



10

Steps for Improving Survival from Sudden Cardiac Arrest

based on the book "Resuscitate! How Your Community Can Improve
Survival from Sudden Cardiac Arrest" by Mickey Eisenberg, M.D.
and inspired by the Faculty of the Resuscitation Academy

Can We Do Better?

A BRIEF INTRODUCTION BY MICKEY EISENBERG, MD

As a medical emergency there is nothing more dramatic than sudden cardiac arrest. A person at home or in the community, suddenly (*often with no symptoms*) collapses. Consciousness is lost in a matter of seconds and there is instantaneous loss of pulse and blood pressure. At the moment of cardiac arrest the person is clinically dead. Within 10 minutes clinical death will progress to irreversible biological death and another statistic will be notched in the tally of deaths from heart disease. This cold “statistic” cannot possibly reveal the reality of a vital person engaged in the community, with family and friends, children and grandchildren. Yet there is a small window of opportunity, measured in minutes, for life literally to be snatched from the closing jaws of death. If CPR, defibrillation, and advanced medical care can arrive at the scene quickly, there is a decent chance of successful resuscitation. Though the national survival rate for cardiac arrest is in the single digits, some communities are able to achieve a survival rate of 50% or higher from cardiac arrest associated with ventricular fibrillation – the rhythm with the best chance of resuscitation.

How these communities do it, and how your community can do it, is what this guide is all about. Achieving success in resuscitation does not entail an understanding of quantum

physics – the factors leading to success are known. This has been the constant refrain of the Resuscitation Academy since its founding in 2009. Lives are saved not just by highly trained EMS professionals, but also by highly efficient EMS systems. Individuals and systems save people. And both can perform smarter and better. This guide lays out 10 steps that will lead to an increase in cardiac arrest survival in your community. It is a practical guide, full of concrete suggestions and specific training tools. The faculty of the Resuscitation Academy and I hope you embrace these ideas and steps. Though each step may require some adaptation so that it can fit and work in your community, we have little doubt that these steps can transform your system.

For those of us in the emergency medical services business, *there can be nothing more gratifying than saving a human life.*



*Mickey Eisenberg, MD, PhD
Medical Program Director, King County EMS
Professor of Medicine, University of Washington*

VIDEO

TEN STEPS FOR IMPROVING SURVIVAL FROM SUDDEN CARDIAC ARREST

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NOTE: Some pages of this PDF include video & 911 audio.
Look for the **AUDIO** **VIDEO** icons. Click to view on YouTube.
An internet connection is required.

Improvement is Possible

Improving Cardiac Survival Rates, One Community at a Time



This guide is intended for EMS directors, medical directors, fire department chiefs, EMS service officers, EMS training officers, and dispatch center directors. It is written specifically for you, and with that in mind, jumps right to the practical information. There is little in the way of background or scholarly discussions of the latest scientific finding. (More extensive discussion of the topics in this guide may be found in the University of Washington Press publication, [‘Resuscitate! How Your Community Can Improve Survival From Sudden Cardiac Arrest’ - Second Edition](#)).

Not every step in this guide will apply to your community, but many of them will. Think of this guide more as a menu, from which you can choose practical programs that (*we believe*) will improve cardiac arrest survival in your community. There are 10 steps and they are divided into low-hanging and high-hanging fruit. The 4 steps designated as low-hanging fruit are those that can deliver the biggest bang (*in terms of improved cardiac arrest survival*) with the least expenditure of resources. The 6 steps, designated as higher-hanging fruit will also improve survival but may require more resources to implement. Whatever step(s) you choose to implement in your community, realize that these are called steps for more than metaphorical reasons. One step at a time, so long as you are on the right path and however long it may take, will get you to your goal.

A Few Words of Wisdom

The Seven Mantras

This guide gives you ten steps to improve cardiac arrest in your community. These steps comprise the core teachings of the Resuscitation Academy. At every Academy class the faculty sets the stage with a few pithy expressions which we hope encapsulate a tiny bit of wisdom. We call them 'the Resuscitation Academy Mantras.'



*Tom Rea, MD MPH
Medical Program Director, King County Medic One
Associate Professor of Medicine,
University of Washington/Harborview Medical Center*

VIDEO

1 Measure, Improve

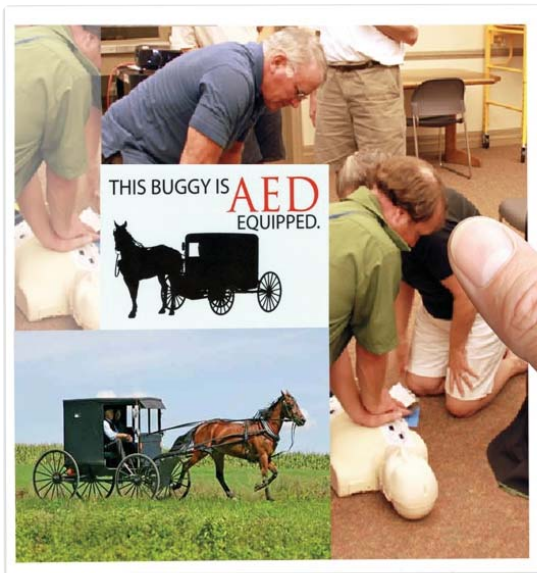
“Measure improve, measure, improve...” defines the essence of ongoing quality improvement. If you don’t measure something you can’t improve it. And once you measure it you will reveal things that need improving. And once you improve the system, measure it again to see if it has improved. And so on, and so on. Measurement and improvement can apply to many elements of an EMS system. First and at the most basic level, it refers to measuring cardiac arrest events and outcomes (*death, survival, neurological recovery*). But it also applies to components of the EMS system such as time metrics (*time for dispatch, time for response, time for scene arrival, time for patient arrival*), high-performance CPR metrics (*CPR density, depth of compression, full recoil, duration of pauses*), and dispatcher assisted CPR metrics (*recognition of agonal breathing, time to recognition of cardiac arrest, time to delivery of chest compression instructions*).



2 If You've Seen One EMS System...

"If You've Seen One EMS System, You've Seen One EMS System"

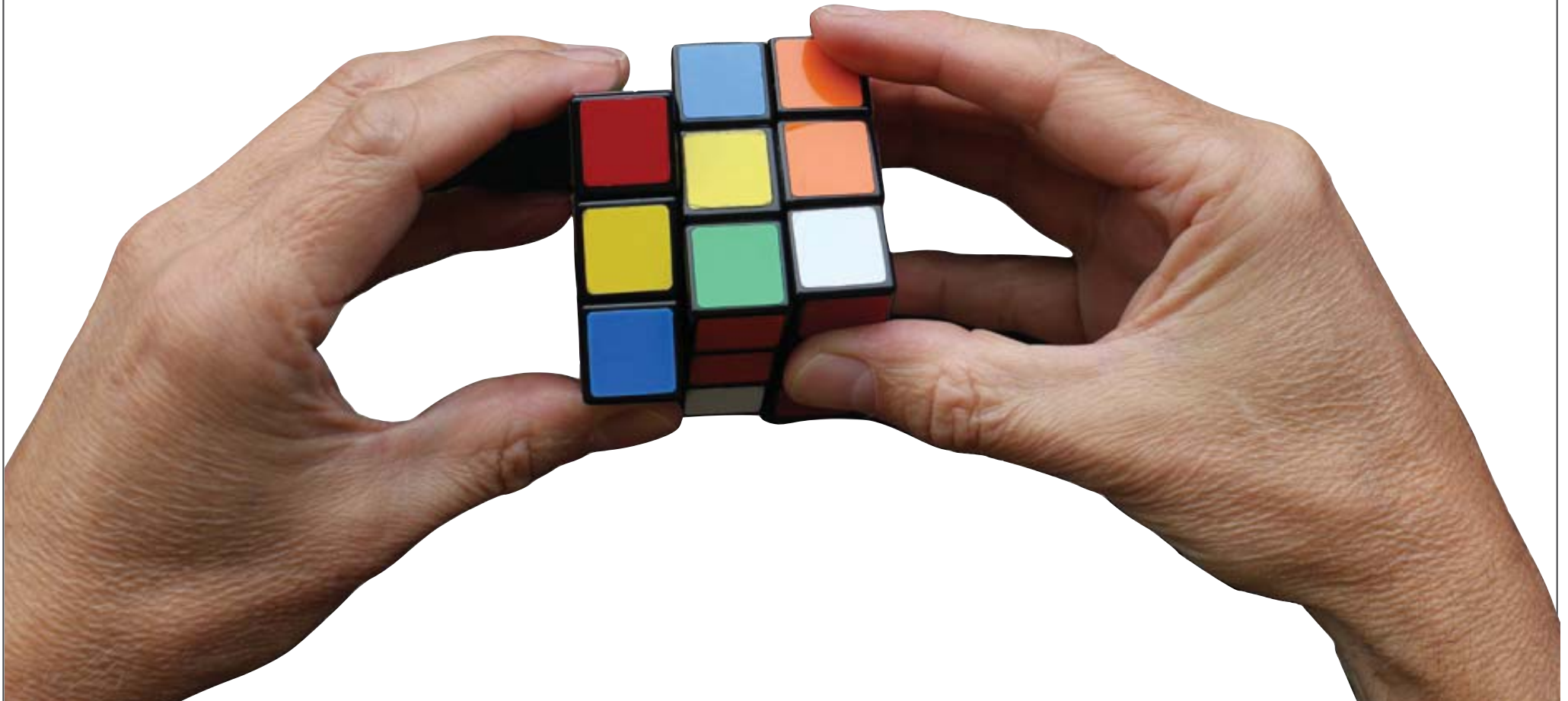
There exists incredible variety and diversity among EMS systems. No two systems are the same. What may be easy to accomplish in one system may be difficult if not downright impossible in another. One example – in some Washington State counties, the EMS medical director has no authority in setting dispatch standards or guidelines for dispatching of EMS. Thus, even if the medical director wishes to establish a dispatcher-assisted CPR program it would be impossible without the full cooperation of the dispatch



director. If the dispatch center does not welcome physician involvement (*unfortunately too commonly true*) an impasse exists, unlikely to be brokered. But that same community may have a mandatory CPR training program for high school students – a program other EMS systems wished they had. The differing strengths and limitations of every EMS community are legion.

3 It's Not Complicated, But It's Not Easy

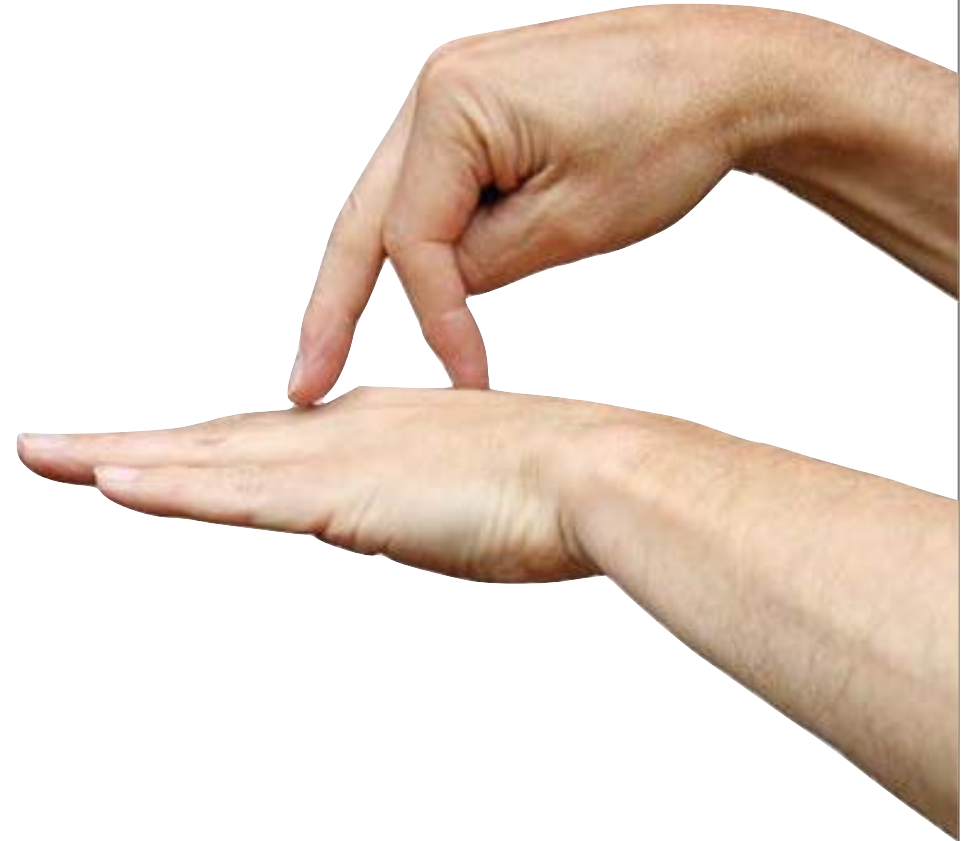
The science behind the steps to improve survival is not difficult to understand and the program requirements are fairly straight-forward. An understanding of nuclear physics is not required. But there may be logistical, cultural, political, resource, union and a variety of other obstacles that block easy implementation. We believe very strongly that change must start at the local level. It is the local medical, administrative, training, operations, and other personnel who are most accountable and can best decide how to bring about change. Ultimately they must decide first what is doable and second how much effort will it take.



4 Change Occurs Step-By-Step

EMS systems are complex organizations and not likely to be transformed overnight, no matter what the leadership may wish. A good analogy is that of not trying for a home run on your first at bat in the Majors. A single would do just fine. Even a walk will move the effort forward. With each change (*improvement*), one should remember the first mantra and continue to measure to see if the change really improved matters.

Step by step also refer to the steps in this guide. Don't try to take on everything at once. Start with one step, gain some success and confidence, and then move on to another.



5 Performance Not Protocol



What counts during a resuscitation is the actual performance of the dispatchers, EMTs, and paramedics. A perfect example is dispatcher-assisted CPR. Most dispatch centers claim to have protocols for telephone CPR, but in fact when you measure their performance they come up lacking. There is either infrequent recognition of cardiac arrest or delay in its recognition or both. The bottom line is that these dispatch centers may have the protocols, but are lacking in performance. Another example might be EMS systems that have protocols defining a standard of high-performance CPR. But unless the system trains and requires its EMTs to achieve letter-perfect performance, the protocol will be just so many empty words. Of course the best way to identify and correct poor performance is through ongoing QI – which circles back to the first mantra: Measure, Improve.

