A Critic’s Assessment of Our Approach to Cardiac Arrest
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In this issue of the Journal, Weisfeldt et al. report that ventricular fibrillation is identified less frequently during sudden cardiac arrest in the home than in public places, even when the arrest is witnessed. The authors surmise that age and coexisting illnesses are responsible and that the location of sudden cardiac arrest may be a surrogate for underlying disease severity. In addition, poorer outcomes were observed with use of the automated external defibrillator (AED) in the home, as compared with public AED use. The authors conclude that perhaps AEDs should be reserved for public locations and cardiopulmonary resuscitation (CPR) should be taught more broadly, as the better path to improving survival from sudden cardiac arrest. This research is controversial in several respects.

Does this study really show that ventricular fibrillation in sudden cardiac arrest occurs less often in the home than in public? Without electrocardiographic (ECG) data regarding the onset of the event, we cannot know for certain. What we do know is that untreated ventricular fibrillation will deteriorate to asystole over a period of minutes, and probably more rapidly in patients with more advanced cardiac disease; after 25 minutes, nearly all patients are in asystole. Although primary bradyarrhythmias as the cause of sudden cardiac arrest are becoming more common, most instances of bradycardia — specifically asystole — follow ventricular fibrillation. These considerations alter the interpretation of the findings that Weisfeldt et al. report. If the home rescuer takes just 60 seconds longer to call 911, as compared with the public witness, then the findings could be explained simply as a matter of response speed. The Home Use of Automated External Defibrillators for Sudden Cardiac Arrest trial (NCT00047411) showed that spouses confronted with the sudden collapse of a loved one commonly exhibit emotional distress and confusion, thus delaying an effective response.

How much time actually elapses between witnessing and assessing the collapse and dialing 911? Does this interval differ between the home and the public setting? Does it differ between those who have CPR training and those who do not? Knowing the answers to these questions has broad implications. The greater number of bystanders who witness sudden cardiac arrest in public makes calling 911 more likely to occur closer to the time of collapse. Moreover, those who have completed CPR courses know that they should call 911 promptly. Because seconds matter, even a modest delay in the 911 call could lead to differences in outcome. Consequently, the lone rescuer at home, who is probably less aware of the critical importance of speed, would lose the race to a public bystander.

What about AED use in the home? Certainly, at present, no grounds exist to broadly promote publicly financed home AEDs. However, this policy assessment should not dissuade persons from purchasing their own AEDs. The dismissal of home AEDs is premature, and other than the personal expense, there is no known downside from such a purchase. Moreover, some home rescuers do indeed act quickly and can save a life. Perhaps the presence of ECG monitoring technologies in the home would prompt a more rapid response and shave off valuable seconds to minutes, improving outcomes of arrests at home.

As an alternative to a home AED, the increased use of CPR does not make sense to me. At best, CPR represents a placeholder. Overall survival rates remain poor, and 300,000 sudden cardiac deaths still occur annually in spite of national CPR awareness. One simple reason for such gloomy results may be the logistic impossibility of responding to a broadly disseminated, quasirandom event that causes death within minutes. Yet there may be another, more subtle reason for this bleak lack of progress. If CPR were a drug or a surgical procedure, its value would be tested prospectively, but it has not


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been. Could it be that innovation in the field is hampered by a reluctance to let go of an entrenched approach that has only the appearance of value?

Last year, Weisfeldt wrote in an editorial, “In CPR, less may be better,” referring to compression-only CPR. In the research that Weisfeldt was commenting on, compression-only CPR was as good as compression along with ventilation, presumably because coronary perfusion was not interrupted by efforts to provide ventilation. Although this presumption was linked to studies in animals that I believe are irrelevant, it was the accepted explanation. Instead, this article could have triggered another explanation: that neither compression nor ventilation is of any value in typical cases of sudden cardiac arrest.

Knowledge of the absolute measured value of CPR would have a profound influence on the direction of research on sudden cardiac arrest and the conservation of resources. More than 40 years after its inception, CPR has never been compared with no CPR in a randomized trial involving patients with sudden cardiac arrest. Although not performing CPR is a heretical idea, it is not unethical; clinical equipoise does exist for the comparison of chest compression with no compression.

Consider six factors. First, improvements in resuscitation (e.g., at airports and in casinos) have been driven by the prompt availability of AEDs, not CPR. Second, the broad national outcomes after sudden cardiac arrest have remained essentially unchanged for the past 40 years. Despite a national awareness and acceptance of CPR, we still have 300,000 deaths a year, with a dismal overall survival rate to hospital discharge of 8.4% even with EMS assessment (from 20,520 sudden cardiac arrests in 10 large resuscitation systems). Third, could it be that the perceived benefit of CPR represents merely a more prompt 911 call made by a bystander with CPR training, thus increasing the likelihood that the patient has a shockable rhythm? Fourth, we should not ignore the financial incentives in maintaining the proposition that CPR is useful. The lion's share of the budget of many nonprofit organizations, including the American Heart Association, comes from teaching and licensing CPR courses. Several corporations exist solely because of CPR.

Fifth, CPR is not harmless. Coronary arteries can be crushed, livers lacerated, and esophagi ruptured. Aspiration is a nearly universal occurrence with mouth-to-mouth ventilation. In 705 autopsies after CPR, 18.3% showed mediastinal hemorrhage, 2.7% abdominal visceral or esophageal ruptures, and 9.8% pericardial bleeding, coronary air emboli, or lacerations of the great vessels and myocardium. Sixth, it has been suggested (but not proved) that CPR performed during organized rhythms after shock reinducers ventricular fibrillation in 22% of patients with sudden cardiac arrest.

It is time to reassess the value of CPR, not dismiss definitive therapy with defibrillation. On purely structural grounds, it is difficult to see how a prospective, randomized clinical trial comparing CPR with no CPR could result in a win for CPR if the time to the 911 call is equilibrated by means of randomization. The worse that can happen with a neutral trial result is that we stop spending hundreds of millions of dollars and millions of hours of “training” on a “therapy” that makes people feel good but does little else. The cold, hard facts of the persistently low survival rate with the already existing national embrace of CPR make it hard to do worse.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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