



# CARES

Cardiac Arrest Registry  
to Enhance Survival

# CARES in Action

*Summer 2018*



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# The Mission of CARES

## **Mission**

To help communities determine standardized outcome measures for out-of-hospital cardiac arrest allowing for quality improvement efforts and benchmarking capability to improve care and increase survival.

## **Overview of Concept**

The Cardiac Arrest Registry to Enhance Survival (CARES) is currently the largest out-of-hospital cardiac arrest (OHCA) registry in the United States. CARES automates the linkage between 911 centers, First Responders, Emergency Medical Services (EMS), and hospitals to create a single record for each event. Registry data collection is critical to improving patient care and survival rates as it allows communities and public health organizations to monitor quality of care, measure and benchmark performance for effectiveness research, enhances the ability to conduct medical product safety surveillance, and creates a platform for intervention implementation.



## **Statement of Impact**

CARES began data collection in Atlanta, with nearly 1,500 cases captured in 2006. At present, the registry now captures that same number of records weekly. The program has expanded to include 23 state-based registries (Alaska, California, Delaware, Florida, Georgia, Hawaii, Illinois, Maine, Maryland, Michigan, Minnesota, Mississippi, Montana, Nebraska, New Hampshire, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, Vermont, and Washington) and the District of Columbia, with more than 60 community sites in 19 additional states. CARES represents a catchment area of almost 115 million people or approximately one-third of the US population. To date, the registry has captured over 350,000 records, with more than 1,400 EMS agencies and over 1,900 hospitals participating nationwide. To date, CARES has published 46 articles in peer reviewed journals and has supported countless quality improvement efforts in participating communities, resulting in an increase in cardiac arrest survival and a more thorough understand of OHCA treatment and survival in the field of emergency medicine.

## **Benefits of Community Participation**

In the simplest terms, CARES provides communities with an infrastructure to streamline the data collection process for OHCA. In doing so, CARES participants have the ability to benchmark their performance to identify opportunities for quality improvement and thus increase cardiac arrest survival in their community. Prior to CARES participation, very few sites had the resources to commit to collecting OHCA data and as such, most sites did not know what the survival rates were in their area or how to begin improving OHCA prevention and treatment. With CARES, communities not only have a robust data collection process and reporting system but access to a community of CARES participants where best practices and lessons learned are shared amongst the most knowledgeable and progressive EMS leaders in the country. The benefit of CARES participation is most easily conveyed in its 100% retention rate since registry conception.

# Mini Case Studies

## **Contra Costa County EMS, California Joined CARES in 2009**

Contra Costa County EMS has noted clear patterns of disparity in survival among their low-income communities and by ethnicity that have helped spearhead public health efforts to improve the cardiovascular health of highly vulnerable groups in their community. CARES has allowed them to measure community efforts with regard to bystander CPR and AED use, and use the data to help prioritize educational efforts for the general public with regard to these life-saving interventions. In the coming year, they will be concentrating on enhancements in the fifth link of cardiac survival, post-resuscitation care at their hospitals, and CARES will be indispensable in these efforts.

“The CARES registry has been the single most important enhancement to our EMS system in the 16 years I have been working as medical director.” –Dr. Joseph Barger, EMS Medical Director

## **San Francisco Fire Department, California Joined CARES in 2007**

San Francisco has utilized CARES data to undertake multiple approaches to improve sudden cardiac arrest survival over the last few years. Since participating in CARES, the survival rate of cardiac arrest patients with a witnessed arrest and shockable rhythm - those that are amenable to defibrillation - improved dramatically (from 9% to 23%). They have presented CARES data at their OHCA summit for quality improvement purposes. In a letter from Dr. Karl Sporer the Medical Director of San Francisco, Fire Department dated November 16, 2011, Dr. Sporer noted that “CARES allows SFFD to collect OHCA data on an ongoing basis and provides our community with a simple, secure and efficient method of tracking key performance measures locally, including bystander CPR compliance, public access defibrillation and overall survival rate at hospital discharge. San Francisco has taken on multiple approaches to improve sudden cardiac arrest survival over the last few years and CARES has been instrumental in measuring our areas of success.”

## **Minnesota Department of Health Joined CARES in 2010**

The Minnesota Resuscitation Consortium has recently started participating in the CDC-funded CARES (Cardiac Arrest Registry to Enhance Survival), with the goal of statewide participation throughout Minnesota within 2 years. CARES supports ongoing surveillance of OHCA and quality improvement efforts at the Minnesota Department of Health in direct support of Objective 2.1 from the Minnesota Heart Disease and Stroke Prevention Plan 2011-2020: Provide consistent, evidence-based and timely acute care for Minnesotans experiencing sudden cardiac arrest. CARES enhances the partnerships between pre-hospital, hospital, state, and local public health agencies to combat one of the leading causes of death.

