

**The Bill Blackwood
Law Enforcement Management Institute of Texas**

Assessing the- Benefits of Equipping Patrol Officers
with Automated External Defibrillators

A Policy Research Project Submitted
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By
Karl J. Hubler

Grand Prairie Police Department
Grand Prairie, Texas
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ABSTRACT

Thousands of Americans die each year from sudden cardiac arrest. It can be the result of many causes. Regardless of the cause, time is critical to these victims if they are to be revived in time to resume healthy, productive lives. The means for ordinary citizens to help these victims are becoming more and more prevalent as more citizens are learning cardiopulmonary resuscitation and automated external defibrillators (AED's) are now being placed in public places where these people can get to them in time to help someone. Law enforcement agencies have been studying the feasibility of training and equipping their officers to use these devices to help save lives. There are documented cases in which AED's have helped officers save the lives of victims of sudden cardiac arrest.

In order to assess the success rate of the use of AED's a number of law enforcement agencies were sent a mail-in survey. The questions were focused on the population of the agency's jurisdiction, the size of the Patrol unit and the number of officers working during a given shift. Information on the number of AED's that the agency owns and for how long was also requested. Other questions asked for the number of times that the AED's have been used and how many saves have been documented. The last questions were concerned with any problems encountered with either equipment or training.

Based on the surveys, the use of AED's by police agencies is increasing. The results indicate that the use of AED's by police officers can and do have a positive impact on the way that the officer serves the community by providing one more tool to him or her while protecting and serving the citizens.

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Introduction

The subject of this study is to examine the feasibility of training and equipping patrol officers in the use of automated external defibrillators (AED's). The American Heart Association (AHA) has cited heart disease as the number one killer of adults in the United States. Studies by the AHA and the medical community indicate that early intervention in cases of sudden cardiac arrest is essential to survival. The AHA refers to this as the "Chain of Survival". Included in this chain is early cardiopulmonary resuscitation (CPR) and early defibrillation. (AHA, 2000b)

In the past, the practice of defibrillation has been confined to either a physician or highly trained emergency medical service (EMS) personnel, normally referred to as paramedics, using manual defibrillators. However, this was changed beginning in the 1980's. With new technology has come the introduction of the AED. These units are small and can be used by the layperson with minimal training. (AHA, 2000c)

This study will attempt to determine the effect of equipping patrol officers with AED's. It is hypothesized that the research will find that the purchase, training and use of AED's by patrol officers will benefit the citizens that they have sworn to serve.

This research project will examine information published by the AHA and articles in law enforcement journals, as well as information provided by manufacturers of AED's. Surveys of law enforcement agencies currently using AED's will be conducted in an attempt to measure success rates.

It is anticipated that this research project will demonstrate a direct benefit of training and equipping patrol officers to help victims of sudden cardiac arrest. Based on the relative low costs of the units and ease of operation, police agencies should be able

to justify any expenses incurred from purchasing these units. Funding for such a project may even be available through federal grants.

The implications to law enforcement are far reaching by increasing its ability to provide more service to citizens. The way that patrol beats are designed allows an agency to place officers in ideal positions to assist victims of sudden cardiac arrest. Odds are that they could arrive on-scene before the fire or emergency medical service personnel. Since the first minutes are so critical, this would permit the officers to render life-saving care until the arrival of better trained EMS personnel, thereby increasing the likelihood of survivability of these people.

Review of Literature

A commercial airliner cruises at 39,000 feet on a flight between Chicago and Los Angeles. In seat 42C a 58-year-old male passenger suddenly begins feeling ill. He begins to perspire profusely and is experiencing difficulty breathing and nausea. There is a dull, crushing pain in the center of his chest and the pain is radiating to and down his left arm. He suddenly grabs his chest, groans and slumps in his seat. The passenger next to him calls for the flight attendant. When she arrives, she sees the male passenger slumped in his seat apparently unconscious. Remembering her cardiopulmonary resuscitation (CPR) training, she checks him to confirm that he is unconscious and unresponsive. He is and she notifies other flight attendants of the problem. Two others arrive; one carrying a recently installed automated external defibrillator (AED). The other attendant is carrying a portable oxygen tank and an assortment of masks used to assist a person with breathing.