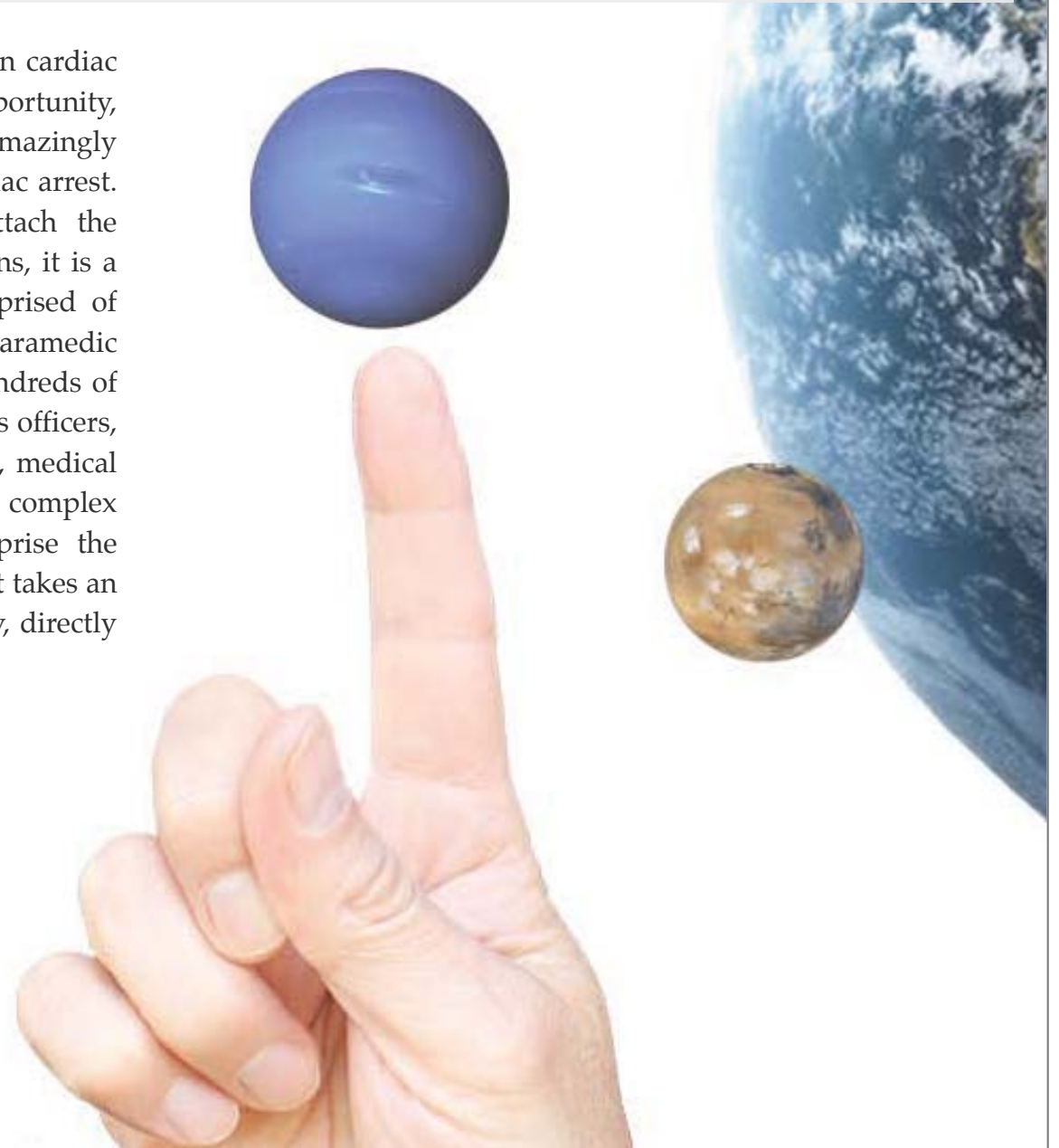
6 Everyone In VF Survives

Expectations become reality. Of course not everyone in VF will survive out of hospital cardiac arrest, but if there is a mindset that they will, behavior will subtly be altered to make it happen. The crew will work a little harder and not give up. They will assume the patient will make it to the hospital alive. In our EMS system, losing a patient in VF is simply unacceptable. I have seen patients receive over 20 defibrillatory shocks with the resuscitation lasting over an hour before achieving a sustaining pulse and blood pressure. A cardiologist once quipped that VF is a benign rhythm? His tongue was in his cheek, since VF means a patient is clinically dead. But he was also making the important point that all that is needed to treat this rhythm is quickly applied electricity. Therein lies the challenge. Quickly applied defibrillation is easy for a cardiologist in a cath laboratory, but a bit more difficult in the community. Nevertheless, if one keeps the mantra in mind – everyone in VF survives – it will create an expectation, a kind of self-fulfilling prophecy. Another aspect to this slogan is that medical directors and EMS directors will begin to scrutinize cases more closely, particularly those in which survival did not occur. The relevant question to ask is: Why did this patient in VF not survive? Asked this way it forces one to look at the system factors that may have contributed to the patient not surviving. Was there a delay in responding? Was there a delay in dispatcher recognition of cardiac arrest? Were telephone CPR instructions provided? Was there bystander CPR? Were there excessive pauses in chest compression? Were there delays in defibrillation?



7 It Takes A System To Save A Victim

Given the unpredictable and catastrophic nature of sudden cardiac arrest, not to mention the brief therapeutic window of opportunity, it is remarkable that anyone can be resuscitated. It is amazingly complicated and difficult to save a victim of sudden cardiac arrest. Though it may be individuals who perform CPR, attach the defibrillator, secure the airway, and administer medications, it is a system that makes it all possible. The system is comprised of numerous agencies - dispatch centers, fire departments, paramedic programs, EMS agencies, and hospitals – and literally hundreds of dispatchers, EMTs, paramedics, fire chiefs, medical services officers, medical services administrators, training officers, QI staff, medical director, hospital nurses, doctors, and support staff. The complex web and interaction all these agencies and staff comprise the system. Implied in this mantra is the modifier excellent. It takes an excellent system. Every part of the Resuscitation Academy, directly or indirectly, is about building an excellent system.



The Perfect Resuscitation



Peter A. had been doing fine, considering. He and his wife, Joanna, had been enjoying his retirement. Their yard was big enough for Joanna to pursue her hobby of butterfly- and bird-attractive gardening.

For Peter, on this afternoon, lifting heavy bags of steer manure for Joanna's garden had triggered another episode of the vague, intermittent ache that he had been experiencing in his upper left arm, mostly when he climbed stairs. This episode, though, was more severe than previous ones, and Peter felt somewhat nauseated. He also felt the ache radiating into the left side of his jaw. But it was his overwhelming sense of fatigue that prompted him to go back inside and lie down on the couch in the living room.

One month before, Peter's doctor had told him that his cholesterol had crept up to the "needing treatment" point, and that his blood glucose now placed him in the prediabetic range. But more disturbing had been his doctor's concern that the ache in Peter's left arm might be related to his heart. Peter's cardiogram had been normal, a result in which he had taken some solace, so he had continued to put off the treadmill test recommended by his doctor.

He wanted to believe that the statin medication he had started taking to lower his cholesterol must be working - it certainly cost enough! And though he hadn't lost any weight, as his doctor had also recommended, it seemed to him that the ache in his arm had become less frequent.

Joanna, from her vantage in the den, saw Peter enter the house, and she knew from his slow gait and the way he half collapsed into the couch that something was wrong. She rushed to his side and tried to control her panic as she noted his limp body, the pasty coloring on his face and the bluish cast of his lips.

"Peter!" she shouted, shaking him by the shoulders.

He didn't respond.

With great presence of mind, Joanna brought the portable phone to Peter's side as she called 911.

"911 operator," came the voice on the other side of the line. "What are you reporting?"

"My husband has collapsed. He's not moving."

The emergency dispatcher quickly asked Joanna where she was calling from. Thanks to his training, he knew right away that he should send a full medic response, which he accomplished by typing the directions to Peter's house into his computer console and pressing several buttons on a "tone out" dispatching machine. As he did all this, the dispatcher continued to ask questions.

"Is he conscious?"

"No," Joanna replied.

"Is he breathing normally?"

Joanna looked at her husband. Peter was taking breaths that were more like slow grunts - definitely not normal. She told the dispatcher what she was seeing and hearing. From Joanna's description, the dispatcher knew that she was reporting agonal respirations - the kind of breathing associated with cardiac arrest, a sign of the brain's last-gasp effort to send breathing signals to the lungs. He also knew that there was little air moving in or out.

"Do you know CPR?" he asked Joanna.

"Cardiopulmonary resuscitation?"

Joanna did not.

"OK," the dispatcher said. "I'm going to give you some instructions. First, pull on his feet, and drag him onto the floor. Put your hands to the center of his chest, one hand on top of the other, right between the nipples, and press down firmly, fifteen times. I'll count for you. That's it. Keep doing it, now. Two more breaths."

In the background, over the phone, the dispatcher heard the fire department's sirens, and he told Joanna to open her front door. She did, and she saw three fire fighters already running up the driveway, carrying heavy suitcases. An large fire department pumper was parked on the street.

It had seemed like an eternity to Joanna, but the three fire fighter-emergency medical technicians, or EMTs, had arrived within four minutes of the dispatcher's "tone out." The regional Medic Unit, staffed by paramedics, was also on the way.

It was obvious to the EMTs that Peter was in cardiac arrest the pulse check confirmed

the situation. The EMTs placed their cases next to Peter and knelt down, one on each side of his head. One of the EMTs started high-performance CPR. He positioned Peter's head, placed a face mask attached to an air bag over Peter's mouth and nose, compressed the bag to push two deep breaths into Peter's lungs, while his partner positioned himself to deliver thirty chest compressions. Meanwhile, the third EMT unzipped the automated external defibrillator (AED) case and attached two pads to Peter's chest. After the thirty compressions he told her partners he was ready to analyze. The AED "spoke" in a firm, but not harsh voice.

Assessing rhythm. Do not touch the patient.

Both EMTs moved back. After ten seconds, the voice spoke again.

Shock required. Stand back. Press the flashing orange button.

An orange button, labeled with a bolt of lightning icon, began to flash insistently.

Again the EMT followed the instructions. Joanna was startled to see her husband's chest jump up an inch as electricity flowed

from the AED and passed between the two pads. Immediately the EMTs began CPR and continued for two minutes. The EMT asked his partners to stop and the AED assessed the rhythm again. This time the machine's message was different.

No shock required. Check pulse. Check breathing. If needed, begin CPR.

The EMT who had been doing CPR placed his fingers on Peter's neck. "I've got a pulse," he said.

Joanna finally allowed herself to take a breath. One minute later, two paramedics arrived, and the EMTs briefed them on what had happened. The paramedics began an intravenous line and because the patient was still comatose they inserted an endotracheal tube. A study of randomly assigned field induced hypothermia was in progress and so the lead paramedic called his control hospital. The doctor on the phone said the patient was randomized to cold fluid. A second IV line was started and 2 liters of ice-cold saline was infused. Peter was placed onto a stretcher and loaded into the paramedic rig. By the time

they reached the hospital almost all of the two liters had been provided.

Later the same day the EMT crew and the paramedic crew uploaded via computer the rhythm and voice recordings from their respective AED and manual defibrillators to the King County EMS Division along with copies of their run reports. The information was logged into the cardiac registry system and along with the dispatch voice recording, formed the case file for the event. This information was used by staff at the EMS Division to provide a quality improvement summary to the firefighters, paramedics, and dispatchers. This report contained performance standards on the time to recognition of cardiac arrest and delivery of chest instructions for the dispatchers and summaries of CPR percentage (for every two minute interval) and pauses in CPR for the EMTs. There was also a clinical summary from the paramedic's medical director with feedback. In this case it was all laudatory.

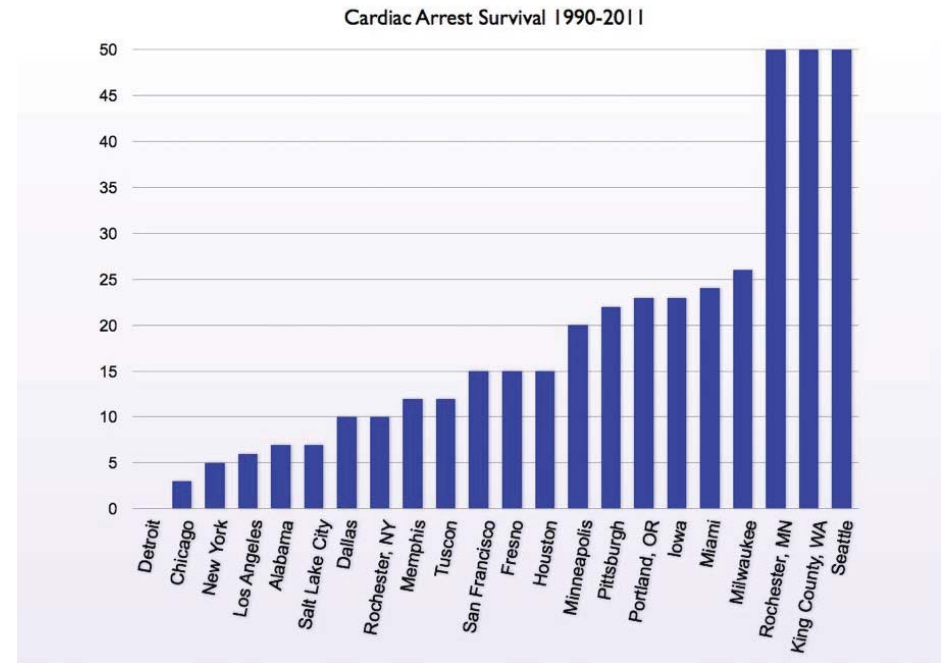
Ten days later Peter was discharged home with a brand new implantable cardioverter defibrillator (ICD) in his left upper chest. He made a full neurological recovery. And two week later an email was sent from the EMS Division to the EMS crews and the dispatchers with the good news.

Embracing the Challenge

Key Challenges

Why Do Some Communities Succeed In Treating Cardiac Arrest While Others Fail?

The survival rate from cardiac arrest in the United States and Canada varies all over the map – literally. In some communities the rate is zero (*yes, no one survives*) and in others it is as high as 50% for ventricular fibrillation. Most communities are on the low end of this range with survival rates in the single digits. Why do some communities succeed in treating cardiac arrest while others fail? It would be convenient if one variable could explain the wide difference in survival rates for cardiac arrest between those communities that are most successful in treating this major public health problem and those that are least successful. But that would imply an easy fix, or at least clarity of direction about what needs to change. Regrettably, there is no single variable and no easy fix. Instead there are multiple variables, each important in itself but insufficient as a single explanation.



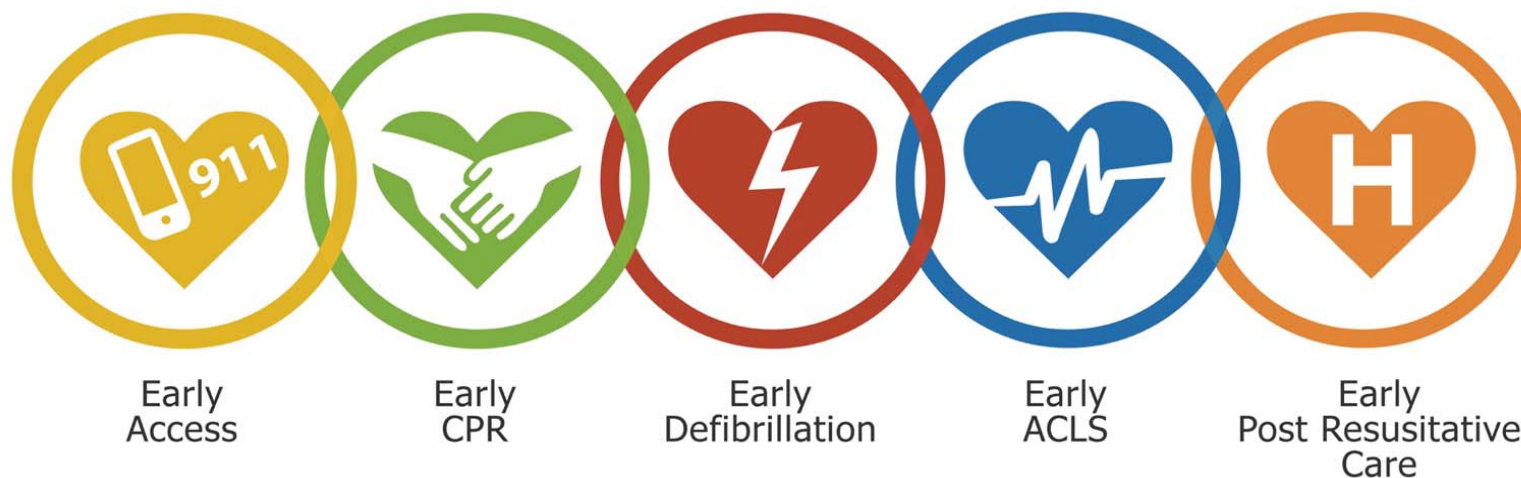
Life Or Death

The many factors which determine whether a patient lives or dies following cardiac arrest may conveniently be divided into patient factors, event factors, EMS system factors, and therapy factors. Certainly patient factors, such as age and co-morbidity, and event factors, such as witnessed collapse and cardiac rhythm, are strongly associated with outcome. But the patient factors and the event factors, although they are undoubtedly important in determining who will live and who will die, cannot be altered by changes made to an EMS program or to the types of therapy it delivers. They are powerful factors, but they are factors of fate of good or bad luck. But the system factors can all be affected by a community's decisions. The chain of survival describes the key system and therapy factors that insure rapid delivery of care.

The Chain Of Survival

What we do know is that successful treatment of cardiac arrest and particularly ventricular fibrillation, is associated with an EMS systems ability to deliver care quickly. The chain of survival, with its five links of early access, early CPR, early defibrillation, early advanced care, and early post resuscitative care illustrates the most critical elements of addressing sudden cardiac arrest.

