

How Often Will an AED Advise the Rescuer to Shock?

A victim of Sudden Cardiac Arrest (SCA) has collapsed and is unresponsive. An AED **has** 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. **Researchers** in various parts of the world have, over the last few decades, investigated **more than 18,000** SCAs. **All** of them present data that allows us to **estimate** that about **half of the time** an AED will detect a VF or VT rhythm and advise a shock. **The other half of the time, no shock is advised.**

- 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 1999.¹ 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,² 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, Washington³, 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,⁴ 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,⁵ 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" study⁶) 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.
- 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 who arrived with an AED *before* the first responders were taken into account? Apparently not, or at least not by much.
- A large study of Public Access rescuers⁷ (called "the PAD Trial" conducted by the US National Institute of Health and published in 2004) found that in 128 SCA events where lay rescuers used an AED, 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.

- A study lasting three years that observed 3,500 families with an AED in their home (called the Home AED or “HAT trial”)⁸ found that of the 29 victims who were attached to an AED, 14 – that is 48% – were found to have a shockable rhythm.
- The “Resuscitation Outcomes Consortium” (ROC) study⁹, published in 2011 and conducted in 11 different cities in the U.S. and Canada, found that in 273 SCAs where an AED was applied prior to the arrival of the ambulance, a shockable rhythm was present in 150 of the rescues, which is **55%** of the time.

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.

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

2 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.

3 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.

4 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.

5 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.

6 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.

7 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.

8 GH Bardy, KL Lee, DB Mark, JE Poole, WD Toff, et.al.”Home Use of Automated External Defibrillators for Sudden Cardiac Arrest.” *New England Journal of Medicine*. 2008;358:10.1056.

9 ML Weisfeldt, SE Stewart, C Sitlani, et. al. “Ventricular Tachyarrhythmias after Cardiac Arrest in Public versus at Home.” *New England Journal of Medicine*. 2011:364;4,313.