The attendants move the passenger to the floor and open his airway to see if he is breathing. He is not and she uses a facemask to give him two breaths and then checks him for a pulse. While she is performing these steps, the second attendant turns on the AED and prepares it for use. The first attendant finds that the passenger is pulseless and begins CPR with the assistance of the third attendant.

While the AED is cycling on, the second attendant attaches the electrodes to the passenger's chest and orders the other two to stop their efforts. She pushes a button on the AED and it soon advises her to push another button on the device. She does and the device delivers a lifesaving shock to the passenger. She follows this sequence two more times and one of the other attendants then checks the passenger for vital signs. Miraculously, he now has a pulse and is once again breathing. They put an oxygen mask on him and the pilot diverts to a nearby airport. Once on the ground, the passenger is transferred to a waiting ambulance. He is transported to a nearby hospital where he is diagnosed with a heart attack. He will recover and continue a prosperous life with his family thanks to the quick actions of the flight attendants and an AED.

It is early spring and a 38 year-old male is at home erecting a new antenna for his Ham radio. He is standing on the ground trying to stand the pole up next to the chimney. He is having some difficulty handling it and forgets about the high-voltage power lines above him that go to the residence. The top of the pole touches one of the lines and he is electrocuted. He falls to the ground unconscious.

His wife has been cooking lunch and comes outside to call him in to eat. She finds him lying on the ground and tries to wake him. Her attempts are unsuccessful. She rushes inside and calls 9-1-1. The dispatcher takes her information and an engine and

an ambulance are sent to her location, Code 3. In addition to these units, a police officer is dispatched to assist. He arrives at the location minutes ahead of the fire units. He goes to the trunk of his squad car and takes out a small, hand-carried device. It is an AED. The victim's wife meets him in the front yard and takes him to the victim.

Using his CPR training, the officer determines that the patient is unresponsive, not breathing and pulseless. He immediately opens the case of the AED, turns it on and attaches the electrodes to the victim's chest. He pushes one button that analyzes the victim's heart rhythm and the AED tells the officer to "shock" the patient. He pushes a second button and the patient is shocked. Again he pushes the first button and the AED analyzes the patient's heart rhythm. This time the AED tells him to check the patient's pulse. He does and discovers that the patient now has a pulse. The officer checks and finds that the patient is not breathing. He uses a face mask to deliver rescue breaths to the patient until the ambulance arrives. It arrives five minutes later, after having been delayed by a train. The paramedics begin caring for the patient and his breathing is soon restored. He begins to regain consciousness and is transported to the hospital. He will recover from the fatal shock that he received from the power line thanks to the second shock that he received from the police officer.

These two scenarios are fictional. However, the problems described and the rescue techniques used are based on real-life situations. They are presented here to portray the health problems that Americans face every day. They also show how the proper training and equipment, used in a timely manner, can and do save lives routinely. The rescuers were not highly trained professionals. They were lay people who

were properly trained and equipped to deal with emergencies. Without this training and equipment, it is likely that these two victims probably would have died.

