

The Unacceptable Disparity in Cardiac Arrest Survival Among American Communities

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The community in which an individual lives is the biggest factor determining whether survival or death follows out-of-hospital cardiac arrest. Consider the facts. Survival (discharged alive from hospital) from ventricular fibrillation in US cities ranges from 0% to 46%. Ample studies during several decades,^{1,2} including a recent publication from the Resuscitation Outcomes Consortium,³ document this disparity: Detroit, 0%⁴; Chicago, 3%⁵; New York, 5%⁶; Los Angeles, 7%⁷; Alabama, 8%³; Salt Lake City, 8%⁸; Dallas, 10%³; Rochester, NY, 10%⁹; Memphis, 12%¹⁰; Tucson, 12%¹¹; San Francisco, 15%¹²; Fresno, 15%¹³; Houston, 15%¹⁴; Minneapolis, 20%¹⁵; Pittsburgh, 22%³; Portland, OR, 23%³; Iowa, 23%³; Miami, 24%¹⁶; Milwaukee 26%³, Seattle, 46% (L. Cobb, personal communication, January 2009 [data are quoted for witnessed cases of ventricular fibrillation]), Rochester, MN, 46%¹⁷; and King County, 46%.¹⁸ We include here only studies with at least 100 cases of ventricular fibrillation. Also, some of the above rates are for all cases of ventricular fibrillation and some used witnessed ventricular fibrillation for the denominator, but we think the point is clear. Variability in survival is only part of the problem. In more than 4 decades of out-of-hospital cardiac arrest research, it is notable that fewer than 50 communities have reported their experience. Is the situation in the rest of the country good, bad, or terrible? We simply don't know. Whatever the service or product, we expect a reasonable standard of quality and a reasonable level of consistency from community to community. For some products and services, we actually have national standards and national enforcement. But with cardiac arrest, we have no such standards, no agency monitoring the quality of service, no political groundswell demanding improvements, and no public outcry for change. Admittedly there are large differences in community resources between rural and urban communities, and any future standards must take these differences into account, much like the National Fire Protection Academy Standard 1710 proposes different performance standards for different types of fire departments.¹⁹ It is likely that defined

standards for management of cardiac arrest can serve as a template for system-wide improvement and consistency.

This disparity in survival from cardiac arrest stares us in the face. Why does it exist? What can be done? A cardiac arrest, especially witnessed ventricular fibrillation, is treated in a very straightforward manner. The American Heart Association's chain of survival metaphor lists the key ingredients for success²⁰: rapid access (call 911 immediately), rapid cardiopulmonary resuscitation (CPR) (with a trained bystander or as a result of dispatcher-assisted telephone CPR), rapid defibrillation, and rapid advanced care (airway protection, intravenous access, medications). A fifth link is probably indicated as well: early postresuscitative care (specifically hypothermia^{21,22}). Certainly much if not most of the disparity among communities can be explained by the speed with which these interventions occur,^{23,24} though it is also likely that there are other factors, more difficult to quantify, that are perhaps just as important as the time intervals. These may include leadership, training, skills, institutional culture, and quality improvement.

Emergency physicians and emergency medical services (EMS) medical directors from all disciplines can play a pivotal role in improving cardiac arrest survival. We are often the ones who medically direct EMS programs, write the protocols, and conduct quality improvement. And, of course, we are the ones who often provide online medical control and ultimately receive the unstable and critically ill patients. Those of us who are EMS medical directors must challenge ourselves to accurately measure cardiac arrest survival in our community and then set in motion a plan to implement mandatory changes. We offer 4 suggestions for immediate implementation.

1. Develop a community cardiac arrest registry. Measuring your current survival rate is the sine qua non before embarking on a plan.
2. Establish rapid dispatch for cardiac arrest. When the caller reports symptoms compatible with cardiac arrest, dispatch the EMS unit(s) immediately and obtain additional information from the caller only once the unit(s) is en route. This can save 30 to 60 seconds in some communities.