## **City of Las Vegas, Nevada Joined CARES in 2008**

When joining CARES in August 2008, it marked the first time that any community in the state of Nevada was able to measure survival from sudden cardiac arrest. At that time, only 5% of patients survived to hospital discharge. Using CARES as a vehicle for change, they began working on systematically strengthening each of the 5 links in the AHA's chain of survival. They addressed the first and third links (early 911 and early advanced care) by implementing a Quick Launch protocol that enabled their alarm office to dispatch a unit on the scene within 4 minutes. CARES also allowed Las Vegas to measure their dispatch-aided CPR rates and correlate and feedback patient outcomes to their 911 call takers. Based on CARES data, they have made many changes to their dispatch process such as enabling their dispatchers to do compression-only CPR and start CPR sooner. They have used CARES to strengthen their paramedic's quality of resuscitation by having a measurement tool that provides meaningful feedback both individually and as a community on SCA victims. Through CARES, they were able to see the direct effect of high-quality CPR, delayed intubation and therapeutic hypothermia had on survival rates. One of the most important benefits of CARES for Las Vegas was that it served as the force to drive their community's hospitals to begin using optimal post-resuscitation care (therapeutic hypothermia, etc.). Their Utstein survival increased from 5% and over the past few years, it has peaked at 58% and now sits in the 30% range. Las Vegas relies on the CARES registry to provide background surveillance and measurement of meaningful outcomes that drive their community's quest for continually improving survival for our citizens and visitors. The City council has chosen Utstein survival, as measured by the CARES registry, to be the primary EMS performance measure for our Fire Department. CARES has assisted with the Quick Launch program, dispatch-aided CPR, Save-a-Life bystander CPR initiative, as well as an evaluation of Pediatric Cardiac Arrest characteristics in the nation. These projects have been presented and published at various venues such as American College of Emergency Physicians annual meeting, the National Association of EMS Physicians, Society of Academic Emergency Physicians and the American Heart Association annual meetings.

## **El Paso County EMS, Colorado Joined CARES in 2009**

Participating in CARES has led El Paso County to a resurgence in interest in CPR training for the public by EMS and local hospitals, as well as a peer emphasis on high quality EMS provider intervention both on scene and in transport. The resultant focus on improving cardiac arrest outcomes led to the momentum to establish therapeutic hypothermia protocols within all four of their area hospitals, as well as their busiest EMS agencies. They have used CARES data in presentations to public officials, EMS crews, hospital-based medical, nursing and administrative staff and other interested parties.

## **Denver Paramedic Division and Denver Fire Department, Colorado Joined CARES in 2008**

Denver EMS has used their CARES data in regular presentations at the Denver City Council as well as the Denver Mayor's Office and because of this data, they have been successful at generating interest at many levels in their community in looking at how they can understand and improve their EMS system. Based on the information provided by CARES, they were able to identify public AED use as a significant weakness in their system and were successful in instituting a program (Save a Life Denver) that will result in an additional 2000 AEDs being placed in the Denver metro area. CARES has provided the first opportunity to track cardiac arrest survival in a meaningful fashion that allows them to understand their strengths and weaknesses. Denver initiated therapeutic hypothermia in the field based largely on the current literature as well as data from the CARES program.

## **Hennepin County Medical Center, Minnesota Joined CARES in 2009**

Hennepin County has used their CARES data to work with government leaders to successfully promote EMS activities and improve survival from OHCA. They used the data showing a disappointing degree of bystander CPR to initiate many bystander-training sessions throughout Hennepin County. CARES data have generated a lot of excitement in new placements of AEDs in the County. They used bystander CPR data and bystander AED data to support a number of successful grants to promote training and AED placements. Their high Utstein number (58% survival to hospital discharge of bystander witnessed shockable rhythm patients in Minneapolis in 2010 with 94% CPC 1 or 2) has given them instant credibility when working with hospitals, government officials, emergency physicians and cardiologists. This credibility is allowing them to take additional steps to increase survival in OHCA. Validated in the Journal of the American Medical Association and the BLS and ALS termination-of-resuscitation rules consistently identified patients with out-of-hospital cardiac arrest who had a limited chance of survival. CARES data has been used to identify neighborhoods with high incidence of cardiac arrest and low rates of bystander CPR and can identify areas, which would benefit from bystander CPR training and other interventions. CARES data has also been used to analyze presenting cardiac arrest rhythm and its effect on outcomes.

