LIFELINE ARM - BUNCOMBE COUNTY

CASE STUDY

THE CHALLENGE

As the training officer for Buncombe County EMS (BCEMS) in western North Carolina, paramedic Jamie Judd led the implementation of a high-performance, pit-crew CPR program. The agency created new protocols, conducted training, and soon began seeing improvements in their cardiac arrest care. But its leaders also noticed that problems persisted.

"When we looked at our CPR quality feedback from our cardiac monitors, we noticed that our compressions were, on average, too shallow, and our rates were erratic, often well over 120 compressions per minute," Judd said. "So we began looking for a way to provide more consistent compressions at a reasonable cost."

Buncombe County responders also frequently have to work cardiac arrests with only a small number of providers. Several of the local fire departments might only have two people staffing the station during the day; getting more than four people to the scene can often require mutual aid requests and take several minutes or more.

THE SOLUTION

Knowing that consistent chest compression depth and rate could improve survival rates,[1] BCEMS turned to mechanical CPR. Not only did agency leaders feel the devices could improve CPR consistency, they also felt it could take some of the chaos out of a cardiac arrest. Mechanical CPR would also serve as an extra set of hands, especially during long resuscitations when resources were limited and only a few providers were on scene.

"It provides the best consistent CPR," said Dr. Stace Horine, medical director for Buncombe County EMS. "Can humans do that? Probably—but certainly not as consistently. To me mechanical CPR makes all the sense in the world."

When choosing a device, BCEMS turned to the people who know best: the paramedics who use them. They considered several models, including one made by the manufacturer of the defibrillator/monitors BCEMS has used for many years. But in the end, they instead chose to try the Defibtech Lifeline ARM automated chest compression (ACC) system.

"It was simple to operate: three basic pieces and three simple buttons to push," Judd said. "I demoed it once, and after one or two tries, the crews were able to operate it without any difficulty."

The paramedics also liked the Lifeline ARM's durability and ruggedness. Its solid pieces gave them confidence that it would hold up under the conditions sometimes faced in the field.

To train its paramedics on use of the Lifeline ARM, Buncombe County EMS included a 30-minute introduction to the device and its use during a regular day of continuing education. They then had each crew practice with the device for 30 minutes while on-duty—what they call "tailgate training." The simplicity of the device allowed BCEMS to focus the training on when and how to use it in order to minimize pauses in chest compressions and give cardiac arrest victims the greatest chance of survival.

Buncombe County EMS office located in Asheville, NC.

RESULTS

Once BCEMS placed the Lifeline ARM on one of its ambulances and used it on cardiac arrests in the field, they quickly found it effective.

"There was some skepticism at first, but soon after our medics were all in—they wanted more of them," Judd said.

When BCEMS leaders examined the CPR analytics data for 64 cardiac arrests where the Lifeline ARM was used, they found that every single case showed a similar pattern. Manual CPR during these 64 cases almost always resulted in inconsistent delivery of compressions and rates much higher than the AHA/ERC guidelines.[2] Once the automated device was used, though, they found the rates consistently stayed at the recommended level, with almost no pauses.

In 2017, BCEMS saw its survival rate for witnessed ventricular fibrillation (VFib) arrests rise to 40%, compared to 32% the previous year. Agency leaders attribute the increase to the implementation of high-performance CPR and other quality improvement efforts. The use of the Lifeline ARM helped them provide consistent compressions, freeing up paramedics to perform other critical tasks, and allowing for movement of patients for whom transport is indicated without the need for firefighters or paramedics to perform chest compressions in a moving ambulance. Being able to transport those patients to definitive care while still delivering high-quality chest compressions also meant spending less time on scene, and getting EMS crews back in service more quickly.

"We didn't use the Lifeline ARM expecting to see a huge change in outcomes, because we already had made some improvements when we went to the pit crew model," Judd said. "Our big concern was whether we could be more consistent, and over time we felt we'd see the numbers begin to go up."

ABOUT BUNCOMBE COUNTY

Buncombe County sits in western North Carolina, just east of the Smoky Mountains. With a population of more than 250,000 spread over 660 square miles, the county is a mix of urban, suburban, rural and wilderness, centered around the eclectic city of Asheville. Buncombe County EMS provides ALS emergency response and transport with ten ambulances staffed with paramedics, responding to more than 29,000 calls annually. Eighteen (18) local fire departments also serve the county, with most providing basic life support response. Six (6) of those departments, as well as one local rescue squad and one private agency, also have ALS transport units that respond to 911 calls.

Buncombe County EMS and some of the other agencies in the county participate in the Cardiac Arrest Registry to Enhance Survival (CARES). The county's annual CARES report cards reported 129 cardiac arrests in 2016 and 143 in 2017.

A LIFE SAVED

"Having the Lifeline ARM made it possible for a crew of just three people to provide all the important life-saving treatments and take that patient safely to the hospital."

On the morning of September 26, 2017, a 55-year-old man from Tennessee was working in a medical building in Asheville when he suddenly collapsed. Buncombe County EMS Unit 12 arrived on scene first, finding the man pulseless with agonal respirations. They began chest compressions and quickly determined he was in ventricular fibrillation. After three defibrillations, the patient remained in cardiac arrest.

Recognizing that a patient in refractory VF could require a lengthy resuscitation and eventual transport to the hospital, the crew applied the Lifeline ARM and initiated mechanical CPR. With only three providers on scene, they were then able to establish vascular access and administer epinephrine, followed by subsequent defibrillations and anti-arrhythmic therapy.

After five shocks, the man's heart continued to be in VFib, so the crew moved him into the ambulance and transported him to the hospital. Just as they arrived, he regained a pulse and began attempting to breathe on his own—26 minutes after the medics initially arrived at his side. Within an hour, he was awake and talking to the cardiologists.

Later, while reviewing the CPR analytics, Judd saw what a difference the Lifeline ARM made. For the first several minutes of the cardiac arrest, the paramedics did a great job of performing consistent compressions with almost no pauses, but they tended to push too fast. In addition, the same data clearly showed that after putting the Lifeline ARM ACC device on the patient, they were able to provide compressions at a rate of 100 per minute with no pauses for 15 minutes.

"Having the Lifeline ARM made it possible for a crew of just three people to provide all the important life-saving treatments and take that patient safely to the hospital," Judd said. "But most important, he was able to return home to his family and resume a normal life."

Defibtech provided technical, editorial and equipment support to BCEMS.

Statements attributed to individuals in this case study reflect the opinion(s) of the individuals. For information about the Lifeline ARM indications, contraindications, instructions for use and other important information, refer to the Lifeline ARM User Manual.

The Lifeline ARM is intended for use as an adjunct to manual cardiopulmonary resuscitation (CPR) when effective manual CPR is not possible (e.g., during patient transport, or extended CPR when fatigue may prohibit the delivery of effective/consistent compressions to the victim, or when insufficient personnel are available to provide effective CPR).

REFERENCES

1. Talikowska M, Tohira H, and Finn J. Cardiopulmonary resuscitation quality and patient survival outcome in cardiac arrest: a systematic review and meta-analysis. Resuscitation 96 (2015): 66-77.

2. Kleinman ME, Brennan EE, Goldberger ZD, et al. Part 5: Adult Basic Life Support and Cardiopulmonary Resuscitation Quality: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 132 (2015):S414–35.

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