The system and therapy factors that comprise the links in the chain of survival are quantitative in nature, meaning they have a specific value and can be measured. Some are time related (*time to CPR, time to defibrillation*); others can be measured by their presence (*dispatcher-assisted CPR, community CPR training, community PAD, hypothermia*) and two can be scored (*quality of CPR can be determined by compressions per minute of CPR and duration of pauses, and the interaction of CPR and defibrillation can be determined by the duration of pauses before and after defibrillation*). All can be measured in one way



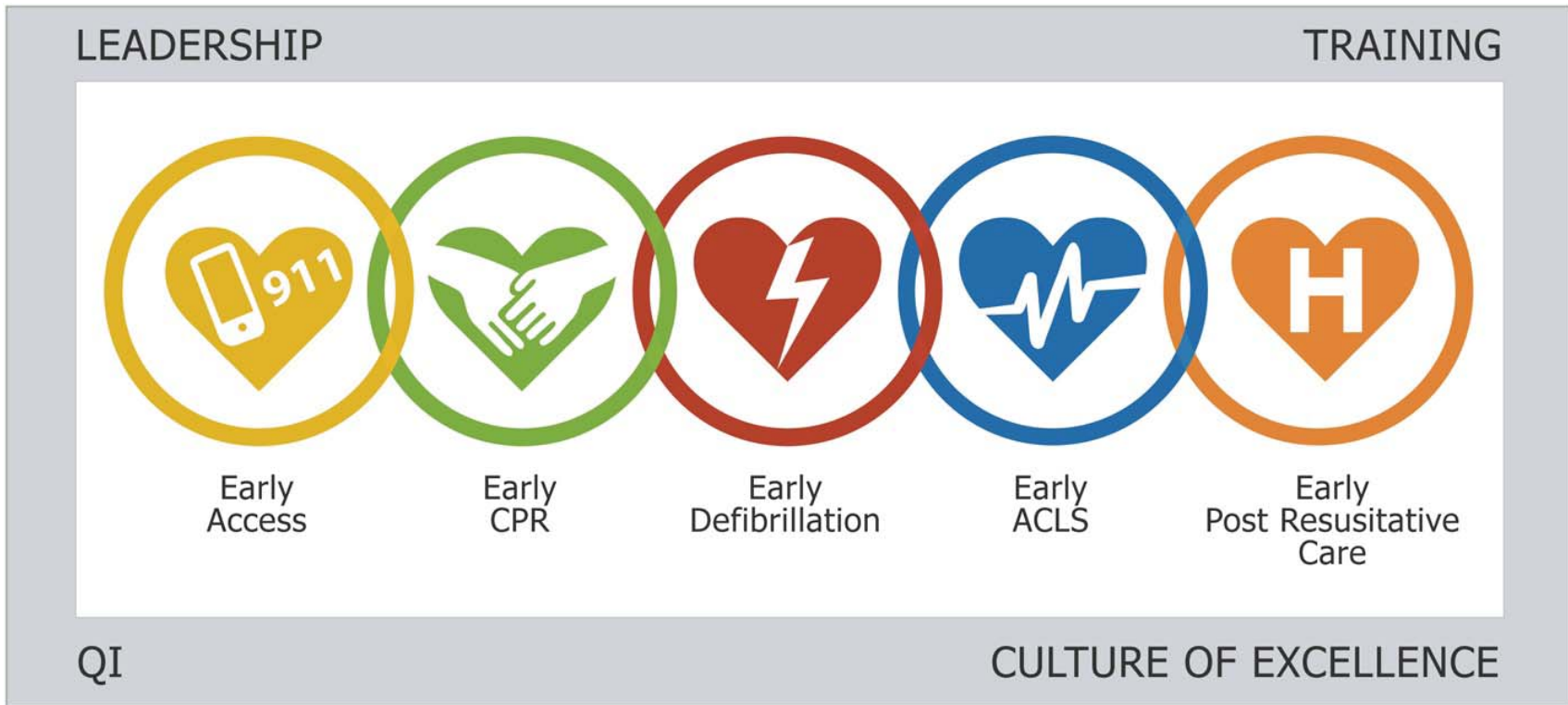
or another. Does this mean that a community merely has to put these system and therapy factors in place in order to see its rate of survival rise? It would certainly be convenient if this were the key to fully understanding the disparity in cardiac arrest survival, but, although one can measure these factors they do not fully explain a systems success or lack thereof. Every community's EMS system already incorporates some if not all of them at least to some degree – but even these factors, although they're necessary, are not sufficient. After all, a baseball team can have nine players but still lose every game. What else, then, is needed?

The Frame Of Survival

To fully understand an EMS system's success (*or lack of success*) we need to address the qualitative factors that also determine the system's performance. The qualitative factors are far more difficult to measure or score. These factors though lacking in hard numbers are just as or more important than the hard metrics.

The links in the chain cannot stay connected unless they are embedded in a context of strong medical and administrative leadership, continuous medical QI, a culture of excellence, and stellar training and continuing education for dispatchers, EMTs, and paramedics. These four elements literally frame, surround, and embed the core links of care. These elements are termed the frame of survival. Together the chain of survival and frame of survival form a complete and comprehensive system of care. Together they nurture, sustain, and define a high-quality EMS system. Just as important to the success of a champion baseball team that starts with nine excellent players are sustained practice, superb managing and coaching, continuous review and fine-tuning, and team spirit. In sum, the frame surrounding the chain of survival can be reduced to a single word: accountability. It is accountability, achieved through leadership, quality improvement, training, and excellence, that holds the chain of survival in place and ensures that its links are as strong as they need to be.





An EMS system that cannot be accountable to the citizens it serves will at best be mediocre. The elements comprising the frame are far more difficult to measure than those inside the frame. As opposed to the quantitative chain of survival, the frame is purely qualitative. Qualitative elements like leadership, culture of excellence, and accountability are softer and less scientific than the quantitative tools that directly contribute to the chain of survival. Nevertheless, these elements are the keys to success in managing cardiac arrest involving VF, and their relative absence is the reason why some EMS systems fail.

Outstanding leaders can instill in their organizations their vision of high expectations and relentless striving for excellence. They also continuously ask the question, "How can the system be improved?" Ongoing quality improvement (*QI*) is the mechanism by which they know where and how to improve. And training and continuing education are the vehicles by which expertise and professionalism are brought to every cardiac arrest.

Public Expectations

Is there a public expectation for high-quality emergency medical services? Before you answer, 'of course', consider the evidence. The average citizen of the average city has no idea what his or her community's EMS systems performance is, as measured by survival rates for cardiac arrest. Furthermore, the average citizen has no idea how his or her community's EMS system works, or who provides the services. Are the services contracted? Are they public? Does the EMS program use a tiered-response system? Are the rest-in personnel EMTs or paramedics? Who is the medical director? Is there an academic connection? Is there a cardiac arrest



*Michael K. Copass, MD
Professor, University of Washington
Harborview Medical Center/Seattle Medic One*

VIDEO

registry? Is there assertive dispatcher-assisted CPR? These and countless other questions would never enter the mind of the average citizen. For most people, the local EMS system, whatever it is, seems to work: dial 911, and several minutes later one or more vehicles arrive to whisk the patient off to the hospital. But what if concerned citizens in Detroit realized that virtually no one survives cardiac arrest in the Motor City? What if citizens in New York, Chicago, and Los Angeles realized that very few survive in those cities? What if concerned citizens everywhere understood that most communities, their own included, don't track survival rates for cardiac arrest? How can a problem be fixed if it can't be measured? How will the problem even be revealed?

Nothing will change if the status quo continues to be tolerated. And the status quo in virtually every community is indifference combined with insufficient data a powerful duo on the side of inaction. The catalyst for change will probably vary from community to community.

It may come from an external group or organization, or it may come from within the EMS system or from the political structure of the community. In some communities, a citizens group or a civic action group may take the lead, or a group of physicians may agitate for change. Coalitions may take shape among the local medical society, the chamber of commerce, health care organizations, chapters of the American Heart Association or the Red Cross, local newspapers or TV stations.

Their united voices, especially on behalf of a mission as clearly and widely accepted as improving the community's survival rates for cardiac arrest, can go along way toward prompting politicians to

review the community's EMS services and create an action plan for their improvement.

The media can also play a large role in galvanizing awareness of sudden cardiac arrest and the potential for successful resuscitation. A news media (*paper, TV, radio or local web story*) might conduct an investigative report to determine the survival rate in its community. The reporter will likely discover how difficult it is to determine his or her community's survival rate and, assuming it can be determined, how poorly it likely fares compared to other communities. That's part one of the report. Part two could be what "best practices" the community does or doesn't have in place. Cardiac arrest registry? Assertive dispatcher-assisted CPR? High-performance CPR? Rapid dispatch? Detailed review of every cardiac arrest? Feedback to EMTs and paramedics? Voice recording of the event? Etc... And, part three could be a prescription for improvement.

It is probable that most people also view cardiac arrest fatalistically – sure, there are all those dramatic saves in the movies and on TV – but for the rest of us cardiac arrest is simply the end. This is certainly true for cardiac arrest associated with asystole and pulseless electrical activity (*PEA*). What is not appreciated, however, is the good prognosis for ventricular fibrillation. When VF is treated quickly, the prognosis is very favorable. If EMS systems began to view VF as a condition with an excellent prognosis, they would both celebrate their successes and investigate every death. Why did the death occur? What could have been done to prevent it?

Leadership

Change is unlikely to happen without leadership. The medical director, paramedics or EMTs, the administrative director of EMS, the mayor, the city council – any of these parties, regardless of their official roles, can take the lead to improve the system. For example, the medical director can unilaterally form an advisory group, create a cardiac arrest registry, rewrite the protocols for cardiac arrest, partner with an academic medical center, establish requirements for training and continuing education, obtain follow-up information on patients, and provide feedback to EMTs and paramedics. Leadership can take many forms and may as likely start in the middle or bottom of an organization, as from the top.



A simple first step is to ask " Why did this patient with witnessed VF not survive?" Detailed answers are likely to facilitate a local action plan leading to improvement. Paramedics and EMTs can work to record times and interventions accurately, improve teamwork, train in high-performance CPR, synchronize AEDs with dispatch centers, suggest ways to speed up response times, and collaborate with dispatch centers to institute rapid dispatch. The administrative director and the medical director can work together to revamp the protocols for dispatcher-assisted CPR. The mayor or the city council can mandate a QI program for cardiac arrest, increase the extent of medical control, and synchronize the

operations of the dispatch center with those of the EMS agency. There is no limit to what can be accomplished by motivated individuals working within an organization. Changing an organization's culture is hard work. It would be naive to think that you, the reader of this guide, could simply shout, "Eureka!", and then instantly set about implementing radical changes within your organization. Nevertheless, whatever your role in your EMS system, you can take or contribute to some relatively resource-light actions that are likely to raise your community's survival rate for cardiac arrest, actions whose short-term dividends can encourage



Russ McCallion, Asst. Chief EMS & Training Divisions
East Pierce Fire and Rescue

VIDEO

EAST PIERCE FIRE & RESCUE ALUMNI

"We would tear our department apart and rebuild it step by step, if we thought we were losing 4 to 6 citizens per year that should have been rescued from fires. So, when we know that we can save 4 to 6 additional people every year from cardiac arrest--are we as an agency going to step up and put the same energy into saving these CPR patients? Whether it is a person dying in a house fire or a person dying from cardiac arrest—to the family—dead is dead, and equally tragic, so why would we spend any less effort saving these patients?"

— Russ McCallion
Assistant Chief, East Pierce Fire & Rescue

and reinforce the will to engage in longer-term, more difficult change efforts.

The Will And The Way

The following pages provides a game plan with 10 specific steps to achieve improvements in both the chain and the frame of survival. It takes determination to incorporate these steps into an existing EMS system. Some individual or some group needs to want it to happen. But change can occur, and survival rates for cardiac arrest can improve. Two-hundred and fifty years ago, community leaders in Amsterdam decided to improve survival rates for drowning, the sudden death of their time, and they established the worlds first rescue society. But resuscitation science at that time was primitive, and therapy was not very effective; the leaders of Amsterdam had the will for resuscitation, but not the way. The sudden death of our time is cardiac arrest due to heart disease. Science has made great strides, and therapy can be effective. We now have the way; all we need is the will. Is it possible to change an EMS system in fundamental ways? Can a community's survival rate for cardiac arrest be dramatically and permanently improved? We believe the answer is an emphatic **YES!**

If you don't believe us, **take a moment to see what our alumni have to say...**



*Cindy Hambly, Training/Quality Improvement Manager
Thurston County Medic One*

VIDEO

THURSTON COUNTY, WA ALUMNI

"Success breeds success: we had immediate, positive results when we rolled out the "High-Density CPR" training. News of this success spread rapidly through the ranks, and the providers were motivated to be part of the success".

— Cindy Hambly, Thurston County Medic One

HOWARD COUNTY, MARYLAND ALUMNI

“The concepts needed to succeed are simple; converting knowledge into ACTION and changing culture are the true challenges. Our approach was to view cardiac arrest survival improvement as a “team” effort. The Academy Faculty’s guidance is “spot on!” Great leadership among our field personnel, those who live and breathe life safety, made the true difference in changing the culture of our department when it comes to improving survival through CPR. Giving ownership of HP CPR to the field EMTs and allowing them to gain the critical buy-in from their officers is our greatest accomplishment.

The medical director committed to reviewing all VF arrests and sending feedback; this created a system of measurement of where we were, so that we could assess the impact of each intervention on neurologically-intact patient survival.

We took full advantage of a Fire Chief who has come to realize that EMS is the specialty that this Fire Department does best and a County Executive who personally and closely realized that Sudden Cardiac Arrest can affect anyone, importantly, those people close to you, to accomplish much more: CPR training for students in our school system, AEDs on police cars and hands-only CPR training for the community. All of our successes are a product of the hard work of a team coupled with support from leadership both in the Fire Department and in the government of Howard County, Maryland.”

*— Kevin G. Seaman, M. D., FACEP
Medical Director*

HOWARD COUNTY, MARYLAND ALUMNI

“Rushing to the scene doing as much as we can, as fast as we can, and rushing to the hospital only does one thing, and that is moving dead people quickly from here to there. If this sounds like you, I hope at least everyone looked good doing it! In a sudden out of hospital cardiac arrest, we the EMS providers are the definitive care. If we do not resuscitate these patients there is nearly a 100% probability they will not be walking out of the hospital because they are dead. In cases of cardiac arrest specifically, good quality care is more important than shortest on scene time possible if you expect patients to survive, and walk out of the hospital.”

— Captain Dale Becker,
Howard County, Maryland EMS

YAKIMA COUNTY, WA ALUMNI

“People have a false belief that one person can not make any changes but those are probably the same people that are afraid of change. Should people be afraid of change? I say not. Sinking your head in the sand hoping that the cardiac issues are going away just because we have the most sophisticated equipment in the world is very mistaken.

I feel proud to say that our department of EMS with your help is trying to make changes one step at a time.

I know and believe that we will start seeing VF as a condition with excellent prognosis. Thank you for all you have done and continue to do for our patients.”

— Juan F. Acosta, DO, MS, FACOEP, FACEP
MPD, Yakima County EMS

“We were already providing the training programs, we just needed to change the message being delivered. Once that happened, we saw improvements in patient outcomes.”

— Candace Hamilton

Plan of Action: Grab The Low Hanging Fruit

The plan to improve a community’s survival rate consists of 10 specific but diverse steps. Four of the steps are relatively easy and do not require much in the way of resources. These may be considered the low-hanging fruit. There are six steps that are more difficult and require either modest to considerable equipment or resources – the higher-hanging fruit. It is unrealistic to presume that all 10 local steps can be implemented in any given community; an EMS director and medical director have to decide what is doable in their community. Furthermore what we consider easy steps, may be very challenging in some communities and vice versa. All the recommended steps are cognizant of the fact that real change requires addressing quantitative as well as qualitative factors. The total picture must entail the chain of

survival as well as the frame of survival. This guide closes with some thoughts on how to implement change.

A disclaimer: The recommendations put forward in this section cannot simply be used as a template and applied to any emergency medical system. Every community has its own constellation of resources, history, culture, and personalities. Indeed, this variety, which makes every EMS system unique, is a strength, offering a crucible for new ideas and new programs, which is why every community can become a source of innovation as well as a testing ground for new ideas. For some

communities implementing even one of the recommendations offered here may prove challenging. For others, they may implement several steps in the first year.

FOUR STEPS TO IMPROVE CARDIAC ARREST: THE LOW-HANGING FRUIT	
STEPS	LEVEL OF DIFFICULTY
Cardiac arrest registry	Low
Dispatcher Assisted CPR: Training, Implementation & QI	Low
High Performance CPR: Training, Implementation & QI	Low
Rapid Dispatch	Moderate

The attendees at the Resuscitation Academy, by the end of the two-day training course, are fired up to return home and begin to make changes. It is clear that they are bursting with ideas big and small for their home communities. What should they tackle first? What will give the biggest bang for the buck? The faculty tell them to pick the low-hanging fruit first. Our advice is to reach for the largest, tastiest, juiciest, and closest pear before climbing the tree. Get some success under your belt and keep plugging away, small step by small step until there is a culture of change, allowing one to pick some of the higher-hanging fruit.

