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Improving SCA Survival

A comprehensive approach to improving SCA outcomes helped raise Ventura County's v-tach/v-fib survival rate above 50%

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Over the first half of 2009, 27 patients who suffered out-of-hospital sudden cardiac arrests walked out of Ventura County (CA) hospitals. Most of them would not have done so had the Ventura County EMS system not taken the time, energy and effort to start a performance improvement initiative in 2008. We are delighted to report on this success, and hope it might give others some thoughts on how to look at their systems.

One of the very time-critical, and arguably most important, roles of an EMS system is to care for the victim of SCAs. Modern EMS got its start after a 1967 report by Dr. Frank Pantridge from Northern Ireland described the first out-of-hospital defibrillations. Some believe that since SCAs make up less than 1% of all EMS calls, they should not be the focus of system evaluations. Others point out that of all critical EMS calls—calls where our care actually affects the patient's outcome—SCA makes up quite a large proportion. Further, an EMS system that can rapidly and effectively respond to cardiac arrests will be better organized for other high-priority responses. The care of seriously ill or injured patients requires critical thinking and a well-choreographed approach from all responders. An EMS system that can deliver high-quality comprehensive management to the SCA patient can also do so elsewhere.

Ventura County has a population of 800,000 and covers 1,900 square miles just north of Los Angeles. It has the typical coastal California benefits and challenges of populous beach areas, sometimes-crowded freeways and remote mountains. The EMS system includes an emergency medical dispatch program, a tiered response system with fire department first responders and private ambulance transport services, aeromedical operations, and eight base and receiving hospitals. Providers have a long history of excellent coordination and cooperation, and meet on at least a monthly basis.

Early in 2008, we started the process of examining our SCA outcomes. Although we'd gone through this exercise in the past, it had been more of a data collection chore than a basis for improving care. The SCA project was especially attractive for two reasons: 1) It involved every part of our EMS system, from collapse to discharge home; 2) With all the exciting recent advances in resuscitation research, we thought, when we were done, we could point to (and hopefully celebrate) a success measured in lives saved.

IMPROVEMENTS

First, we looked at the entire system to see what worked well and what needed improvement. We were doing a lot well. Dispatch worked effectively, and responses were fast—the closest and backup units were getting to scenes quickly. On-scene care, transport and hospital care were excellent. Fire departments, ambulance companies and hospitals were active participants in our QI system, and everyone always kept good patient care as the cornerstone of what they did.

We also found some ways we could improve. First, we had no good way to decide whether anything we did (or changed) for the SCA patient made a difference. We had lots of individual data sitting on a number of different computers (9-1-1, dispatch, fire, ambulance, hospital), but no outcome information and no meaningful system reports. It is helpful to know that a patient has return of spontaneous circulation (ROSC) or is admitted to the hospital, but what we (and our community) really wanted to know was how many patients were waking up, leaving hospitals and going back to their families. We decided that instead of building our own reporting system, we would join the Cardiac Arrest Registry to Enhance Survival (https://mycares.net). CARES is a nationwide project funded by the CDC and run out of Emory University. With more than 20 EMS systems now participating, all entering information using the same definitions into one database, we could see exactly how we were doing to improve neurologically intact survival to hospital discharge, as well as begin to compare ourselves to others.

Many 9-1-1 calls are placed from wireless phones. Wireless 9-1-1 calls have increased substantially over the last 10 years, and now outnumber wire-line calls. Unfortunately, the infrastructure to answer these calls has not kept up. Wireless calls in our area have traditionally been routed to the California Highway Patrol—a practice that started when there were just a few bulky power-hungry car phones that only encountered emergencies on the road. The volume of such calls now far exceeds the capacity (9-1-1 trunks, call-takers) to answer them, and they usually originate far from highways. A local company, Public Safety Network, is working with the state 9-1-1 program office to improve delivery of wireless 9-1-1 calls by analyzing historical call data and redirecting calls to the local public safety answering point (dispatch center). Shortening ring times, answering more calls and reducing unneeded transfers can significantly decrease the time it takes to begin treating our patients.

We also improved our time to dispatcher-directed CPR. This is often thought of as immediate, but the process of instructing a caller to start CPR frequently takes several minutes to get to the first chest compression. By measuring, reporting and reviewing calls with dispatchers, in addition to moving to the streamlined caller questioning protocols in version 12.0 of the Medical Priority Dispatch System, we decreased our time to CPR by more than 30 seconds.

Our most significant survival impact came from improvements in provider CPR. Immediate high-quality CPR and prompt defibrillation are the most important treatments for SCA, but many studies show CPR is usually done poorly, both in and out of the hospital, and training is inadequate. We surveyed CPR competencies of on-duty fire and ambulance company EMTs and

paramedics. We visited stations around the county with an Ambu SmartMan, a manikin/computer system that measures the rate, depth and recoil of each chest compression and displays them in real time as color-coded bars that can be used for training and/or testing. What we found was not surprising: Of 80 EMTs and paramedics, each performing five cycles of 30 compressions, only 20% of the compressions were correct according to AHA guidelines. However, we also found this easy to fix: With only one minute of SmartMan real-time visual feedback training, providers were able to perform compressions that were 80% correct. We used the QI approach and SmartMan manikins to train and test all of our 950 active EMTs and paramedics.

We encouraged case reviews. Individual providers had been downloading and reviewing monitor strips, but we began to look specifically at the quality of CPR—rate and percentage of time on the chest. This increased everyone's attention to these patients. News of anecdotal successes began spreading. The "subject not breathing" call is now someone who might eventually go home, and not just a futile 20 minutes of resuscitation before being pronounced.

RESULTS

Our results were extraordinary. Even before these improvements, we were doing pretty well. The survival rate for bystander-witnessed SCA from ventricular fibrillation/tachycardia was 32% during the six-month period of July-December 2008. This was just above the 28% mean of all the CARES sites. Over the next six months (January-June 2009), our CPR training and other efforts enabled Ventura County's survival rate to jump to 52%! Better yet, every one of the survivors was awake and doing well. The number of people who were able to return home increased from 13 to 27.

Using our data, looking at our times and improving our CPR made the difference. It would be hard to find an EMS QI effort that could do better.

Still, there is more to do. We have a list of projects that will help us solidify and perhaps improve upon our gains. First, we will continue to focus on the "back to the basics" approach to SCA treatment. Rapid response, high-quality, minimally interrupted CPR, and prompt defibrillation need to remain our focus. Second, we have started a study using the King LTS-D airway and ResQPOD impedance threshold device. Combining these devices allows us to improve the effectiveness of chest compressions. Third, we are transporting patients with ROSC to hospitals that can perform angioplasty and therapeutic hypothermia. Fourth, we are looking at improving bystander CPR rates. At 18%, we are lower than the CARES sites' average of 23%. And fifth, we are redesigning our basic and advanced resuscitation training programs by shaping them to fit our specific needs and using our QI data to adapt.

Once these goals are realized, there will be others in the pipeline. There is no more skilled, harder working or energetic EMS team anywhere. Our successes motivate us to do more.

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