Cardiovascular disease is the number one killer of Americans today. In its advanced stages, cardiovascular disease can result in sudden cardiac arrest. Other causes of sudden cardiac arrest include electrical shock, drowning, drug overdose, etc. According to the American Heart Association, sudden cardiac arrest claims about 225,000 each year. Currently, only about 5 percent of these victims survive. Many of these deaths can be prevented if the victims get prompt help - if someone trained in cardiopulmonary resuscitation (CPR) provides proper lifesaving measures until trained professionals take over. (AHA, 2000a)

After cardiac arrest, promptly initiated CPR may return victims to productive lives. Without CPR, permanent brain death due to a lack of oxygen will occur. If the heart is not restarted within the first four to six minutes after the arrest, the victim may sustain irreversible damage to the brain and vital organs. *Speed* in getting specialized medical care for victims and in starting CPR is the key to saving lives. Every minute that defibrillation is delayed means that the chance of surviving a cardiac arrest drops 10 percent - even if CPR is started immediately. (AHA, 2000a)

CPR *alone* is not enough to save lives in most cardiac arrests. It is, however, a vital link in the chain of survival that must be initiated to support the victim until other, more advanced support is available. The chain of survival includes the following sequence: early activation of the emergency medical service (EMS) system, early CPR, early defibrillation and early advanced care. It is estimated that a strong chain of

survival can increase the survival rate to 20 percent or more. That would save at least 40,000 lives per year. (AHA, 2000a)

As stated above, CPR alone is not always sufficient to save lives. At best, it buys the victim a little time until more advanced care can be rendered. Traditionally, this advanced care has been provided by highly trained personnel such as doctors, paramedics, etc. using manual defibrillators and cardiac medications. However, advances in medical technology are making it possible for the layperson to deliver lifesaving defibrillation with a minimum of training. (AHA, 2000c),

Any further discussion of defibrillation should first define and describe fibrillation. Commonly known as ventricular fibrillation, it is the most common rhythm associated with sudden cardiac arrest (about 80% to 90% of cases). This is an abnormal, chaotic heart rhythm that prevents the heart from pumping needed blood and oxygen throughout the body. The most effective treatment for ventricular fibrillation is an electrical shock that stops this irregular rhythm, which then allows the heart's natural pacemaker to take over and start the heart to begin beating normally, restoring blood circulation to the body. The earlier that this shock, or defibrillation, is delivered, the greater the victim's chance of survival and recovery. In many communities throughout the United States many lives have been saved when early defibrillation programs have been started. (AHA, 2000a)

The key to delivering this defibrillation has always been having highly-trained personnel and a defibrillator, which can be very expensive. In the early 1980's, the first automated external defibrillator was introduced. The AED was designed to analyze the rhythm of the heart of the patient and determine through a highly sophisticated set of

algorithms whether defibrillation will be necessary. If the AED determines that a shock is indicated, it will then allow the rescuer to do so. It took the guesswork out of the equation and made it possible for lesser-trained rescuers to help save these victims. A major set back of manual defibrillators has always been the fact that an ill-advised shock could actually do more harm than good and cause further problems for the victim. The AED is programmed to automatically analyze the heart's rhythm and will only shock within extremely narrow parameters. This helps to provide virtual foolproof care to victims of sudden cardiac arrest. (AHA, 2000c)

Over the years, AED's have become smaller, more affordable and easier to use. Their average cost is around \$2500 to \$3000. Major airlines have begun equipping their aircraft with them. They can be found in shopping malls, major airports, private industry, etc. They may also be found in casinos and sports arenas and stadiums. Most have both voice prompts *and* screen messages that guide the rescuer through the process. Training has now been incorporated in the American Heart Association CPR training programs and takes a minimal amount of time for the student to become proficient in its use. AED's are powered by either a rechargeable battery or a long-life lithium battery that requires no maintenance. They are programmed to analyze themselves daily to ensure proper operation and require nothing more than a person to look at them to check for any maintenance-required signals. They are water-resistant and designed to survive in the trunk of a vehicle for years with a minimum of care.

In recent years, law enforcement agencies across the nation have begun studying the feasibility of equipping squad cars with AED's and training officers to use them. They are providing the patrol officer with one more tool to protect and serve the

community. While there is a special need for officers serving in rural areas, where EMS providers may have a long response time, officers working in urban areas have also used them to save lives.