The steps that can achieve the quick results are: 1) to establish a cardiac arrest registry, 2) to begin a program in dispatcher-assisted CPR, 3) to begin a program in high-performance CPR, and 4) to begin rapid dispatch. These steps are neither complicated nor costly, but they are not without challenges.

Three of them require ongoing QI if they are to reach their potential. High-performance CPR, dispatcher-assisted CPR, and rapid dispatch all require continuous maintenance and nurturing. To do otherwise would be like planting a vineyard and assuming it would do fine without watering and pruning. Programs without ongoing QI and ongoing training will result at best in mediocre and lackluster performance and at worst in no improvement at all.

STEP

1

Establish a Cardiac Arrest Registry



*Randi Phelps, MPH
Program Manager, King County EMS
Washington CARES, Coordinator*

VIDEO

A cardiac arrest registry is the first step to improving survival. It is the essence of measurement. One of the mantras at the Resuscitation Academy is “measure, improve, measure, improve...,” encapsulating the concept of documenting cardiac arrest events (*measuring*) and then implementing changes for improvement. In turn, continued measurement will determine if the improvement has had an effect and will identify further steps

the improvement has had an effect and will identify further steps for improvement. And so on... This is the most important mantra of the Academy since it pithily describes the bedrock upon which all programmatic change springs forth.

A registry is a means of taking the entire EMS system's temperature. If a cardiac arrest is well managed, it's more than likely that all other conditions will be well managed, too. In this sense, cardiac arrest stands for the whole system. A registry measures more than whether the patient lives or dies, but all aspects related to the care. Was bystander CPR performed? Did the dispatcher provide telephone CPR instructions? How good was the EMT CPR? Were there unacceptable pauses in CPR? Did the paramedics intubate successfully? Given enough cardiac arrests, a profile begins to emerge of where the system is succeeding and where it is failing. This information then informs the specific elements that need improvement.

The cardiac arrest registry's efforts must be viewed as a core function, and the registry itself must not be threatened with funding cuts or elimination during lean times. It must have sufficient resources and the full support of the medical and administrative directors. Necessary resources include staff time for gathering information from run reports (*electronic or paper*), dispatch center reports, AED recordings, hospital records, and ideally death certificates. Clearly, a small community will not have the volume of events to justify full-time dedicated staff, but several small communities can join together to establish a registry at the county or regional level. Investigators from Emory University have established, with funding from the Centers for Disease Control and Prevention, a national cardiac arrest registry: The Cardiac Arrest

Registry to Enhance Survival (myCARES.net). The registry is open to EMS systems throughout the nation. As of 2013, there were 50 communities from 17 states participating, plus 6 entire statewide EMS programs. The registry entails having the EMS system and local hospitals submit data via a web-based system. CARES overcomes a major obstacle in most well intentioned registries, namely obtaining outcome data from hospitals. Did the patient live or die and what was the neurological condition on discharge? The CARES project is based on voluntary participation, and all the participants receive summaries of their own community as well as a national summary.

myCares.NET

Welcome To:

Cardiac Arrest Registry to Enhance Survival (CARES)

Sponsored by:

CDC Department of Health and Human Services
Centers for Disease Control and Prevention

EMORY UNIVERSITY SCHOOL OF MEDICINE

American Heart Association
Learn and Live.

Log In to myCares™

Username:

Password:

Did you forget your password?

CARES Introduction

More information on Cares

Press on Cares

Maps

IRB/HIPAA

CARES

The Cardiac Arrest Registry to Enhance Survival (CARES) was initiated in October 2004 as a cooperative agreement between the Center for Disease Control and Prevention (CDC) and the Department of

myCares website

CARES can be customized for the needs of the local community. CARES also provides templates so communities can review their statistics sliced and diced in any way they wish. The main template is the Utstein reporting template, which provides the survival (*discharged alive*) rate for witnessed cases of VF in which the collapse occurs before the arrival of EMS personnel. For agencies participating in CARES, the Utstein template is automatically generated. Utstein survival report for reporting cardiac arrest survival (*also known as the Utstein Template*).

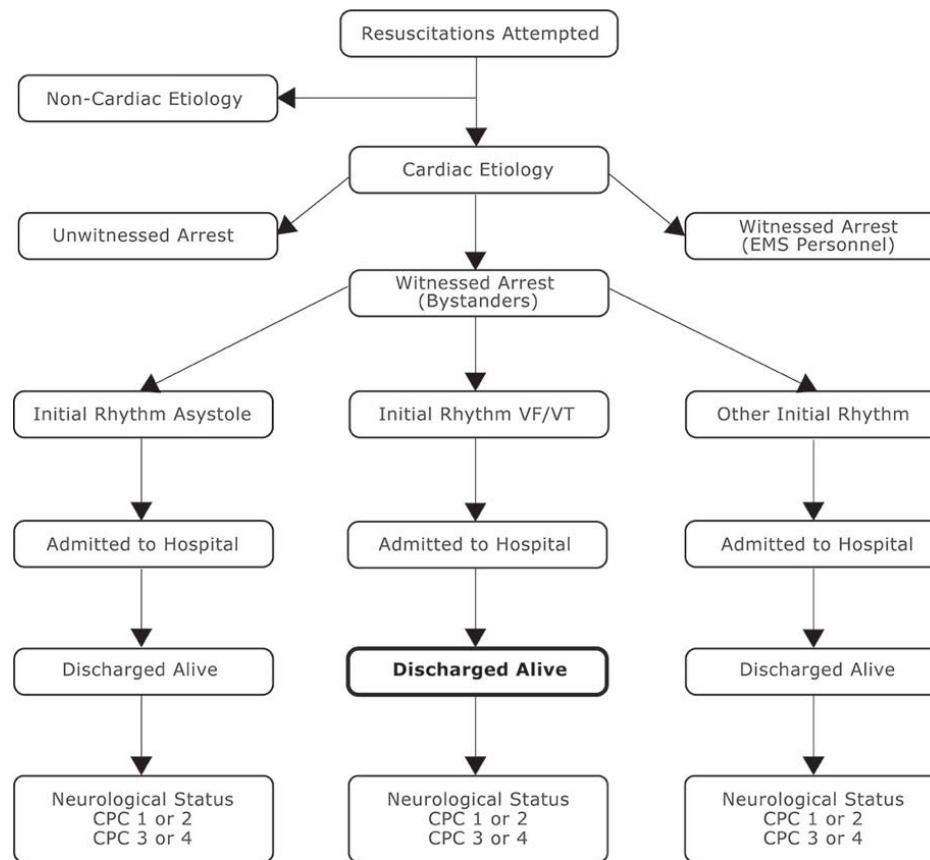
The main metric is discharged alive survival from bystander witnessed cases of ventricular fibrillation of cardiac etiology. The survival is expressed as a percentage of all cases meeting this definition. When possible the neurological status of the survivors should also be determined from the hospital record. CPC scores of 1 and 2 indicated good to moderately good neurological outcomes and CPR scores of 3 and 4 indicate poor to terrible outcomes. To maintain a cardiac arrest registry (*whether in*

CARES or as a free-standing registry) at its basic level, probably a quarter-time person is needed for a community of one million to gather incident data and obtain follow-up information from

hospitals. If the tasks associated with maintaining the cardiac arrest registry are combined with those of collecting and managing data for high-performance CPR and the dispatcher-assisted CPR program, there will be enough work for one half-time employee. This estimate assumes that the EMTs and paramedics are assisting in the data collection such as forwarding run reports and defibrillator downloads. It also assumes that the dispatch center is providing CAD reports and recordings on CPR calls.

The registry should collect information on all cardiac arrests for which EMS care has been provided – in other words, when resuscitation was attempted. The major emphasis, however, should be on cardiac arrests in which VF was the presenting rhythm. For communities with limited resources, restricting the

Utstein Survival Report



registry to cases of VF or witnessed VF is a reasonable measure. Implicit in the concept of a cardiac arrest registry is the assumption that time intervals will be measured accurately. The most important time intervals are those between the patients collapse and the start of CPR, and between the collapse and the first shock. Admittedly it is not usually possible to know the exact time of collapse. Therefore, the first accurate time is the time the 911 call is answered, and this should be the precise moment the EMS clock starts ticking. For cases involving bystander CPR, the initiation of CPR can be arbitrarily defined as having occurred halfway between the time of the call to 911 and the time of the first-in units arrival. Ideally, all the systems AEDs will be synchronized automatically or manually to an accurate clock.

YAKIMA COUNTY, WA ALUMNI

“After providing the facts from our new data entry program through CARES, we saw marked increase in interest and participation from local EMS and Fire administrators

- Candace Hamilton

Yakima County EMS

It is important to be realistic about what a cardiac arrest registry includes.

To be fully functional a registry must have the following three elements:

1. **Full capture of all arrests meeting the case definition:**

The case definition we use in King County for an event is a cardiac arrest in which EMS personnel initiate or continue CPR. Patients who receive AED shocks and subsequently do not require EMS CPR, are also considered cases. Trauma cases are excluded from the registry unless the trauma involves a low speed motor vehicle accident or other situation in which the cardiac arrest may have preceded the trauma. Patients who are dead on arrival or have a “do not resuscitate (DNR)” order and those who did not receive EMS CPR do not qualify under the “case: definition. But we do include cases in which EMS CPR is started and then stopped after a DNR order is clarified. However, since these cases are invariably non-VF cases, they do not affect the VF survival rate.

2. **Measurement of critical variables:** Measurement of critical variables: Witnessed collapse, collapse before EMS arrival, first rhythm obtained, shockable rhythm, bystander CPR, telephone CPR, time of call to dispatch center, time of EMS CPR, estimated time of bystander CPR, time of first compression for dispatch-assisted CPR, time of first defibrillation.

3. **Measurement of outcome:** death at scene, death in hospital, discharge alive (*ideally with a determination of neurological outcome*) To obtain critical information on the outcome of all patients admitted to the hospital, a good working relationship with area hospitals is essential. A registry is part of ongoing quality improvement and is considered protected information in most states (*and consent from the patient to release medical information is not required*). The completeness of the registry can of course vary from the bare minimum of information to

hundreds of variables. In King County, we have a registry that is comprehensive and serves as the basis for many studies. The 300 variables we collect from CAD reports, incident reports, defibrillation downloads, voice recordings, hospital records,

autopsy reports and death certificates, would be considered excessive for routine quality improvement. A good basic registry can be achieved with 14 event and 3 outcome variables.

CARDIAC ARREST TRACKING SYSTEM	
EVENT VARIABLES	OUTCOME VARIABLES
Demographic information	Died at scene
Age, sex	Admitted to hospital
Collapse before EMS arrival	Discharged alive
Witnessed collapse	Discharge location (<i>optional</i>)
Time of call to 911	CPC score on discharge (<i>optional</i>)
Resuscitation stopped because of DNR orders	
Rhythm on arrival (<i>or shockable rhythm on arrival</i>)	
PAD shock	
Dispatcher-assisted CPR	
Bystander CPR without dispatcher-assisted CPR	
Estimated time from call to 911 and bystander CPR (<i>half of interval from 911 call to scene arrival</i>)	
Time from call to 911 to time to dispatcher-assisted CPR (<i>first compression</i>)	
Time from call to 911 to time to EMS CPR	
Time from call to 911 to time to first shock	

The list of variables in the preceding page exhibits a minimal data set.

For communities not participating in CARES, information about a free-standing registry may be obtained by contacting the [Resuscitation Academy](#). This free-standing registry, called CATS (*Cardiac Arrest Tracking System*), includes 14 event variables and 3 outcome variables. It comes with a data dictionary and is a simple to use registry which collects only essential variables. Though CATS is not linked to a national registry, it will allow any EMS system to monitor its own performance in managing cardiac arrest and to track changes in survival over time. CATS uses an Access data base in which to record information, and thus, should be readily available within most organizations. CATS can display the data in an Utstein template and can be exported to Excel to allow for customized displays.

STEP

2 Implement Dispatcher Assisted CPR with Ongoing Training & QI



Linda Culley

Section Manager

Community Programs, King County EMS

VIDEO

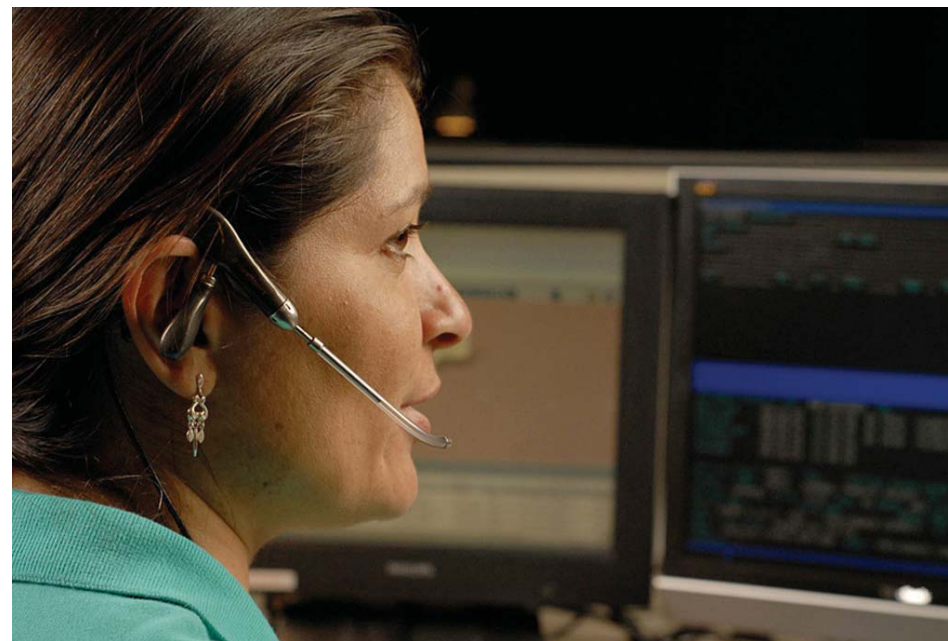
Most dispatch centers claim to have dispatcher-assisted CPR protocols in place, but in practice they don't offer CPR instructions very often. (*Synonymous terms are telephone CPR, dispatcher CPR, and dispatcher-assisted telephone CPR*) Admittedly, it is difficult and stressful for dispatchers to determine the presence of cardiac arrest and provide CPR instructions; it is far easier simply to reassure the caller that help is on the way. But the center whose culture supports it's dispatchers to assertively offer callers CPR instructions over the telephone, is a center that has the chain of survival firmly in it's grasp. This kind of culture can exist only if

someone has responsibility for teaching dispatcher-assisted CPR, monitoring the program, and watching it like a hawk. Someone has to listen to recorded information from all cardiac arrest calls and give feedback to individual dispatchers, as well as to the entire staff. It is just as important to review the calls in which instructions were provided (*how could it be done faster, better?*) as it is to review the calls in which cardiac arrest was not recognized (*how can we do a better job identifying cardiac arrest?*)

The adjective “assertive” describes a useful mindset for dispatchers when fielding possible cardiac arrest calls. A take charge attitude that moves ahead with CPR instructions, when there is reasonable likelihood that cardiac arrest is present, is the attitude needed for this program to succeed. If the dispatcher is overly cautious or holds back in the face of uncertainty, the instructions will seldom be given or there will be considerable delay in their implementation.

One element of any successful dispatcher-assisted CPR program is training, which should include continuing education. Dispatchers in King County receive an initial forty hours of training in emergency medical dispatching, and are thereafter required to complete eight hours of continuing education every year. Special emphasis is placed on recognizing cardiac arrest and delivering CPR instructions.

AUDIO 911 Audio Excerpt:
Great CPR For Over 8
Minutes



AUDIO 911 Audio Excerpt:
Quick to Identify Need
for CPR



AUDIO 911 Audio Excerpt:
Great CPR & Good
Coaching



Recently a five-year randomized clinical trial in King County, and Thurston County (*south of King County*) in Washington State and London (*England*) looked at whether dispatcher-assisted CPR achieved better survival with standard CPR (*mouth-to-mouth with compressions*) instructions than with chest compressions only instructions. The trial found no difference overall in survival but there were non-statistical improvements in survival and neurological recovery with chest compression only. As a result we

now provide chest-compressions only instructions for all adult cardiac arrests. (*Chest compression only instructions for adults is also recommended by The American Heart Association*). The dispatchers provide standard CPR instructions (*mouth to mouth combined with chest compression*) for cardiac arrest in children and infants (*fortunately rare events*) and when there is an obvious respiratory cause of arrest such as drowning, hanging, or smoke inhalation.

