of CPR training density



Cardiopulmonary resuscitation (CPR) saves lives and early performance of chest compressions is a critical intervention in the chain of survival for out-of-hospital cardiac arrest (OHCA).¹ In this edition of *Resuscitation*, Ro et al.² examined the associations between county-level bystander CPR training density (quantity of people trained per a geographic area) in the general population from 2012 through 2016, the rates of bystander CPR provision, and neurological function after survival. Using the Korean OHCA registry, the authors included aggregate data for 254 counties and 81,250 individual OHCA events for which resuscitation was attempted prior to EMS arrival. For the primary outcome of good neurological recovery, the overall risk-adjusted rates increased from 5.4% in 2012 to 7.1% in 2016. The largest improvements in good neurological recovery were seen in counties with the highest density of CPR training (adjusted rates: 5.2% in 2012 and 7.4% in 2016) as compared to counties with the lowest density of CPR training, which were relatively stable over time (adjusted rates: 5.9% in 2012 and 6.0% in 2016).

Over the 5-year study period, Korea instituted a public education and advocacy campaign to increase the numbers of individuals trained in CPR. In addition, a dispatcher-assisted CPR (DACPR) program was started in 2012. Subsequently, the rates of bystander CPR in Korea have increased from 2012 to 2016, and the differences in the bystander CPR rate between the highest and lowest density CPR-trained counties has narrowed, from 30.0%–38.7% in 2012 to 64.0%–66.9% in 2016.

This is the first study to show the density of CPR training in small areas (e.g. county) in lieu of a more common approach of reporting CPR training as a percentage of population trained for a large geographic area.³ However, it may be by looking at small area variations in the density of bystander CPR training by county could lead to more actionable quality improvement efforts like focusing CPR training in the areas which have the lowest underlying CPR density.

In this study, a threshold level of $\geq 50\%$ of the county population receiving CPR training (the Q1 group: 49.6–61.9% for CPR training rates), appeared to be associated with the greatest effect on neurological survival (the adjusted good neurological recovery rate increased 2.2% over a 5-year period and the adjusted survival rate increased 1.2% from 2012 to 2016). It is plausible that in this study, a “plateau effect” may have occurred when a certain threshold of the population was trained in CPR. This suggests the marginal benefits of getting to 70%, 80% or even 100% of the population trained in

bystander CPR could be desired, but may not always be required to see significant improvements in OHCA survival. A “tipping point” may occur at a lower threshold where the marginal effects of additional training may not necessarily result in a significant increase in the number of OHCA lives saved. However, a more detailed study is needed to examine the distribution of CPR density across a broader range of values and how the threshold values may vary within a geographic location.

Moreover, “priming” people by teaching them high-quality CPR prior to an OHCA event may be an important component of improving OHCA survival. Consistent with others studies, when DACPR was started in 2012 in Korea, there was an increase in the provision of bystander CPR by laypeople.⁴ In the counties with the highest levels of people trained in CPR, the neurological outcomes from OHCA survival were better. This may be explained by people who have taken a CPR course and are “primed and ready for action”, and can perform higher-quality CPR. CPR education in short bursts which primes the community, along with appropriate demonstration of hands-on skills of chest compressions, may lead to improved outcomes for OHCA patients.

There are some important limitations to this study. There is no information on the quality of bystander CPR performed and further research to assess the quality of CPR delivered is important. Second, this study may suffer from ecological fallacy, where aggregate data are used to make individual-level associations. Finally, it is difficult to know how cultural differences within or between countries may affect the CPR training density needed to impact cardiac arrest survival or the willingness to perform DACPR when asked to perform it.

What implications does this study have for the resuscitation community globally?

- *Measurement is key.* Gathering data on the OHCA event, but also who is being trained and where they live is paramount in identifying the link between the public health intervention (e.g. CPR training) and outcome.
- *Cardiac arrest incidence, bystander CPR provision, CPR training, and survival outcomes are key public health indicators.* Making this information public and reportable is important in focusing public health efforts. It engages community members, policy experts, and local organizations to focus on actionable interventions to improve OHCA survival.

- A goal of training 100% of the population is not required to see improvements in OHCA survival. Although this is the ideal, it may be a more realistic goal to start with a lower threshold value in which the effects of bystander CPR training may still have significant impact on OHCA outcomes.
- DACPR may help reduce county-level disparities in the provision of bystander CPR. Prior research has shown disparities in bystander CPR by geographic location, socioeconomic status and race/ethnicity.⁵ Improving DACPR may be an important part of reducing this variation in bystander CPR provision, reducing health disparities and ultimately improving OHCA survival.
- “Priming” people by teaching them high-quality CPR prior to an OHCA event is important part of the chain of survival. Prior training in how to perform high-quality CPR may help activate bystanders to respond in an emergent setting if directed by dispatchers.

In summary, CPR training is and continues to be an important part of the chain of survival for OHCA, which impacts early activation of emergency services, immediate provision of bystander CPR, and rapid defibrillation. Examining variations in the density of bystander CPR within communities appears to be an important step in improving OHCA survival outcomes.

Conflict of interest

Haukoos—None.

Sasson—Employee of American Heart Association.

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