# Moving the Needle in Home Cardiac-Arrest CPR, Survival

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VANCOUVER, BC — More people experiencing an out-of-hospital cardiac arrest (OHCA) received bystander CPR and first-responder defibrillation at home and in public and lived to survive, following a series of simple public-health initiatives, new research shows[1].

Beginning in 2010, booths began cropping up at the state fair, local movie theaters, and civic events offering chest compression–only training and education on cardiac-arrest basics to North Carolina residents, as well as to patients with cardiovascular disease and their family members before hospital discharge.

At the same time, the North Carolina Regional Approach to Cardiovascular Emergencies Cardiac Arrest Resuscitation (RACE-CARS) program was also working to train emergency dispatchers on early recognition of cardiac arrest and first responders on team-based CPR.

An earlier analysis of almost 5000 OHCA patients showed North Carolinians were more than three times as likely to survive to discharge after bystander-initiated CPR and defibrillation vs EMS-initiated interventions. Armed with an additional year of data and now 8269 OHCA patients, researchers this time homed in on whether outcomes varied by OHCA location.

The results, reported October 4, 2017 in *JAMA Cardiology*, showed that survival to discharge improved for arrests at home from 5.7% to 8.1% (*P*=0.047) and in public from 10.8% to 16.2% (*P*=0.04) over the study period of January 2010 through December 2014.

After adjustment for age and sex, North Carolinians with an at-home OHCA who received bystander-initiated CPR and first-responder defibrillation were the most likely to survive to hospital discharge vs patients receiving other combinations of CPR and defibrillation (odds ratio 1.55, 95% CI 1.01–2.38).

Patients with arrests in public were four times more likely to survive if they received both bystander-initiated CPR and defibrillation (OR 4.33, 95% CI 2.11–8.87).

"This isn't the first study to show an improvement in survival, but what's unique is that it showed that public-health initiatives work both at home and in public," said lead author Dr Christopher Fordyce (now with the University of British Columbia, Vancouver).

"Even though more arrests occur at home and the outcomes are dismal, we can impact home survival, and I think that's really important for communities, particularly rural communities where most of these patients will be."

Dr Peter Kudenchuk (University of Washington, Seattle), who was not involved in the study, commented that the findings demonstrate "cardiac-arrest survival can be improved and it doesn't take rocket science to do so, just implementing the basics.

"Second, it begins in the home, the most common place for the occurrence and highest site of death from cardiac arrest," he said.

## Normalizing CPR

Less than 10% of the almost 400,000 Americans who experience OCHA annually survive to hospital discharge, and the chances of survival are four to five times lower for the roughly 80% of individuals who arrest at home rather than in a public place.

The recent death of rocker Tom Petty at age 66 after suffering a sudden cardiac arrest (SCA) at home shocked many Americans, but both men suggest it may be a teachable moment to increase SCA recognition and normalize the use of CPR and automated external defibrillators (AEDs).

Fordyce said, "There's a huge emotional component when it's someone you love and you're sitting next to them and they collapse. People are afraid they're going to hurt them, injure them. So it's sort of easier to call 911 and wait for something to happen. There are barriers at home that need to be overcome, but I think education can do that."

He pointed out that in many Scandinavian countries, learning CPR is required in order to get a diploma or driver's license. "They've normalized it. This is just something that you need to learn because it could happen to someone you love or someone you don't know."

Some individuals who witness a collapse fail to act because they mistakenly believe rescue breathing is still required as part of CPR. False signs of life that often accompany SCA, such as open eyes, seizurelike body movements, and irregular breathing patterns, can also mislead would-be rescuers into thinking a collapse is due to a less serious condition or misdirect resuscitation efforts in such a way they actually lower the victim's chance of survival, observed Kudenchuk.

In a recent editorial[2], he called for adoption of the two-question "No, No, GO!" algorithm, which has been shown to improve SCA recognition and prompts 911 dispatchers to walk callers through immediate chest compression if they answer 'no,' the patient is not conscious, and 'no,' they are not breathing *normally*.

"If you listen to the 911 call, which is publicly available for Tom Petty, you'll recognize that he didn't receive CPR for the 2 minutes that the emergency call was made," he said. "The problem hinged on folks being fooled by the fact that they thought he was 'breathing,' when the point is that he was in cardiac arrest and was not breathing normally."

## Just Two Hands

The study identified 5602 home OHCA patients and 2667 public OHCA patients, based on a strict definition of at-home that included only private homes or residences because of the concern that at nursing homes or healthcare facilities AEDs would be more available and healthcare professionals would be more likely to witness arrests.

Over the study period, significant gains were made in the proportion of patients receiving bystander CPR at home (28.3% to 41.3%; $P<0.001$) and in public (61% to 70.5%; $P<0.01$).

First-responder defibrillation increased at home (42.2% to 50.8%; $P=0.02$) but not significantly in public (33.1% to 37.8%; $P=0.17$).

Neurologically intact survival rates, however, rose into double-digits for public OHCA (from 9.5% to 14.7%; $P=0.02$) but not for at-home OHCA (4.9% to 6.1%; $P=0.06$).

The authors noted that at-home OHCA patients were younger than their public counterparts (median 64 vs 68 years) but, consistent with historic trends, were less likely to have a shockable rhythm (21% vs 26.5%).

## Variations in Care Matter

An editorial[3] accompanying the study cautions that enthusiasm for the improvements in survival should be "tempered" by the fact that only 29.56% of counties in North Carolina were able to fully participate in the program.

In addition, there was still underuse of bystander CPR and defibrillators, and overall survival after at-home arrest remained much less than that in public places, write Dr Terence Valenzuela (University of Arizona, Tucson), Dr Andrew Harrell (University of New Mexico) and Dr Graham Nichol (University of Washington, Seattle).

"Such variation in the process and outcomes of care remain important because patients with OHCA in predominantly black neighborhoods have lower rates of bystander CPR and automated external defibrillator use as well as survival compared with those in predominantly white neighborhoods," they write.

Fordyce said they have yet to break down the data by race but that the beauty of the initiative lies in its simplicity. "This isn't about fancy technology; it's not even about AEDs. It's about if you have two hands you can save a life no matter where you live."

The North Carolina program cost about $2.5 million, with funding provided since 2010 through the Medtronic-sponsored HeartRescue Project. That funding dried up in June and in 2015 the program was transitioned to the Heart Rescue United States consortium.

It tries to build local sustainability by tapping existing community resources (for example, those willing to loan space or equipment for CPR/AED classes); ensuring that SCA care goals are incorporated into local job descriptions; and bringing EMS, 911, fire, and local hospitals together under a single vision and to share data through CARES, the Cardiac Arrest Registry to Enhance Survival, said Lisa Monk (Duke University, Durham, NC), RACE CARS state project leader, in an interview.

"Despite cardiac arrest being among the greatest killers of Americans, no government-mandated registry exists for it. Most communities don't even know the number of patients who sustain a cardiac arrest within their borders, let alone the outcome," commented Kudenchuk.

"This study demonstrates how such a nationwide registry can assess efforts to improve survival and whether they prove successful or not. We'll never know what we don't make the effort to measure."

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