AUDIO 911 Audio Excerpt:
Need for CPR Missed
Despite Many Signals



AUDIO 911 Audio Excerpt:
Unnecessary
Questions



Prior to delivering these instructions the dispatcher has determined the likely presence of cardiac arrest. This is achieved by asking two critical screening questions: Is the patient conscious (*awake*)? Is the patient breathing normally? Note that the instructions call for chest compression only CPR. If respiratory arrest is the suspected cause of cardiac arrest then ventilation instructions are provided. There are slightly different protocols for children and infants as well as protocols for choking patients.

In King County, there is an expectation that “every call is a cardiac arrest until proven otherwise”. (*We think of this as a step specific mantra for dispatcher assisted CPR*). Though only 1 percent of the calls will actually be a cardiac arrest, nevertheless this expectation primes the dispatcher to always ask the **two screening questions** (*unless the caller is the patient*) as quickly as possible. These two questions must be asked of every caller (*unless the caller is the patient*):

▶ **Is the patient conscious (*awake*) ?**

▶ **Is the patient breathing normally ?**

If the answer is no to both, the dispatcher immediately begins instructions. (*Thus, giving us the second step specific mantra “No, No, Go”: No Not Conscious, No Not Breathing Normally, Go - Begin CPR.*)

Dispatchers learn the significance of agonal respirations and how to recognize them. It is particularly important that they offer CPR instructions when there are agonal respirations, since these patients are the ones most likely to be resuscitated and discharged from the hospital. Agonal breathing is present in approximately 60 percent of patients with VF cardiac arrest. Yet the presence of agonal breathing will often confuse the caller and/or dispatcher into thinking the patient is not in cardiac arrest.

Despite our considerable training on how to recognize agonal breathing, it remains a challenge. When asked, “Is the patient

AUDIO 911 Audio Excerpt:
Agonals Example -
Gargling



AUDIO 911 Audio Excerpt:
Agonals Example -
Moaning



breathing normally?” the caller often responds with “a little” or “sometimes” or “I’m not sure” or “I think so.” The dispatcher is seeking a yes or no response to the question and instead receives an ambiguous reply. When the dispatcher asks the caller to describe the breathing, the replies are varied and include gasping,

AUDIO

911 Audio Excerpt:
Good Example -
Breathing Normally



snoring, slow, grunting, groaning, and gurgling. Often the agonal breathing can be heard in the background but if not the dispatcher may ask the caller to bring the phone to the patient in order to better hear the breathing. In terms of training and motivation, the director of a dispatch center should do whatever is necessary to

ensure that the center achieves a 50 percent rate of offering dispatcher-assisted CPR instructions in cases of cardiac arrest. This is not an unrealistic target. Achieving such a target will require a sponsor – someone who takes charge of the desired change, has the authority to mandate it, and establishes training, professional expectations, and ongoing audits to see that the change is fully implemented. Once dispatchers realize how vital they are to the chain of resuscitation, and especially when they see concrete evidence of their success, they will become the staunchest advocates of dispatcher-assisted CPR.

As with high-performance CPR the quality of dispatcher-assisted CPR can be measured. At a minimum every call of cardiac arrest must be reviewed with the following elements measured:

- Was cardiac arrest recognized?
- Were the two basic questions asked:
 - Is the patient conscious (*awake*)?
 - Is the patient breathing normally?
- Were agonal respirations (*if present*) recognized?

● Were telephone CPR instructions offered? We believe ongoing QI of dispatcher-assisted CPR should include the following attainable goals:

1. Recognition cardiac arrest by the dispatcher in 75% of all cardiac arrests treated by EMS.
2. Recognition of cardiac arrest within one minute (*on average*).
3. Provision of dispatcher-assisted CPR in 50 percent of all cardiac arrests calls treated by EMS (*excluding the calls in which bystanders are performing CPR at the time of the call*).
4. First compression started within two minutes (*on average*).

AUDIO

911 Audio Excerpt:
Dispatcher Does Not
Get Sidetracked



AUDIO

911 Audio Excerpt:
Well Handled
Breathing Question



Feedback must be provided to the dispatcher following every event. [View DA CPR QI Form \(Sample\)](#)

The American Heart Association in 2012 issued a [Scientific Statement strongly endorsing dispatcher-assisted CPR](#), including the importance of asking the two identifying questions, special training in the recognition of agonal respirations, and a vigorous ongoing QI program.

DISPATCHER ALL CALLER INTERVIEW

Only use bulleted phrase if caller does not understand bolded instruction

9-1-1

- What is your emergency?
- Do you need police, fire, or medical help?
- What are you reporting?

What is the address?

- Are you at (prompt with location on screen)?
- Where are you?

Are you the patient?

- Who is hurt?
- Who needs help?

Are they conscious? (Awake?) – If **NO**: ask next question (breathing). – If **YES**: "Bring the phone to the patient so I can speak with them."

- Can they talk to you?
- Can they respond to you?
- Can you wake them up?

Are they breathing normally?

- Tell me what their breathing sounds like
- Is their chest rising and falling?
- Is their stomach going up and down?

If patient is not conscious and not breathing normally, begin CPR instructions.

- Dispatch Police AED unit
- Be alert for premise/radius information indicating AED
- Send second rescuer to retrieve AED or send lone rescuer ONLY if AED is nearby and easily accessible

About how old is the patient?

- Adult, child, baby?
- 20's, 40's, 60's?
- Skip the following all-caller questions until later in the call if the patient needs CPR

Is the person a man or a woman?

What is the phone number you are calling from?

What is your name?

ADULT CPR INSTRUCTIONS

Only use bulleted phrase if caller does not understand bolded instruction

1. "I've notified the dispatcher, talking to me won't cause a delay.

Follow my instructions"

If caller does not understand, say something like this:

- "We need to help the heart work."
- If caller asks, confirm that they will be doing CPR.

2. "Get them on their back on the floor." (Confirm position, if any doubt that patient is on floor.)

If caller does not understand, say something like this:

- "Lay them down"
- "On the ground"
- "Face up"

3. "Kneel by their side. "

If caller does not understand, say something like this:

- "Get down on the floor"
- "Next to/close to/near them"

4. "Put your hand on the center of their chest, right between the nipples, and put your other hand on top of that hand."

If caller does not understand, say something like this:

- "Middle of the chest"
- "Between the breasts"
- "Use palm/heel/bottom of your hand"

5. "With straight arms push down as hard as you can, just like you're pumping the chest. Let's start: push, push, push, push, 1, 2, 3, 4, 1, 2, 3, 4, 1, 2, 3, 4... Push and count out loud 1, 2, 3, 4, 1, 2, 3, 4, 1, 2, 3, 4... Keep going! Do not pause. "

TIPS: Count with the caller!

When it sounds like caller is confident counting, stop counting to listen to rate. Jump back in counting with them to speed up or slow down rate, or eliminate pauses. Don't interrupt them with unnecessary questions.

COACHING: Give reassurance and coach caller after chest compressions have been going for awhile:

- "You're doing great! Keep going!"
- "Push as hard as you can"
- "Don't stop until they tell you to stop"

TROUBLESHOOTING

- If caller worries they are hurting them, reassure them that they are not in pain.
- If caller is tired, ask if they are keeping their arms straight, or suggest a short break.
- If caller mentions phone is interfering with CPR, suggest using speaker phone or putting the phone down during compressions.
- If another person is present, suggest that this person do compressions (take turns).
- If caller feels weak or unable to do compressions, ask if there's a neighbor you can call to come help.

NOTE: IF CALLER REPORTS VOMITING, INSTRUCT CALLER TO:

- Turn patient's head to one side.
- Sweep out contents with your fingers before you resume.

VENTILATION INSTRUCTIONS <i>(for use when suspected cardiac arrest is secondary to respiratory arrest)</i>	FOREIGN BODY AIRWAY OBSTRUCTION INSTRUCTIONS <i>(confirmed choking, now unconscious)</i>
START with 30 compressions, then:	Look for item after 30 compressions: "Look inside mouth and remove any obvious obstruction."
PINCH the NOSE, with your other hand, LIFT the CHIN so the head tilts/ bends back	If object is removed, give 2 ventilations between each set of 30 compressions.
Completely COVER their MOUTH with your MOUTH	If object is not seen, continue with compression. Look for item after each set of 30 compressions.
GIVE 2 BREATHS OF AIR	
Continue with cycles of 30 COMPRESSIONS, followed by 2 BREATHS	

[Download PDF File](#)



ADDITIONAL INFORMATION

[Dispatchers CPR Coaching Saves Lives When Every Minute Counts](#)

NPR - KPLU

[Dispatcher Assisted CPR Toolkit](#)

Resuscitation Academy

STEP

3 Implement High Performance CPR with Ongoing Training & QI



*Peter Kudenchuk, MD
Professor of Medicine, Division of Cardiology
University of Washington
Associate Medical Director, King County EMS*

VIDEO

Recent studies demonstrate the connection between quality CPR and survival from cardiac arrest. Not only is the time interval from collapse to onset of CPR predictive of survival, but also the quality of the CPR is just as important. The better the CPR, the better the outcome. Since 2005, when we trained every EMT in our system

how to perform high-performance CPR, we have seen a dramatic increase in survival. Resuscitations that go on for 50 or 60 minutes with a pharmacy of medications and 10-20 defibrillatory shocks and a patient who survives – with excellent neurological recovery – used to be the exception, but now seems commonplace. It is as though the onset of high-performance CPR suspends death and gives a better opportunity for the defibrillatory shocks and medications to work their magic.

High-performance CPR is as much a construct as a measurable skill. The construct says that letter-perfect CPR is the goal of all resuscitations. This skill can be achieved in training, as well as through review of real events. We believe training on manikins with “paper strip recorders” is the best teaching tool as it provides



High Performance CPR - BLS - Continuous Compressions

VIDEO

instant feedback (*tangible, quantifiable, etc.*) about the quality of CPR.

Elements of High-Performance CPR include:

- Correct hand position
- Compression rate of 100-120 beats per minute
- Depth of compression of 2 inches
- Full recoil on the upstroke
- 50:50 duty cycles
- Ventilations of one second each
- Minimal interruptions of CPR (*no pause to exceed 10 seconds*)
- Intubation and IV start without pausing chest compressions

Last, and perhaps most important, is that there is an ongoing QI program that provides feedback with specifics about CPR performance to EMTs following every cardiac arrest? A QI program should among other things measure the percentage of time chest compressions are performed during each two-minute interval between rhythm assessments. Well-trained EMTs should be able to provide chest compressions for at least 90 percent of the available time. Most defibrillators allow digital downloads following the resuscitation, including precise measurements of CPR percentage and quality.

Another aspect to high-performance CPR is the choreography between the EMTs and the paramedics. Other terms used to describe this flawless team performance are the “dance of resuscitation”, the “CPR ballet” and the “pit-stop approach to CPR”.

Observing well-trained rescuers engaged in high-performance CPR it is indeed like watching a well-choreographed dance. The term pit-stop refers to the pre-defined role of each rescuer and the very minimal waste of time. Like a professional race car pit crew, each member of the team knows exactly what to do and does it with the minimal wastage of time and effort. This choreography means the members switch or rotate roles with minimal interruptions – current protocols call for rhythm analysis every two minutes. Thus, the chest compressor and the ventilator can switch roles every two minutes. With sufficient personnel at the scene, one EMT can start compression, the second EMT can attach the AED pads, the third EMT can provide ventilation, while the fourth EMT can feel the femoral pulse (*in order to define the location*



Captain Jonathan Larsen, Firefighter/Paramedic
Seattle Fire Department

VIDEO

of the artery and determine if a shock leads to a perfusing rhythm). A fifth EMT, if present, could be the “captain” of CPR and provide direction to the crew (typically the person providing overall direction is the one who operates the automated external defibrillator). Paramedics should optimally intubate and place the IV with no interruption in chest compression. Clearly if there are fewer rescuers the responsibilities must be aggregated. In our system, we think of the EMT crew as owning CPR, meaning that they are responsible for the quality and directing assignments. The paramedics own advanced life support, meaning they are responsible for intubation, starting an IV, and administering medications. Upon arrival paramedics become the overall team captains, but they know to delegate CPR to the EMTs. The EMT team not only keeps

track of the quality of CPR, but also keeps track of the timing of interventions. Since there is a rhythm analysis every two minutes, an EMT is the official timekeeper, literally using a stopwatch. (In King County we go slightly beyond two minutes of CPR in order to end with 30 chest compressions prior to every rhythm analysis.)

For the EMTs and paramedics to understand why high-performance CPR is so critical, part of our training includes instruction in the science of CPR. My colleague, Dr. Peter Kudenchuk, has developed a compelling 30-minute video on the science of CPR and why letter-perfect CPR is so important. This video is part of every King County EMT’s training. The video below, is an excerpt:



Norm Nedell, Paramedic, EMT Instructor & Dispatcher
Seattle Fire Department

VIDEO



Excerpt from *The Science of CPR*, with Peter Kudenchuk, MD

VIDEO

High Performance CPR & The American Heart Association

The [American Heart Association guidelines](#) emphasize the need for high quality CPR (*proper depth, rate and full recoil*) and minimizations of pauses while performing CPR. This is exactly what HP CPR focuses on and strives to achieve.



*Michael Sayre, MD
Professor, School of Medicine
University of Washington*

VIDEO



*Russ McCallion, Asst. Chief, EMS & Training Divisions
East Pierce Fire and Rescue*

VIDEO

4 Implement Rapid Dispatch



Cleo Subido, EMD Training/QI Coordinator
King County EMS

VIDEO

With rapid dispatch, the closest EMT-staffed vehicle is dispatched within seconds, when specific medical emergencies are reported to the 911 dispatcher. The dispatch should occur even while additional information is being gathered from the caller. The quick arrival of at least an EMT vehicle, allows the EMTs to perform CPR and deliver the first defibrillatory shock. On the other hand, it may be immediately clear that both EMTs and paramedics are required (*such as a report of ongoing CPR*) and thus, both vehicles can be

rapidly dispatched. If additional information from the caller suggests that paramedics will not be needed after all, the dispatcher can call off the paramedic unit with a code green message.

The symptoms or complaints that should trigger a rapid dispatch are: unconscious or suspected cardiac arrest, chest pain, difficulty breathing, stroke symptoms, ongoing seizure, and significant trauma. A community should carefully measure its current time interval from first ring into the alarm center to specific dispatch of the first responding unit (*EMT or paramedic unit or EMT/paramedic unit*). This time interval is variously labeled but will be called “dispatch time” here. The National Fire Protection Association (*NFPA*) sets a dispatch time standard of 60 seconds for critical events. Rapid dispatch can do much better than that. The rapid dispatch target time in King County dispatch centers is 15 seconds or less, especially when the address is auto populated into the dispatcher CAD (*computer aided dispatch*) system. The first mention

SYMPTOMS TRIGGERING RAPID DISPATCH

Unconscious
Difficulty breathing
Stroke symptoms
Chest Pain
Seizure
Major Trauma
Diabetic hypoglycemia



the dispatcher to use common sense and immediately send EMTs whenever a caller otherwise conveys the likelihood of a critical event. In King County rapid dispatch is used in approximately 30 percent of EMS calls. We believe rapid dispatch saves 30-60 seconds in dispatch time for the most critical medical emergencies.

Given the fact that survival falls about 10 percent for every minute of delay in CPR and defibrillation, rapid dispatch can add 5-10 percent to a community's survival rate. All of this can happen with no additional staffing or resources. Not bad. Now you see why this is one of the low-hanging fruits.

One more point to be made – EMS dispatch centers (*whether stand-alone centers or part of larger combined centers such as fire and police*) must have protocols authorized by medical directors. Medical expertise is necessary to provide pre-arrival instructions as well as determine the urgency of the callers complaints and thus how quickly units must be dispatched. The logical person to fill this roll is the EMS medical director. Unfortunately many dispatch centers still do not involve the EMS medical director in the writing or approval of protocols for medical emergencies, a bizarre disconnect between the patient and the EMS system.

of a critical symptom mandates an immediate dispatch. Dispatch centers that place priority on a rigid, predefined protocol over rapid dispatch are doing their communities a disservice and in the case of cardiac arrest are delaying life-saving therapy.

