

## How Often Will an AED Advise the Rescuer to Shock?

A victim of Sudden Cardiac Arrest (SCA) has collapsed and is unresponsive. An AED is found on the premises and electrodes have been properly attached. The AED has ordered everyone not to touch the victim. An electrocardiogram (ECG) analysis of the victim's heart rhythm is in progress.

What is the probability that the AED will advise shocking this victim?

A shock will only be advised if the AED detects a ventricular fibrillating (VF) or ventricular tachycardia (VT) heart rhythm. A number of researchers in various parts of the world have, over the last few decades, investigated a large number of SCAs. None of them had set out to answer the question of how often an AED will recommend a shock, but all of them present data that allows us to make a reasonable estimate that about *one half the time* an AED will detect a VF or VT rhythm and advise a shock.

- Probably the largest and most thorough epidemiological study of cardiac resuscitation to date is a review of SCAs that occurred in King County, Washington, from 1990 to 1999.<sup>1</sup> From a total of 5,213 cases of cardiac arrest during that time, 2,071 victims presented VT or VF, for a total of **40%** for whom a shock would have been advised.
- A second study of SCAs in Finland,<sup>2</sup> published in 2001, found that over a five year period 771 SCAs were witnessed and responded to. Of these, 442 victims presented VF and 2 presented VT heart rhythms, for a total of **58%** of all victims for whom a shock would have been advised.
- Another study published in 2002 investigated 20 years of data from 1980 through 2000 in Seattle, Washington<sup>3</sup>, and found that of 2,686 SCA incidents that occurred over the 20 year period, 1,365 presented VF or VT, for a total of **51%** for whom a shock would have been advised.
- A fourth study published in 2003 reviewed SCAs from 1993 to 2001 in Basel, Switzerland,<sup>4</sup> and found that of 380 cardiac arrests, 205 presented VF or VT, for a total of **54%** for whom a shock would have been advised.
- A fifth study published in 2003 reviewed 19 years of data in Gothenberg, Sweden,<sup>5</sup> where the reviewers found that in a total of 3,089 cases of SCA, 1,577 presented VF or VT, for a total of **51%** for whom a shock would have been advised.
- A study published in 2004 reviewed SCAs in 17 different cities in Ontario Canada (the Ontario Prehospital Advanced Life Support Study Group, or "OPALS" study<sup>6</sup>) and found that in 5,451 SCAs over a 36 month period, 1,819 presented VF or VT, for a total of **33%** for whom a shock would have been advised. (This more recent lower percentage is consistent with the findings of some of the studies described above which, because they spanned decades, were able to show that over time the incidence of VF and VT as a percentage of all SCAs is shrinking. Why this is happening is a subject of some

controversy amongst researchers. Some believe the population may be getting healthier. Others believe improved medical care may help to shrink the percentage of SCAs that present VF or VT.)

- That most of the defibrillations accounted for in the articles above were performed by first-responders could be interpreted by some as a difficulty. Would the percentages of VF and VT rhythms go up, if infrequent rescuers were to be taken into account, and not any first responders? Apparently not, or at least not by much. The largest study ever performed of Public Access rescuers has just been published (called “the PAD Trial” being conducted by the US National Institute of Health) and found that in 128 SCA events where an infrequent rescuer used an AED (in most cases along with CPR), 71 events – that is, **57%** of the total – involved a victim whose first ECG analysis indicated a shockable rhythm. In all the other cases, no shock was advised and the rescuer had to move on to CPR.

Given the results of this research, ZOLL believes it is right to say that once a victim of SCA has been attached to an AED, the probability that the rescuer will be advised to shock the victim is approximately 50-50. For that reason, ZOLL believes that an AED designed for the infrequent rescuer needs to provide the best possible support for CPR, because once an AED has determined that no shock is advised, the most helpful thing the rescuer can do for the victim is to perform continuing, vigorous, and precise CPR.

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<sup>1</sup> M Eisenberg, T Mengert. “Cardiac Resuscitation.” *The New England Journal of Medicine*. 2001; 344:1304-1313.

<sup>2</sup> M Kuisma, J Reppo, A Alaspaa. “The Incidence of Out-of-Hospital Ventricular Fibrillation in Helsinki, Finland, from 1994 to 1999.” *The Lancet*. 2001; 358:473-474.

<sup>3</sup> L Cobb, C Fahrenbruch, M Olsufka, M Copass. “Changing Incidence of Out-of-Hospital Ventricular Fibrillation, 1980-2000.” *Journal of the American Medical Association*. 2002; 288:3008-3013.

<sup>4</sup> M Stotz, R Albrecht, G Zwicker, et. al. “EMS Defibrillation-first Policy May Not Improve Outcome in Out-of-Hospital Cardiac Arrest.” *Resuscitation*. 2003:277-282.

<sup>5</sup> M Fredrickson, J Herlitz, J Engdahl. “Nineteen Years’ Experience of Out-of-Hospital Cardiac Arrest in Gothenburg – Reported in Utstein Style.” *Resuscitation*. 2003; 58:37-47.

<sup>6</sup> I Steill, G Wells, B Field, et. al. “Advanced Cardiac Life Support in Out-of-Hospital Cardiac Arrest.” *The New England Journal of Medicine*. 2004; 351:647-656.

<sup>7</sup> AP Hallstrom, JP Ornato, M Weisfeldt, “Public-Access Defibrillation and Survival after Out-of-Hospital Cardiac Arrest.” *The New England Journal of Medicine*. 2004; 351:644.