## **William Beaumont Hospital, Macomb and Oakland County, Michigan Joined CARES in 2008**

CARES has been valuable in Macomb and Oakland County, Michigan because it has made cardiac arrest part of the daily consciousness of the agencies that participate in the registry. For that reason, it has been an important addition to their EMS efforts locally. Individually it has supported research efforts for the EMS division and has allowed them to evaluate the care provided to cardiac arrest victims in schools, and helped assess the value of transporting cardiac arrest patients to the hospital after failed attempts to revive them. These are both important public health issues locally and nationally.



# Testimonials

## Santa Barbara and Ventura Counties, CA

*By: Angelo Salvucci, MD, FACEP, Medical Director, EMS Santa Barbara and Ventura Counties, CA*

Ventura County EMS was invited to join the CARES program in 2008 as the first site in the western U.S. Santa Barbara County joined two years later. CARES has been one of the most important programs our EMS systems have undertaken. In the 7 years we have been fortunate enough to participate, we have learned and grown and continue to make changes to better serve our community.

Prior to CARES, we had no organized structure or method to evaluate the treatment we were providing to our cardiac arrest patients. Training policies and treatment protocols were in place, but our QI system consisted of episodic projects on issues like IV starts, response times, ETI success, and occasionally ROSC - data we could reliably obtain from our EMS EMR. But the process was really just an exercise in data gathering. No one particularly cared that the IV start rate was 80% or the ETI rate hung in there at 70%. Why did it matter? ROSC was a little more impactful, but dropping off a patient with a pulse was still not the stuff for celebration.

The first CARES report was the start of a substantial shift in our understanding and direction. It gave us meaningful information – how many of our patients were leaving the hospital and going back to their families. It's why we are in EMS.

We were not satisfied that our survival rates were at or below the group average, so we began to use CARES data to refocus our QI efforts. Our first and most important step was to retrain all of our EMS providers in CPR. By using feedback training and testing with Ambu SmartMan manikin systems, we were able to get every EMT and paramedic to perform at a consistent, high level. That measure alone increased our survival rates (overall and witnessed shockable rhythm) by 30%. At the same time, we began the process to shorten the time to first chest compression for dispatcher-directed CPR.

With the clear process improvement of better CPR along with better outcomes, we reached a tipping point. The QI efforts made sense. We were doing better for our community. Cardiac arrest calls were an opportunity to help save a life – not an exercise in futility. Everyone was paying attention.

### CARES-based QI efforts:

Since the introduction of CARES and the initial wins, we have continued to use the data to cycle through improvements.

### 911 and Dispatch:

We use monthly reports of CARES patients to our EMD dispatch centers to look at caller interrogation, dispatch priority, and post-dispatch instructions. Our goal is to have every “seizure”, “fall”, or “sick person” accurately identified as a cardiac arrest and to start CPR promptly.

### Bystander CPR:

One of our challenges has been bystander CPR. Our rate is under 40% - less than the CARES group mean. Our survival success has motivated the EMS providers, hospitals and community groups to participate in our brief, chest-compression-only Sidewalk CPR training efforts.

### On-scene EMS care:

We have developed a comprehensive training program and set of treatment protocols for use by all EMS responders. Our Cardiac Arrest Management (CAM) program uses evidence-based team education, individual and team SmartMan training and testing, coordinated pre-assigned roles and post-incident performance review. This has been highly successful at standardizing and improving on-scene care and outcomes.

We improved our airway management protocols. Due to its ease of insertion relative to endotracheal intubation (ETI), we began to use the King Airway as the primary airway device. When we found that patients with BMV or ETI or had the same survival rate, but were more likely to have favorable neurological recovery, we changed the protocol to make BMV the preferred method.

### Quality Management:

We use cardiac monitor output reports to give prompt feedback to crews. The focus is primarily on continuous (CPR density 80% or greater) high-quality CPR with minimal duration pauses for defibrillation. This will allow us to establish a retraining interval that will be part of CAM.

### In-progress QI:

At this point our systems are performing well. So far in 2014, we have a better than 15% overall survival and it's over 50% for witnessed shockable rhythms. We are looking for ways to improve further. Several projects are planned or have started.

CARES was created to open and join three silos of data - dispatch, EMS and hospital. But there is a fourth important silo that is still not connected – 9-1-1. We have created teams in each county with every Public Safety Answering Point (PSAP) as members. Our goal is to track every 9-1-1 call reporting a cardiac arrest from the first ring at the first Primary PSAP through to delivery to the EMS dispatch center. This will be most critical for wireless 9-1-1 calls, which are now over 80% of the total. Wireless 9-1-1 calls typically do not have location information available at the time of the call, so are often routed to regional centers. There the caller is queried and the call transferred. This introduces a delay in response that averages more than a minute – an important time in cardiac arrest response. We will be able to quantify these transfers and delays and look for opportunities to get responders on the way more quickly and pre-arrival CPR instructions started.