The concept of rapid dispatch applies to tiered-response EMS systems as well as single response systems. Many EMS systems dispatch protocols require full information before even a single rescue vehicle can be sent. That may be an acceptable procedure for the majority of calls, but speed is of the essence in a life-or-death situation, and in those cases usual dispatching protocols must be short-circuited. In Seattle and King County, we train dispatchers to use rapid dispatch when they hear certain key words and phrases from callers - either the short list of symptoms in the preceding paragraph or words such as "collapsed," "unconscious," "can't breathe" and "heart attack." We also urge



COMMUNITY SCORECARD

CARDIAC REGISTRY	SCORE	ASSERTIVE DA CPR	SCORE	HIGH PERFORMANCE CPR	SCORE	RAPID DISPATCH	SCORE
Ongoing registry of every cardiac arrest that receives EMS care <i>(1 point)</i>		Specific training including recognition of agonal breathing <i>(1 point)</i>		Specific training and testing with a printout strip <i>(1 point)</i>		Rapid dispatch program with first-in unit dispatched within 30 seconds of the call for 90% of cardiac arrests <i>(1 point)</i>	
Determination of outcomes <i>(primarily discharged alive)</i> <i>(1 point)</i>		Dedicated person who listens to all cardiac arrest tapes and measures performance, such as: Was cardiac arrest recognized <i>(two questions asked)</i> ? When was it recognized? What was the time to first compression? <i>(1 point)</i>		Dedicated person to measure performance from real events <i>(1 point)</i>			
Ability to calculate the Utstein metric <i>(survival from witnessed VF)</i> <i>(1 point)</i>		Provides feedback to dispatchers <i>(1 point)</i>		Provide feedback to EMTs <i>(1 point)</i>			

There are a total of 10 points. This scorecard is neither validated nor linearly scaled *(A score of 8 is not necessarily twice as good as a score of 4)*. Rather it offers a simple metric that anyone can quickly apply to his or her own EMS system. It would be an interesting study to correlate a community's VF survival rate with its number of points. There is likely a strong correlation. We are confident that if the above four easy steps are taken, there will be a measurable improvement in survival

Plan of Action: Reach For The Higher Hanging Fruit

Overcoming Challenges

Now it is time to go after the higher hanging fruit. These six more difficult steps will also likely lead to improved survival but their implementation is more challenging and resource intensive.

STEP

5 Voice Record All Attempted Resuscitations

SIX MORE DIFFICULT STEPS TO IMPROVE CARDIAC ARREST: THE HIGH-HANGING FRUIT

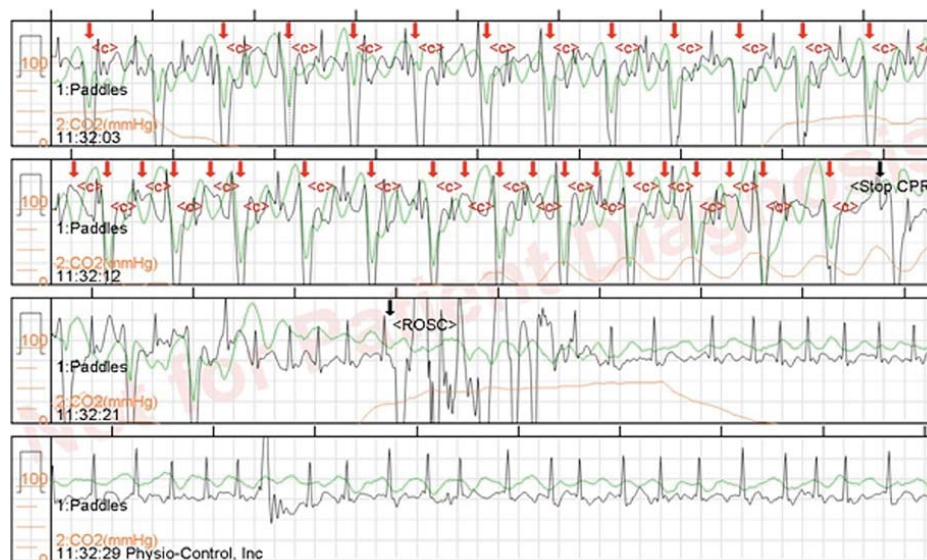
STEPS	LEVEL OF DIFFICULTY
Voice record all attempted resuscitations	Middle - High
Begin a program in police defibrillation	Middle - High
Establish a public access defibrillation program	Middle - High
Establish or partner with local foundation to raise funds for training and QI	Middle - High
Institute hypothermia in all receiving hospitals	Middle - High
Culture of excellence	High



Steve Perry
Paramedic,
King County Medic One

VIDEO

All voice recordings in Seattle and King County are part of an ongoing cardiac arrest QI. Though some EMTs and paramedics may think that the recorded information will be used for disciplinary purposes, the goal of recording is simply to reconstruct the actual events of the resuscitation with accuracy. We have analyzed thousands of voice and ECG recordings and have never used them for any disciplinary action. Listening to a voice recording while viewing the patient's cardiac rhythm makes the event vivid. You can tell the moment when the AED was attached and when ventilations were given. You can piece together the sequence and timing of events and deduce the reason for any delays (*the dog was growling at the EMT, the patient had to be moved from the bathroom to the hallway, the oxygen tank ran out, and so on*). A post-event digital readout of the heart rhythm, with the timing of the shocks, is clearly useful, however nothing beats a voice recording of the event. Some people believe that the only thing better might be a video recording, like those made by police cams, but this suggestion is problematic. Such a recording would be logistically challenging and intrusive, not to mention a violation of privacy. It would be



Cardiac Arrest QI

only a matter of time before resuscitation videos began appearing on YouTube. Frankly, though, the most important objection to video recording is that they are not needed. A voice recording is enough to allow adequate reconstruction of the event.

Voice and ECG recordings provide the crucial data allowing for the event to be accurately reviewed. When shared with EMTs and paramedics it provides beneficial QI and teaching material. And it makes everyone want to do better the next time. As an example, in one recording of cardiac arrest the paramedic asked the EMT to stop CPR so he could intubate. Then a long pause ensued that lasted 65 seconds (*with no CPR*) before the paramedic asked the EMT to resume chest compression. The paramedic, when the tape was reviewed with him, could not believe how long the pause was. You can be sure this paramedic will do better the next time. Many training officers in King County fire departments use the recordings for internal teaching. There is nothing like a real event to grab your attention – to make one breathe a sigh of relief when things go well and to cringe when they don't.

STEP

6 Begin A Program in Police Defibrillation



*Ann Doll, Executive Director, Resuscitation Academy
Manager, Medical QI, Seattle/King County EMS*

VIDEO

Providing police officers with CPR skills and training in the use of an AED has the potential to increase survival rates from cardiac arrest. Though the promise exists, law enforcement's role in resuscitation and early defibrillation has been modest and inconsistent. Yet some communities that have embraced police defibrillation have seen dramatic improvements in survival. Perhaps the most notable community is Rochester, Minnesota. Our system in King County has also seen benefit with police response to cardiac arrest.

Embarking on a police defibrillation program is not without challenges, and some communities that have tried, have not seen much benefit. There are many issues to address: support from the police chief and buy-in from the rank and file, support from the fire-department and or EMS agency, initial and ongoing training and its costs, cost of AEDs, supervision, QI, and integration with EMS dispatching. In early 2010, we undertook police AED programs in Bellevue and Kent, two cities in suburban King County, Washington, each with approximately 100,000 residents. The program has contributed to the successful resuscitation of a handful of lives; and we believe further training (*both for police and dispatchers*) will lead to even more successful police defibrillations.

A few critical lessons we have learned might help other communities as they embark on police defibrillation. First, there



must be total support from the police and EMS agencies. Ideally every police officer should be taught in person (*rather than solely with video or web based training*) and given the chance to practice with the AED device. Second, the training message must be simple and involve two checks: “If the **person does not respond** and **is not breathing normally**, attach the AED.” Let it analyze and or shock and then follow the CPR prompt. Third, we teach the police to provide chest compression only (*most are relieved that they do not have to perform mouth to mouth ventilation*). Fourth, we do not



Russ McCallion, Asst. Chief EMS & Training Divisions
East Pierce Fire and Rescue

VIDEO



use voice recordings for police AEDs. The police find this a huge relief. Fifth, the dispatch center is key to achieving rapid police response. The police must be dispatched simultaneously with the first responding EMS agency. This is perhaps the most challenging issue in achieving a successful police defibrillation program. Our goal is for police to be dispatched only for true cardiac arrest events. Many times it is clear that the caller is reporting a cardiac arrest, but other times it takes some seconds (*or longer*) to confirm an arrest (*remember that the EMT unit has already been dispatched under rapid dispatch*). When the dispatcher waits to confirm cardiac arrest before dispatching police, the fire department will have had enough of a jump start to arrive before police. How to send police quickly, but not over send, is a challenge we continue to work on.

ADDITIONAL INFORMATION

[Bellevue Police Defibrillation](#) (*youTube video*)

[Automated External Defibrillator Use by Police Responders Where Do We Go From Here?](#) (*article*)

American Heart Association, Circulation
José A. Joglar, MD, Richard L. Page, MD

[Only a Third of U.S. State Police Agencies Equip Cars With AEDs, Penn Research Shows](#) (*article*)

Perelman School of Medicine, Penn State

[Resuscitation Academy Police Defibrillation Toolkit](#) (*PDF*)



STEP

7 Establish a Public Access Defibrillation Program



Megan Bloomingdale, Dispatch QI, EMT, EMT Instructor
King County EMS / North Seattle Community College

VIDEO

Public access defibrillation (PAD) refers to placing AEDs in public locations and using them as elements of a community's resuscitation chain. PAD is a difficult step, not necessarily because it is technically challenging, but rather because it involves widespread community effort and its effects are likely to be modest. Even with widespread dissemination of AEDs in public locations there will be only a small increase in survival. The Public Access Defibrillation Trial was a multi-center trial

demonstrating that sites with AEDs on the premises, and with staff trained in their use, had higher survival rates for VF than comparable sites without AEDs (*the non-AED sites relied on the fire department or an EMS agency to bring an AED to the scene*). Other studies, reporting the use of AEDs in casinos and on airplanes, also showed benefit.

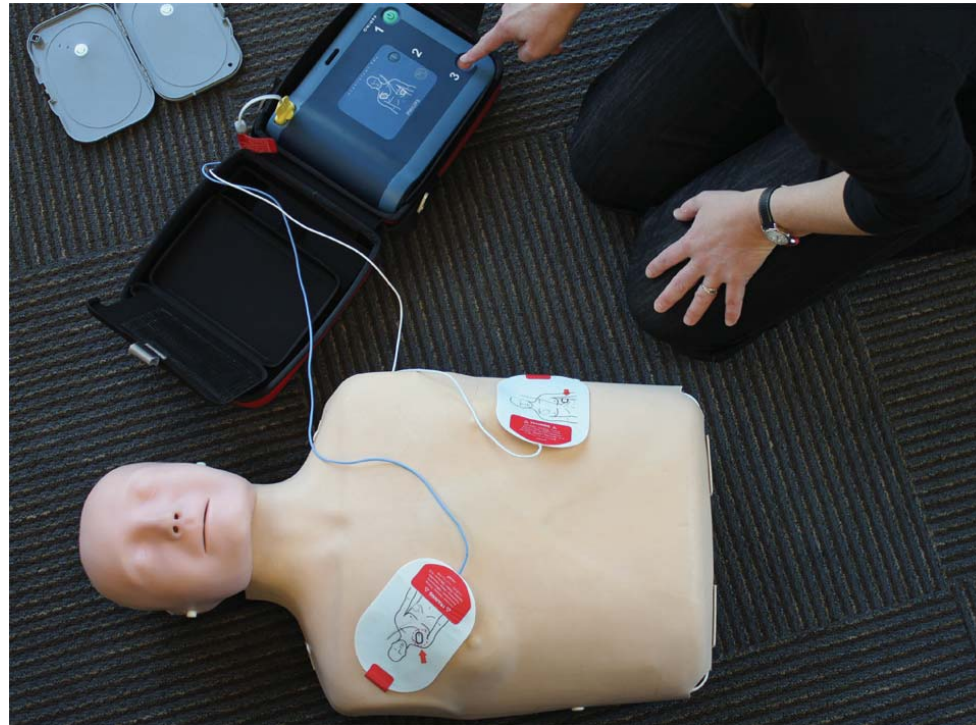
There is an active PAD program in Seattle and King County, with more than 3,000 AEDs registered with EMS, as of 2012. Sites with



AEDs include such places as the airports, health clubs, jails, community centers, senior centers, shopping malls, office buildings, and ferryboats. The number of AEDs has increased significantly over the past decade. A study from Seattle and King County reporting on eight-years' experience with PAD, found that in 1999, 1.8 percent of VF arrests had an AED applied compared to 8.8 percent of VF arrests in 2006. Survival among PAD cases was approximately 60 percent. The strategy of using public AEDs has merit, but enthusiasm must be tempered with awareness on the relatively small number of cardiac arrests – only 15 percent – that occur in public places (*approximately 150 of 1,000 arrests per year in King County*).

Though the absolute number is small, these are great saves. A cardiac arrest in public usually befalls an active person who is out in the community, and since most collapses in public are witnessed, CPR is often started quickly. The fact that these arrests have everything going for them – they are witnessed, they usually involve VF, CPR and defibrillation are started quickly and there is probably less comorbidity – explains

the excellent survival rate (*and the typically good neurological recovery*).



Residential facilities offer great potential for PAD programs. As incentives, an EMS agency could provide free training to residents and personnel and could offer to register the facility's AED with the local dispatch center. The agency could also offer advice on where in the facility to place the AED. A residential community or an apartment or condominium building could establish an AED security system. In such a system, the AED would be placed in a locked box (*all the residents would know the combination*) in a

central accessible location. This location would be registered with the dispatch center, and if a cardiac arrest occurred on the premises, someone at the scene would be instructed to get the AED.

Existing computer-aided dispatch programs allow dispatch centers to identify AEDs at particular locations (*assuming that these AEDs are registered with the dispatch center*) as well as any in close proximity. Wouldn't it be amazing if a caller to 911 were informed

that the doorman in the next building had an AED in his buildings lobby and was being called to bring it over? This idea is currently being tested in the King County NorCom Communications Center, and though this is not a formal test, it is offered as one idea for how a community can be creative with AEDs. And what if the dispatcher could automatically alert all staff responsible for AEDs within a certain radius? Thus a security guard in an adjoining building would get a phone text telling him or her that there was a cardiac arrest next door. This technology is commercially available and deployed in a few cities. New smart phone applications can pinpoint (*registered*) AED locations. Clearly, AEDs in the community have the potential to save lives. The challenge is to maximize this potential.

There is interest on the part of some national sudden cardiac arrest foundations and prevention advocacy groups to revise building codes to mandate placement of AEDs in multiple occupancy dwellings and business establishments. The reasoning is that an AED is a lifesaving technology that should be built into the structure of the building, just like a sprinkler system. Another innovative idea is to use social networking and crowd sourcing (*using the public to engage in community data collection*) both to identify the locations of AEDs and to volunteer to respond to a cardiac arrest event if notified by the dispatch center. Dr. Raina Merchant, in a recent commentary in *Circulation Cardiovascular Quality and Outcomes*, describes both the challenges and potential benefits of crowd sourcing and the potential ability to retrieve AED location information on smart phone mobile apps. With over 1 million AEDs sold in the United States, wouldn't it be nice to determine the precise location of these AEDs and then have this information readily available for witnesses at a cardiac arrest?

Perhaps future AEDs could have embedded geographic transponders.

ADDITIONAL INFORMATION

[Community PAD Toolkit](#)
Resuscitation Academy

[MyHeart Map](#)
Pennsylvania, USA

[AED Locator](#)
United Kingdom



8 Supplemental Funding & Support for Training & QI



Jan Sprake, Executive Director
Medic One Foundation

VIDEO

When times are tight financially, usually the first things to be eliminated or reduced are budgets for training and QI. While these decisions may be penny wise and pound foolish, they nevertheless reflect the harsh realities and the need to preserve basic operational personnel. Thus, it is important to find additional sources of revenues. Charitable gifts can provide needed funds to support activities such as training and QI. These in turn provide the margin of excellence to boost a program to a higher level of performance.