3. Begin an aggressive program of dispatcher-assisted telephone CPR. Dispatchers can play a large role in providing instant CPR instructions²⁵ and in so doing may allow just enough blood to circulate so the patient is still viable when EMS arrives.
4. Promote early defibrillation.²⁶

Patients whose cardiac arrests occur in public locations are very likely to have a witnessed collapse, receive bystander CPR, and be in ventricular fibrillation. These patients have an excellent likelihood of survival if a defibrillator reaches them quickly. Community programs to encourage automated external defibrillators in public offer great potential. In King County, approximately 8% of all ventricular fibrillation episodes have a public automated external defibrillator applied before the fire department arrives. Survival in this publicly treated cohort exceeds 50%. Police trained and equipped with automated external defibrillators is yet another way to achieve rapid defibrillation.^{17,27,28} For police automated external defibrillator to succeed, the police must be dispatched simultaneously with EMS personnel. Most important, the police chief or delegate must be a vocal supporter and be willing to work closely with the medical director. We think integration of police automated external defibrillator into the EMS system offers an untapped reserve of benefit.

These suggestions represent an immediate action plan. Incorporating them will require support, buy-in, adequate resources, and ongoing commitment from the dispatch center director, the EMS administrative director, the medical director, and perhaps even elected officials. We believe such an effort could produce positive changes relatively quickly, and with minimal resources.

There is another strategy that could complement an immediate action plan or serve as a separate endeavor. This strategy entails a case audit using all available clinical information but begins with a unique perspective on ventricular fibrillation, one which assumes that every patient with a witnessed ventricular fibrillation cardiac arrest should survive. If the patient does not, the goal is to determine why. We believe the medical director should personally conduct these case audits. The first step is to gather all available system and clinical information on the ventricular fibrillation episode: dispatch center tape and time data, all run reports, death certificate, autopsy report (if done), even telephone interview with bystanders or relatives. If the cause of death is attributed to patient characteristics (significant comorbidity, for example) or circumstances (such as delay in reaching a telephone or misidentification of cardiac arrest by the bystander), one may consider the death to have been unavoidable. But if the poor outcome is a result of factors attributable to the EMS system (such as delay in dispatch, delay in roll-out, long response time, failure to provide telephone CPR instructions, delay in defibrillation) then one could conclude this was a potentially avoidable death. It would not take many such detailed analyses to identify those portions of the EMS system in need of

attention. The audience for such an audit should be the EMS administrative director, as well as the EMS personnel. The goal should be to achieve system improvement and not to discipline individuals.

From our own audits of witnessed cases of ventricular fibrillation, we have explained why some patients who should have survived (in other words, all the time elements were short) did not. For example, the patient in one arrest in which telephone CPR was apparently provided did not in fact have CPR. The wife, when interviewed on the telephone, indicated that she could not get her husband flat and was merely pressing on his chest while he was sitting in a chair. Thus, what appeared to be a death without a discernable cause in fact had delayed time to CPR. This case was emphasized in dispatcher continuing education to make sure the patient is flat before providing chest compression directions. Further information, as well as data collection tools for an EMS cardiac arrest registry, is available online at <http://survivecardiacarrest.org>.

Many communities deserve credit for the good efforts they are making. For example, the Cardiac Arrest Registry to Enhance Survival project is a multisite effort to improve community CPR survival rates (available online at <http://mycares.net>).²⁹ Another effort is the Take Heart America program (available online at <http://takeheartamerica.org>), currently comprising 4 communities in 3 states. And we applaud those medical directors and researchers who rigorously study their community's survival rate and have the courage to report their findings even if abysmal, knowing it is the first important step toward improvement.

We are not so naïve as to think that EMS systems can establish meticulous QI for cardiac arrest overnight. Nor do we believe that systems mired in their unique histories, politics, and inadequate resources can easily transform themselves. It may well be that many EMS systems do not view cardiac arrest as a medical problem but rather as an organization or bureaucratic problem, one in which properly trained personnel must arrive within predefined time limits. Thus, the medical model focused on outcomes takes a backseat to a bureaucratic model focused on process measurements.

Although we believe medical leadership is key and the above steps will improve matters, we also think fundamental improvements will occur only when there is comparable oversight and regulation of out-of-hospital medical care, as there is for hospital medical care. Currently, there is no meaningful oversight and regulation of out-of-hospital clinical performance. There is no lead government agency for EMS, no clinical performance standards, and no mandatory reporting of key conditions (and what could be more critical than management of ventricular fibrillation?). There is also no public indignation decrying the wide disparity in cardiac arrest survival. A logical first step would be mandatory reporting of ventricular fibrillation survival.³⁰ Such information might energize an apathetic public and provide medical leadership with the

evidence needed to bring about programmatic changes. An enlightened public, combined with medical leadership, makes for a powerful team.

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