We are starting a trial of the air-Q. This supraglottic airway is simple to insert, ventilates effectively, and has a cuff that self-inflates only during inspiration. We believe it will be easier than ETI, more effective than BVM and not have the carotid pressure concern of dual-balloon airways. The CARES outcome data will be essential in the evaluation.

We have created and are expanding our cardiac arrest survivor network. They are grateful for the support and are looking forward to assisting in our community CPR training efforts. CARES has been the foundation for great improvements in our EMS system. The data have allowed us to accurately examine, plan, and improve. And the positive outcomes have created excitement in the entire EMS community. Everyone enjoys being on a winning and productive team. With attention and effort the “CAR” is a useful tool for “ES”. It has certainly worked for us.



## New Castle County, Delaware

*By: Robert Rosenbaum, MD, FACEP, Medical Director and Chief Lawrence Tan, New Castle County EMS*

New Castle County, Delaware is an urban/suburban area located between Philadelphia and Baltimore along the I-95 corridor, and has a population of 549,684. The pre-hospital EMS system consists of a tiered response configuration with basic life support (BLS) services provided by 21 volunteer fire companies, a career fire department, a private contracted provider in the municipality of Wilmington, and a student-staffed ambulance at the University of Delaware. Advanced life support (ALS/paramedic) services are provided by the New Castle County Government. The New Castle County Paramedics operate as a “third service” EMS agency in an ALS-intercept configuration. The county paramedics provide ALS to the entire county, including the incorporated municipalities. Medical direction is provided by the state Office of Emergency Medical Services under the authority of state code.



"The first time I heard Bryan McNally's presentation at NAEMSP in 2009, I was committed to the idea that we needed to bring CARES to New Castle County," was the first thought of Dr. Robert Rosenbaum, EMS Medical Director. The presentation wasn't over and Dr. Rosenbaum was already in contact with New Castle County EMS Chief, Lawrence Tan. Both agreed with the concept and potential benefit and immediately began to work to bring CARES to Delaware.

"Measuring EMS system performance can be extremely difficult, given the variables in operating configurations and the multiple places that data must be obtained," said Chief Tan. "CARES has facilitated our ability to uniformly collect, analyze and compare our system performance in out-of-hospital cardiac arrest (OHCA). It also helps us monitor and trend the consistency of our clinical response to OHCA in our jurisdiction."

New Castle County has seen continuous improvement of cardiac arrest survival rates and the numbers of annual survivors of sudden cardiac arrest (SCA) since beginning participation in CARES. The improvement is measurable in the number of survivors presenting with any initial rhythm, and especially noticeable in patients with witnessed, shockable rhythms. In the past two years, New Castle County has seen survival rates nearly double from what they were before 2012. Quarterly survival rates for patients presenting with witnessed, shockable rhythms reaching 50% are not uncommon, and we have come to expect quarterly survival rates for this group of patients to reach 35 to 45% on a regular basis. Survivors of witnessed arrests with any presenting rhythm are now over 20%, which is nearly double the rate in New Castle County for this same group of patients prior to 2012.

Analysis of CARES data has prompted modifications and adjustments in practice for paramedics and BLS providers in New Castle County. For instance, EMS crews are encouraged to remain on scene, provide high quality CPR, and make every effort to restore spontaneous circulation before considering transport. “Pit crew” CPR is being promoted to facilitate an organized, consistent approach to providing excellent basic life support and improve the chances of a return of spontaneous circulation (ROSC). The New Castle County Paramedics were one of the early services to implement pre-hospital induced hypothermia to treat patients post-arrest and there is ongoing emphasis on beginning this process on scene after sustained ROSC is established.

Ongoing use of CARES data will enable NCC\*EMS to target interventions that may further improve survival rates. Directed education to zip codes and fire districts with lower survival rates is already planned. The potential to use technology to enhance and improve bystander intervention is also being explored. We will track changes in survival as we implement additional system enhancements and monitor for ongoing performance improvement. “This was absolutely one of the best choices we’ve ever made and is proving to be one of our most valuable quality assurance and performance improvement projects,” said Dr. Rosenbaum.