[The Medic One Foundation](#) is an example of how fundraising can supplement a public EMS system. This foundation supports 100 percent of paramedic training for communities throughout King County and cardiac arrest QI for the Seattle Fire Department. In addition, it funds paramedic training for other agencies outside of King County, as well as provides equipment and research grants.

In order to solicit charitable gifts, EMS agencies can establish a separate nonprofit foundation or find an existing nonprofit that is willing to serve as a fiscal sponsor of your fundraising activities.

For example, an EMS agency could partner with a hospital foundation or auxiliary, fire department auxiliary or benevolent fund, or with a local community foundation.

Such an arrangement saves the local fire department the expense and effort establishing a nonprofit charitable organization.



Medic One Foundation website

9 Institute Hypothermia in All Receiving Hospitals



Peter Kudenchuk, MD
 Professor of Medicine, Division of Cardiology,
 University of Washington
 Associate Medical Director, King County EMS

VIDEO

Hypothermia is the standard of care for resuscitated VF patients when they arrive at the hospital in a coma. Cooling the patient's body for twenty-four hours after resuscitation, offers the promise of a modest improvement in chances of survival, and to date there is no indication of harm from this practice. [The American Heart Association](#) and the [International Liaison Committee on](#)

[Resuscitation](#) have both endorsed it. Like any complex hospital procedure proficiency requires written protocols, practice, and accountability.

As of 2013 most hospitals, that receive resuscitated patients, have hypothermia protocols in place. Lance Becker, director of the Center for Resuscitation Science at the [University of Pennsylvania Perelman School of Medicine](#), is a leading proponent of hypothermia. He and his colleagues, on the basis of laboratory studies, have come to believe that the cells of vital organs do not die from insufficient oxygen; rather, they say, the harm occurs when oxygen is reintroduced. The benefit of cooling is that it inhibits many of the destructive reactions associated with reperfusion of blood and with the reintroduction of oxygen. The [University of Pennsylvania Hypothermia and Resuscitation Training \(HART\) Institute](#) offers an annual two-day "boot camp" designed to educate care providers on in-hospital care of cardiac arrest patients.



Hypothermia is a relatively recent addition to the armamentarium of resuscitation therapy. In 2002, two studies of hypothermia were published in the *New England Journal of Medicine*. Both studies randomized patients either to receive hypothermia or to not receive hypothermia (*called normothermia*), for VF patients who had been successfully defibrillated but were comatose when they arrived at the hospital. One of the studies, reporting data obtained from several centers in Europe, demonstrated favorable neurological outcomes six months after cardiac arrest when hypothermia treatment had been delivered: 55 percent of patients in the hypothermia group had favorable outcomes, compared to 39 percent in the control group. Mortality was also significantly lower in the hypothermia group than in the control group: 41 percent and 55 percent, respectively. The other study, this one from Australia, did not demonstrate a significant difference in survival (*the main outcome of the study*) among the hypothermia and normothermia groups, though the authors did report better neurological outcomes in the hypothermia group. This was a smaller study, with only 77 patients as opposed to the 275 patients in the European study. On the basis of these two studies, several national and international organizations, including the [International Liaison Committee on Resuscitation](#) and the [American Heart Association](#), now recommend hypothermia for patients who have suffered ventricular fibrillation and are initially resuscitated but are still in a coma when they reach the hospital.

Unresolved issues are whether patients should receive hypothermia in the prehospital setting and whether only VF patients should be eligible for hypothermia therapy. It is for this reason that hypothermia is placed in the difficult-steps category. Though the therapy is reasonably straightforward, the difficult

part comes in knowing whether it is beneficial for prehospital use. There is currently no data to clarify whether hypothermia should begin in the field, either after return of spontaneous circulation or in the middle of a resuscitation – in other words, prior to return of a pulse and blood pressure. Dr. Francis Kim at the [University of Washington](#) is currently studying the potential benefits of prehospital hypothermia for resuscitated VF patients. This is a randomized trial, and the results will not be known until mid-2013. Also unresolved is whether hospital hypothermia benefits patients who are resuscitated from asystole or pulseless electrical activity. Stay tuned on this issue.

ADDITIONAL INFORMATION

[Institutional Protocols for Therapeutic Hypothermia](#)

Perelman School of Medicine

[Therapeutic Hypothermia Links](#)

Perelman School of Medicine

[Cardiac Arrest, Hypothermia, and Resuscitation Science](#)

with Benjamin Abella, MD, MPhil (Coursera course)

10 Work Toward A Culture of Excellence



*Leonard Cobb, MD,
Medic One Founder, Professor Emeritus,
University of Washington
Harborview Medical Center/Seattle Medic One*

VIDEO

Creating and nurturing a culture of excellence is perhaps the most difficult step. What is a culture of excellence? It is an implicit awareness perceived by most or all members of the organization that high expectations and high performance define the standard of care. A culture of excellence requires a leader (*or leaders*) with an uncompromising vision. Ideally, the administrative director and

the medical director should share this vision. Practically they should meet regularly – perhaps weekly – to jointly administer and plan all aspects of the EMS program. The two of them, together, should establish a long-term plan to create and maintain a culture of excellence. Some people would argue that a high-quality EMS system demands such a culture. An equal number would claim that creating a culture of excellence is extremely challenging. No doubt it is. Nevertheless, a culture of excellence, hard though it may be to define or measure, is probably a key factor separating great systems from those that are merely satisfactory.

Administrative and medical leadership together must enhance training and continuing education and make medical QI the means of constant improvement. Excellence also requires buy-in from the extended EMS family of dispatchers, EMTs, and paramedics. When



*Michael K. Copass, MD, Professor, University of Washington
Harborview Medical Center/Seattle Medic One*

VIDEO

EMS providers recognize the presence of sincere, mission-driven leadership, as opposed to lip service, they respond to the positive culture and contribute to it as well.

The Medical Model

A culture of excellence can be achieved in any organization model. However, we believe such a culture can more easily be accomplished in a system that is based on a medical model. What is meant by a medical model? It is a system in which a medical director plays a large role in determining and supervising the quality of medical care. Specifically, a medical model of EMS is a system in which the medical director is responsible for the following seven areas:

Medical Director - Areas of Responsibility

- protocols for dispatchers, EMTs, and paramedics
- medical supervision online and offline
- evidence-based practice
- ongoing medical QI
- training and continuing education
- controlled substance policies
- medical discipline

There is an eighth optional area of responsibility, namely, ongoing research studies. Continuous studies (*to push the envelope of knowledge*) create a sense of being part of a larger enterprise and helps foster a desire to contribute new evidence-based knowledge

to the world of EMS. These studies do not have to be randomized clinical trials. One can embark on small-scale projects and still make a contribution. The studies need not necessarily be published in peer-reviewed journals – merely sharing the findings with the personnel, can be rewarding and help to achieve a sense of pride.

A medical model does not require that the physician director run the entire system. In fact, the less administrative involvement by the medical director, the better. The medical director should be responsible for the quality of medical care and establish high expectations and see that they are being met. The EMTs and paramedics must be accountable to the medical director for the quality of their care. The ideal system would have the administrative director responsible for budget, operations and personnel matters and the medical director responsible for patient care. And in the best of all worlds the two would work closely in partnership since their responsibilities complement each other. The medical director should not deal with hiring, though he or she should have a say in who is hired. And we don't expect the doctor to directly fire anyone, though we expect him or her to work with the administrative director to limit, suspend or terminate an EMT or paramedic whose medical care is substandard. In Seattle and King County, there is a phrase that encapsulates the critical role of the medical director: The EMT or paramedic practices under the medical license of the medical director. In essence, the clinical buck stops with the medical director.

How does one create a medical model? Certainly there is no guidebook to follow and probably many if not most EMS programs think they have a medical model. The test is whether

the medical director has responsibility for all the seven areas above. Why stress the concept of the medical model? Because the medical director is so importantly involved in every link in the chain of survival and every piece of the frame of survival.

Medical directors are appointed in various ways. Whatever the process, the medical director must have the authority to supervise a system that uses a medical model of EMS care. The medical director must clearly state and constantly promote high expectations, and the EMTs and paramedics must be accountable to the medical director for their patient care.

It is desirable (*though not always possible*) that the medical director have an academic appointment and be jointly appointed by the EMS administrative director and by the academic dean or department chair. An academic appointment ensures accountability. Moreover, an academic physician is generally one who is committed to furthering learning, and one who probably has knowledge about epidemiological principles and research methodologies. This is not to say that every medical director must conduct research – far from it, but only that the director must understand the benefits and limitations of data, and know how to interpret (*and not over interpret*) this information. An academic medical director has access to all the expertise of an academic medical center and can turn to colleagues in cardiology, anesthesiology, pediatrics, obstetrics, trauma surgery, endocrinology, biostatistics, epidemiology, preventive medicine, health services, and toxicology to get answers about clinical issues and to seek help in guiding policy.

What can a community do if it is geographically distant from an academic medical center? Many centers offer clinical appointments

to individuals who are in service roles in the community, or who help with the teaching mission of the university. Many deans and department chairs in emergency medicine would welcome a conversation with a community's elected officials or its EMS administrative director and would be pleased to help establish a clinical appointment for the community's medical director. It is also advantageous for a community to partner with an academic medical center, which probably already serves as the regions trauma center.

A partnership between a local community and an academic medical center can be a win-win proposition.

The EMS program can provide training opportunities for emergency medical residents and help partner with the medical school on EMS fellowships. The medical center can provide clinical expertise, communications expertise, database management, and managerial experience and can cooperate with local medical directors to establish regional consortia of EMS medical directors and programs. An academic medical center, after all, has a mission to serve the larger community, and the goodwill and reciprocity generated by this kind of effort can reap big dividends.

Continuous Quality Improvement

A culture of excellence also demands ongoing quality improvement. The medical director, with the support of the administrative director, is responsible for conducting QI audits of the EMS system. The cultural norm says we (*all of us who provide care*) are measuring how we perform in order to perform even better.

Medical QI can involve any aspect of EMS care. As it relates to cardiac arrest, however, the substrate for continuous QI is the cardiac arrest registry. Without QI, the cardiac arrest registry is just a collection of facts. With QI, the registry becomes the basis for improvement.



QI can occur at the macro level (*system level*) or micro level (*components of the system*) and even at the level of an individual resuscitation. At the system level one should be able to determine the survival rate for witnessed VF. For the micro level, QI bores down to the components of the system.

For example:

What is the average time to...

- CPR? Defibrillation? What percentage of arrests have bystander CPR?
- Telephone CPR? What is the average time to deliver CPR instructions? The time intervals from the 911 call to CPR and defibrillation are critical to measure. Measuring these time

intervals can be challenging but without this information it will be like trying to solve a puzzle with several key pieces missing.

Most EMS systems report response time (*time from call to arrival at scene*). However, in many centers the actual call occurs seconds (*sometimes a minute or more*) before being keyed as an EMS call. Thus the actual call occurred before the response time clock starts ticking. And arrival at scene occurs a minute or several minutes before someone touches the patient. Measuring time intervals in EMS is a maze. The point, however, is that there are unmeasured time intervals prior to the so-called response time and unmeasured time intervals after the response time.

What really matters is the interval from the first ring in the primary PSAP to contact with the patient including who starts CPR, when it starts, and the exact time of the first defibrillatory shock. At the level of individual cases QI should routinely try to piece together the key interventions. This is particularly important for VF cases when the patient did not survive.

If one starts with a mindset that every case of VF should survive, then, when the patient does not survive, the question becomes, Why not?

Important Questions

- Who started CPR?
- What was the time to CPR?
- What was the time to first defibrillation? (total number of defibrillatory shocks)
- Were telephone CPR instructions offered?
- Did the dispatcher recognize agonal respirations?
- Was there rapid dispatch? (What was the time to dispatch the first-in unit?)
- What was the interval between EMTs arrival at the patients side and delivery of the first shock?
- What was the density of CPR between two shocks?
- After the first defibrillatory shock, how long did it take to resume chest compressions?
- Did CPR occur for two minutes between shocks?
- Was the patient intubated? (How many attempts were required for intubation?)
- Was an alternate airway used? (Such as laryngeal mask airway)
- Was an intravenous line started? (Was it peripheral, central, or interosseous?)
- When was hypothermia started?



Every link and every sub link in the chain of survival can be studied; the number of possible QI projects is limited only by resources and by the accuracy of the registry's data. An EMS system should never become complacent. There are always opportunities for improvement, and continuous QI is the way to bring it about.

Improve Skills among Paramedics, EMTs, and Dispatchers

Improvement in skills, is another part of a culture of excellence. Training for excellence. The cultural norm says that we (*again all of us who provide care*) train in order to improve our skills. Paramedic's skills improve with a combination of training, continuing education, and actual performance. In Seattle and King County, paramedics are required to perform 12 intubations and 36 IVs every year to maintain certification. Paramedic staffing correlates directly with opportunities to perform critical skills. There are strong advocates for various types of paramedic staffing in EMS programs. In Seattle and King County, a tiered response system is utilized and paramedics are sent only to the most serious calls. Thus, they are able to maintain critical skill such as endotracheal intubation and central vein IV placement. In other systems, a paramedic is sent to all EMS calls. These programs assume that service is thereby improved, since every call, regardless of the seriousness of the emergency, will have a paramedic in attendance. But the unintended consequence is less opportunity for any single paramedic to practice critical skills. It is unclear whether a high or low ratio of paramedics to total population served, is associated with community cardiac arrest survival.

As for EMTs, the care provided by these personnel is the foundation for all subsequent care delivered during an attempted resuscitation. If that foundation is of poor quality, the entire care structure is jeopardized. EMTs can do a great deal to treat ventricular fibrillation definitively, or to prime the patients body with high-performance CPR for further intervention by paramedics. The details of CPR and defibrillation often determine the outcome, and the key to positive outcomes is training.

Emergency dispatchers are also members of the EMS team. They have the critical role of mobilizing the EMTs and paramedics and seeing that telephone CPR begins before EMS personnel show up. Dispatchers training, practice and skill review are as important to positive outcomes as are high-performance CPR and defibrillation. A highly trained dispatcher can, with rapid dispatch, easily save thirty to sixty seconds in the initial dispatch and, by offering telephone CPR instructions, can significantly increase the likelihood of the patients survival.



Putting Plans into Action

Overcoming Challenges

This guide lists 10 steps that will lead to improved survival. There are four easy steps (*the low-hanging fruit*) and six more difficult steps (*the higher-hanging fruit*). But one community's easy, may be another community's difficult. An EMS director or manager, partnering with the medical director, must decide what can be achieved in his or her own community. Whether one selects an easy or more challenging step the key is to begin. Success with one step will create momentum for tackling others. The steps listed above provide the overview and general approach to implementation. Missing are detailed game plans as well as the specific tools to implement the programs. Reading a short description of high-performance CPR, or dispatcher-assisted CPR, or rapid dispatch may convince you of the importance and need of such programs but how do you bring them about?

The [Resuscitation Academy](#) began in 2009 with the goal to improve cardiac arrest survival. Its tag line is "Improving cardiac arrest survival, one community at a time." It was apparent from the first Resuscitation Academy class in 2009 that the lectures, breakout sessions and workshops could only go so far. We, the faculty, needed to spell out the details of how to implement the various programs we were talking about. The [Resuscitation Academy Tool Kits](#) were developed to do just this. They provide a how to guide, for setting up various programs within local communities. But even tool kits have limitations and we realize

how hard it can be for local communities to implement the various programs. We think more attention must be focused on the challenges of implementation and the need to mobilize local community resources. Thus the last portion of this chapter tries to shine a beacon on the difficult topic of implementation.

Implementation



Hendrika Meischke, PhD
Professor of Health Services, University of Washington VIDEO

Hendrika Meischke, PhD is a Professor of Health Services at the [University of Washington](#). We have been colleagues in the world of resuscitation research for over 20 years. We both wonder what it takes for communities to implement some of the recommendations in this guide as well as the lessons and programs of the [Resuscitation Academy](#). The question is also gaining attention at the national level – the [American Heart Association](#) recently published a consensus statement in 2011 appropriately called “Implementation strategies for improving survival after out-of-

hospital cardiac arrest in the United States.” Why does community A embrace these recommendations and transform their system and why does community B, given the same information, do very little to improve resuscitation? What is the secret sauce? Definitive answers are elusive, though there is no end to possible explanations. Is it individual charisma? Is it leadership? Is it complementary personalities? Is it legislative mandates (*funded or not*)? Is it adequate resources? Certainly some or all of these may provide part of the explanation. Common sense says that an effective leader can be a catalyst for change (*I have seen very strong county medical directors almost single handedly make substantive and dramatic changes in their EMS system*) but such individuals are relatively rare and often the changes evaporate when that individual leaves or retires. Thoughtful implementation will facilitate meaningful change.

Three complementary features can enhance the likelihood of successful implementation.

First, the core components (*cardiac arrest registry, assertive dispatcher-assisted CPR, high-performance CPR, rapid dispatch*) must be in place.

Second, there must be fidelity to the core components. The best way to achieve fidelity is to define performance standards and use QI to measure the actual performance. This makes sense since, as is all too common, there is a large gap between perceived performance and actual performance.

Third, the EMS program must adapt to the local situation. Again, this makes sense since only through mobilization of local resources can there be any chance of undertaking new initiatives. Change, always difficult, is best smoothed with local buy in and support.

Implementation is not easy and this guide concludes with 5 specific actions on how to implement changes in your local community.

The Four Actions

Action 1: Form an advisory board: We believe the most important ingredient in the sauce of implementation is a team effort with a shared vision. The vision can be as simple as Improving survival from out of hospital cardiac arrest. The advisory board or steering committee (*or whatever term you use*), should ideally be led or co-led by the EMS director (*or fire chief or chief of EMS operations*) and the medical director with a core group consisting of the dispatch director, the head of EMT and paramedic training, the QI officer (*if one exists*), a representative of the local hospital (or local hospital association) and ideally a political leader (*mayor or council member*) and a citizen. The latter could be the head of a local philanthropic organization such as the Kiwanis or Rotary club. This core group may be ad hoc or formal (*in other words commissioned by the mayor or council with formal appointments*), and all it takes is one fired-up individual to catalyze the initiative. Large communities should have a full or at least a part time staff person who is accountable to the advisory board and can keep everyone on task and maintaining forward momentum. The staff person should be thought of as the site coordinator who works on behalf of the advisory board.

Action 2: Determine how to make it happen in your community. Every step in this chapter must be customized to the local system and its strengths. There is no one pattern. Rochester, MN has a completely different EMS system from Seattle and King County.

And yet both achieve high survival rates proving that there is no ONE system. Each EMS leader must mobilize and strategize based on what is possible locally.

Action 3: Set specific goals. This group must be realistic. they will not transform their system overnight and they should set attainable goals achieved by plucking the low hanging fruits. Progress will likely be slow and iterative (*step by step*). But once on the path to improvement there is no stopping that community.

Action 4: Establish performance standards. For example earlier in this guide possible performance standards for dispatcher-assisted CPR and high-performance CPR were listed. Let everyone know what the standards are why they matter. Then provide the training and support to meet these standards. Constant (*and timely*) feedback is also part of the equation.

There are regrettably few, if any, national performance standards for resuscitation. A 2011 consensus paper from the American Heart Association calls for specific benchmarks and quality improvement goals for out of hospital cardiac arrest. These goals span the spectrum from medical leadership to dispatch to EMS and hospital care. Whether one agrees with the specific goals, is in some way less important than the fact that performance standards are becoming part of the national dialogue on how to improve survival rates. The following are possible standards for an urban EMS system and are meant to complement the 10 specific steps at the beginning of this guide. Note how the standards are weighted heavily toward bystander CPR (*whether by a trained person or as a result of dispatcher assistance*) and the rapid delivery of CPR and defibrillation standards that will surely lead to improved survival.

One might consider different standards for urban and rural EMS systems. But whatever the standards are, adherence to them should be mandatory, and reported to the members of the EMS agency and governing board.

- Bystander CPR in more than 60 percent of witnessed cardiac arrests
- Dispatcher-assisted CPR in more than 50 percent of all cardiac arrests (*excluding arrests when bystander CPR is in progress at the time of call*)
- Less than five minutes between pickup of the call to 911 and the arrival of EMTs at the patients side more than 90 percent of the time
- Less than six minutes between pickup of the call to 911 and the first defibrillatory shock more than 90 percent of the time
- Less than ten minutes between pickup of the call to 911 and the arrival of paramedics at the patients side 90 percent of the time
- Use of voice and heart rhythm recordings in all resuscitations
- Medical directors review and critique of all resuscitations
- A community survival rate (*discharge from hospital*) of 25 percent for patients with witnessed VF

Action 5: Measure and improve. Ongoing measurement of survival and ongoing QI are vital. A cardiac arrest registry need not be onerous. It can take as little as 10-15 minutes to register the data. Similarly analysis of cardiac arrest CPR performance or dispatch performance need not be exhaustive. Ten to fifteen

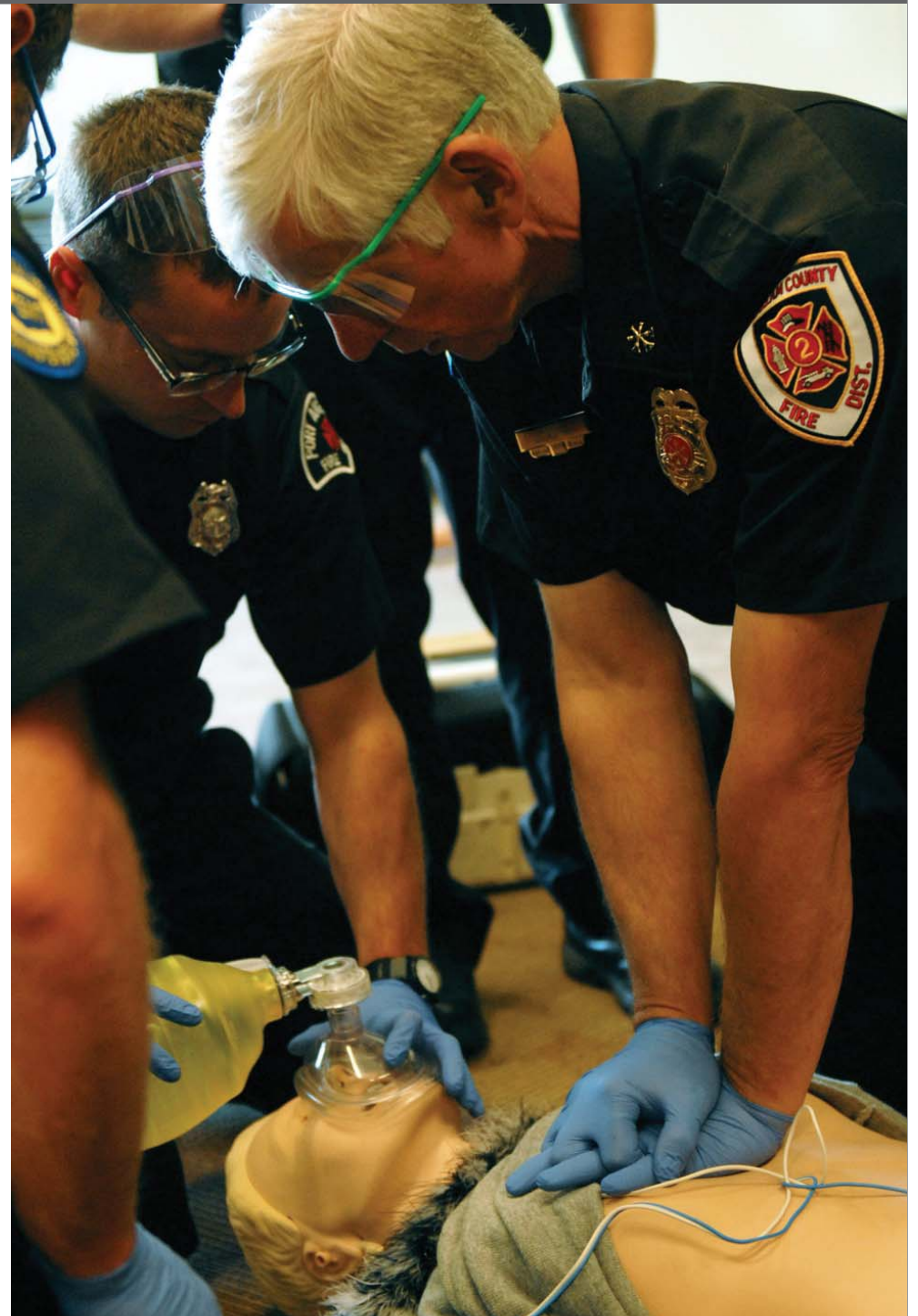
minutes should provide the vital elements of QI and will certainly provide the information needed to monitor the system and allow for feedback to the individual EMS personnel and individual dispatchers. Praise is given for good performance, and for the less than good performance, we always stress the challenges of the task and ask how it can be done better the next time. We have never used QI information in a punitive or disciplinary manner.

These five implementation actions help define the frame of resuscitation. The metaphor of a chain of survival and a frame of survival fit nicely with the concepts of resuscitation. The chain of survival is all about the specific therapy, particularly providing CPR and defibrillation as rapidly as possible and with as much fidelity as possible. The frame of survival is all about the qualitative factors leadership, culture, ongoing training and QI. These are the stuff of implementation: establish an advisory board (*leadership*), set specific goals (*vision*), establish performance standards (*culture*), determine how to make it happen (*training*), measure and improve (*QI*).

Clearly, the links in the chain and the qualities in the frame are integrally linked. Put them together and lives can be saved.

A Vision Of The Future

We believe that survival from VF in many communities could reach 60 percent. Some communities are already near 50 percent. In King County we will approach 60 percent in the near future with meticulous application of high-performance CPR and intensive training in recognition of cardiac arrest and delivery of dispatcher-assisted CPR. For communities currently at the 10, 20, 30, or 40 percent survival rates, we cannot guarantee a sudden surge to 60 percent, but we do think dramatic increases in survival are possible. From the many inspiring success stories alumni have shared since attending the [Resuscitation Academy](#), clearly this is evidence that improving survival rates from cardiac arrest is not only a possibility for the future, but can, with focused and concerted effort, be possible now.



Finding Your Own Path

Remember two of the opening mantras: “Change occurs step by step” and “It’s not complicated but it’s not easy”. Those are good reminders as you embark on the difficult but rewarding journey to improve cardiac arrest survival in your community. We hope this guide will motivate you, not only to start the process of improvement in your community, but also to attend a future Resuscitation Academy class. The classes are offered tuition-free twice a year, typically in March and October. Each class is 2 days long. We also offer one day focused Academies on Dispatch-assisted CPR and High-performance CPR. Information about future classes and how to register, as well as free downloads of the toolkits, may be found at the [Resuscitation Academy website](#).



*Mickey Eisenberg, MD, PhD
Medical Program Director, King County EMS
Professor of Medicine, University of Washington*

VIDEO

Hope to see you



in Seattle!

The Resuscitation Academy



The tag line for the Resuscitation Academy is, “improving cardiac arrest survival, one community at a time.” Since the first Academy class in 2009, we have been trying to do just that. The Resuscitation Academy, held twice a year in Seattle, is a joint effort of King County EMS (*Public Health – Seattle and King County*), Seattle Medic One (*Seattle Fire Department*), and the Medic One Foundation.

Additional support comes from [Harborview Medical Center](#), [University of Washington](#), [Asmund S. Laerdal Foundation for Acute Medicine](#), [Life Sciences Discovery Fund](#) and the [Medtronic Foundation HeartRescue Program](#). The faculty members are veterans in directing EMS programs as well as distinguished researchers in resuscitation science. My back of the envelope calculation says that the faculty members collectively represent 300 years of EMS experience.

“The Academy broadened my awareness & knowledge of the science of cardiac resuscitation. It convinced me that measuring outcomes is absolutely required for improving system performance.”

— *Resuscitation Academy Alumnus*

The Resuscitation Academy is offered tuition-free and attendees come from throughout the country (*and world*). The small class size allows for a two-way exchange of Information – the faculty provides evidence-based information and tools to improve cardiac arrest survival and the attendees share the real-life challenges they face. Every community has a different constellation of culture, leadership, resources, and opportunity. Above all we (*the faculty*) have learned that change is very challenging and one should never assume that just because someone comes along with a good idea that it will be embraced and implemented. Impediments to change, whether they stem from habit, inertia, malaise, or lack of

resources, will overwhelm the best of intentions. We have also learned that no system will transform itself overnight. Change is not only difficult, it occurs slowly – tiny step by tiny step.

Resuscitation Academy Website

Information about the Academy may be found at: www.resuscitationacademy.org. The most recent curriculum is posted on the site as well as upcoming Academy classes and registration information. Though we have experimented with different lengths for the Academy ranging from one to five days, we have settled into the 2-day length that works well for us, and allows a nice mixture of lectures, small group discussions, workshops and breakout sessions. We expect every student to



Resuscitation Academy website

<http://www.resuscitationacademy.org>

select a project to implement in his or her home community upon return from the Academy. We limit each Academy to 35-40 students in order to maintain a small group seminar feel to the class. Plus, the small class allows the faculty to get to know the individuals and vice versa.

The Academy's Main Message

The Academy encapsulates the collective experience of decades of running the [Seattle Medic One](#) and [King County EMS](#) programs. Quantitative and qualitative factors explain a system's success or failure in managing cardiac arrest. The combination of measurable and "softer" factors was conveyed in the figure of the [chain of survival](#) (*measurable quantitative factors*) surrounded by a [frame of survival](#) (*"softer" qualitative factors*). The operant message is that the chain of survival and the frame of survival provide a complete package for success. The Academy obsesses on that message and



takes it further by offering concrete instruction on how to implement change.



Resuscitation Academy Tool Kits

The Resuscitation Academy provides toolkits on the following topics:

- Cardiac Arrest Registry
- High Performance CPR: Training, Implementation, and QI
- Dispatcher Assisted CPR: Training, Implementation, and QI
- Community CPR - Community Public Access Defibrillation
- Police Defibrillation
- End of Life Issues
- Foundation and Fundraising

[Download Resuscitation Academy toolkits](#)



The tool kits are not exactly recipe books with specific steps for each program. Rather, they provide the information, background, training materials, sample letters, sample forms, references and resources, and a general approach to achieving buy in from directors and managers, as well as the dispatchers, EMTs, paramedics, and police. While they provide important tools, the contents of each kit must be applied and/or modified based upon resources and leadership within the attendee's community.

While most of the kits are directed toward the chain and frame of survival there are two kits that provide supplemental information. One is on End of Life Issues, and the other tackles the challenging matter of raising funds. Most EMS programs face increasing demand for services and programs while grappling with decreasing resources. When EMS personnel are being laid off it seems hardly the right time to take on new programs requiring new staff or additional resources. But we think there are ways to create additional resources. Call it the margin of excellence to make the system better, even in the face of difficult economic conditions. One of the tool kits specifically addresses how to establish a local foundation or partner with an existing foundation and engage in fundraising. Several communities have used the information in this kit to find resources for new equipment and fund additional staff time for QI activities.

The tool kits are publicly available on the [Resuscitation Academy website](#). Tool kits (*pdf format*) may be downloaded free of charge. All the information on the website is free.

The faculty considers the Resuscitation Academy to be a work in progress. We strive to make each Academy better than the one before. In addition to the two-day Academy, we offer one-day mini Academies focused on dispatcher-assisted CPR and high-performance CPR. Such mini Academies can better reach the folks directly responsible for training and QI. We continually learn from attendees on what works best and what needs to be modified. We have welcomed the opportunity to partner with EMS leaders in other states to assist with starting up regional Resuscitation Academies.



Acknowledgements & Resources



Over 500 people, from the United States and the World have attended the Resuscitation Academy. The faculty would like to thank the Academy alumni for teaching us about their EMS systems and the enlightening us on the unique challenges they face. We thank them all for serving as change agents in their community, and for their willingness and passion to be catalysts for improving cardiac arrest survival. We think this small army of believers will do wonders in their community.

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Resuscitation Academy Contributors

Jennifer Blackwood
Megan Bloomingdale
B.A. Bosaiya
Pam Bryson
Leonard Cobb, MD
Michael Copass, MD
Linda Culley
Susan Damon
Ann Doll
Mickey Eisenberg, MD
Peter Kudenchuk, MD
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Jennifer Blackwood – Photography
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Mickey Eisenberg, MD – Writer & Editor in Chief
Rebecca Watson – Designer, Image Editor, Digital Producer

Resources

Websites

[Resuscitation Academy](#)

[Resuscitation Academy Toolkits](#)

[Resuscitation Academy Alumni Facebook Page](#)

['Resuscitate! How Your Community Can Improve Survival From Sudden Cardiac Arrest' \(Second Edition\)](#)

[Learn CPR](#)

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