He and Chief Tan agree that the database and support of CARES staff has been incredibly valuable and a key to successful utilization of the information gathered on OHCA patients. Chief Tan added, “We look to build on the improvements of the last 5 years and continue to use CARES data to increase the rate of survival from OHCA and help us improve the care being delivered in New Castle County, Delaware.”

### **Plano, Texas**

*By: Mark Gamber, DO, MPH, FACEP, Medical Director, Plano Fire-Rescue*

CARES data is a source of pride for members of Plano Fire-Rescue (PFR). Our department has been enrolled in CARES since 2009. Originally, we were met with inquisitive looks when we tried to explain the importance of the word “Utstein” and standardized cardiac arrest outcomes reporting. However, these concepts are now a part of our common EMS language, as CARES data is shared with our 350 personnel on a monthly basis and actively discussed in our live quarterly EMS Continuing Education sessions. CARES data is also an integral part of PFR’s annual report to the city manager and city council. We believe this provides transparency and accountability to our local citizens.

CARES data allows us to place an increased focus on cardiac arrest care. This has in turn led to stronger partnerships between PFR and our receiving hospitals. As data sharing between field and hospital providers was implemented, it built a foundation to work on emergency care such as therapeutic hypothermia and patient contact-to-balloon for STEMI. CARES data is shared with all PFR hospitals that serve as resuscitation centers, opening the lines of communication and providing a feedback loop.

Prior to our enrollment in CARES, there was no benchmark for our cardiac arrest statistics. Now, Plano Fire-Rescue has a 5-year running average of greater than 50% survival among Utstein patients. We owe this to bystander CPR, the work of the members of Plano Fire-Rescue, our receiving hospitals, and CARES.

# Excerpts from Letters of Support

## **King County EMS**

“I am the Medical Director for King County, Washington and have worked in emergency medical services and cardiac arrest research for the past 36 years. Vital to improving the management of cardiac arrest is a cardiac arrest surveillance program. We have had such a program for over 3 decades. Since the inception of CARES I have been in close communications with Dr. McNally and applaud his efforts. CARES offers any EMS program and community in the nation to painlessly participate in a cardiac arrest registry and therefore gives that program the data and opportunity to make meaningful changes to improve survival. For the past two years we have been active participants in CARES.”

*Mickey Eisenberg, MD, PhD  
Medical Director, King County EMS*

## **American Heart Association/ American Stroke Association**

“CARES provides the necessary infrastructure to help both local and state agencies uniformly measure performance, benchmark care, and ultimately improve cardiac arrest survival in their own communities. The ability to measure performance and determine outcomes is important to supporting and driving our 2020 goal of doubling survival from cardiac arrest. The AHA has been pleased to see the successful expansion of CARES into more than 40 communities in 26 states and are particularly pleased that medical directors and system administrators have used this data to improve care by strengthening the chain of survival in their community as part of their efforts to increase cardiac arrest survival.”

*Meighan Girgus  
Chief Mission Officer*

**National Association Of EMS  
Physicians  
(NAEMSP)**

“Please accept this letter of unbridled enthusiasm from the National Association of EMS Physicians (NAEMSP) in support of the CARES (Cardiac Arrest Registry to Enhance Survival) program... It is with great pride that our members initiated the inaugural CARES program. NAEMSP is an organization of physicians and other professionals partnering to provide leadership and foster excellence in out-of-hospital emergency medical services. Our over 1,400 members have used the CARES data to improve EMS system effectiveness and patient outcomes in their communities.

CARES allows our members to collect OHCA data on an ongoing basis and provides their community with a simple, secure, and efficient method of tracking key performance measures locally, including bystander CPR compliance, public access defibrillation usage, and overall usage, and overall survival rate at hospital discharge.”

*Ronald G. Pirrallo, MD, MHSA  
President*

**Pan-Asian Resuscitation Outcomes  
Study  
(PAROS)**

“The PAROS Clinical Research Network consists of investigators from Asia-Pacific countries, Emergency Medical Services (EMS) systems and hospitals. Today, PAROS has pre-hospital and emergency care providers from 8 participating countries- Japan, Korea, Malaysia, Singapore, Taiwan, Thailand and Turkey.

Working with CARES has allowed us to collectively develop a uniform set of essential data elements on a standard software platform in both Asia and the United States- a key effort in helping to establish international benchmarking for OHCA and improve survival. Singapore has also benefited from the installation of a network server and related hardware contributed to the PAROS Clinical Research Network. As EMS is still its infancy in the Asia Pacific region, I believe the CARES-PAROS collaboration will play an important role in stimulation the developing of research capability and improvement of EMS system.”

*Assoc. Professor Marcus Ong Eng Hock  
Chairman, PAROS Clinical Research  
Network*