Using an AED is relatively simple, incorporating three basic steps. Using standard CPR guidelines, the rescuer must first determine that the patient is unresponsive, not breathing and pulseless. Once these conditions have been determined, the rescuer must:

1. Turn on the AED.
2. The rescuer attaches the adhesive electrodes to the victim's chest. The AED assesses and then interprets the victim's heart rhythm.
3. The rescuer follows the AED's voice prompts and screen instructions.

If a shock is advised, the voice prompts will tell the rescuer to press the "SHOCK" button. The AED will not allow a shock to be given unless the victim needs it.

Methodology

To better understand the role that AED's play in today's law enforcement missions, this project conducted a mail-in survey in order to determine the success of equipping patrol vehicles with AED's. The following questions were asked:

1. Does your agency deploy automated external defibrillators (AED's) in patrol vehicles?
2. What is the population of your jurisdiction?
3. How many officers are currently assigned to Patrol?
4. How many officers work during a given shift?
5. How many AED's are assigned to patrol vehicles?

6. How long have you had the AED's?
7. How many times have they been used by officers to save someone?
8. Of those times, how many saves have been documented?
9. Have you documented any problems with either equipment or training when using an AED in an actual emergency? If so, what were they and how were they remedied?
10. Does your agency intend to purchase additional AED's in the future?

The results of the survey were then analyzed in order to understand the feasibility of using AED's in law enforcement.

A total of thirty-five surveys were sent out to various law enforcement agencies across the nation. They included police and sheriffs departments in jurisdictions with varying population sizes. To date, twenty-four have been returned. The agencies surveyed were identified by various manufacturers as having purchased AED's. The surveys also questioned them about their satisfaction with the units and customer service. The second section was included in a separate survey and will not be discussed in this report. It was hoped that the surveys returned would contain enough data to show that AED's that had been deployed in patrol vehicles had been used effectively by officers.

The answers to the twenty-four surveys break down as follows:

Question number 1: Twenty-four agencies indicated that they had equipped patrol officers with AED's.

Question number 2: The answers to this question were divided into six categories based on the population totals of the individual jurisdictions. The categories are:

Over 500,000 people	3
250,000 - 500,000	6
100,00 - 250,000	5
50,000 - 100,00	4
25,000 - 50,000	4
Less than 25,000	
Total	24

Question number 3: The number of officers assigned to Patrol range from 450 to 24.

Question number 4: The number of officers working during a given shift range from 65 to 4.

Question number 5: The number of AED's assigned to patrol vehicles range from 20 to 4.

Question number 6: The average length of service for these AED's is less than three years.

Question number 7: The total times that AED's were used by these agencies is 47.

Question number 8: The total number of saves is 9. This number indicates that using the AED has resulted in a 19 percent save rate.

Question number 9: Three agencies reported problems with the AED. The problems were discovered during a routine check of the equipment prior to its use in an emergency situation. No problems with either equipment or training were noted during an actual emergency.

Question number 10: All twenty-four agencies indicated that they intended to purchase additional AED's.

This survey indicates that the use of AED's by patrol officers has resulted in a save rate similar to the 20 percent survival rate estimated by the AHA when it discusses the advantages of early defibrillation.

Conclusions

Cardiovascular disease is the number one killer of Americans today. Sudden cardiac arrest can be caused by cardiovascular disease as well other causes, such as electrocution, drug overdose, etc. Only about 5 percent of these victims survive. It is estimated that early CPR and early defibrillation can increase the survival rate up to 20 percent or so. Research has shown the direct benefits that victims of sudden cardiac arrest derive from early defibrillation. The earlier that the victim receives the shock, the higher the odds of a full resuscitation and recovery.

Equipping patrol officers with AED's and training them to use them puts more of the units in the field. This would create additional units to respond to the scene of an emergency. Although AED's have been in use by law enforcement agencies for a relatively short period of time, they appear to have a positive impact on the way that officers render aid to the citizens that they serve. Instead of just being a spectator during rescue attempts, the officer can now take an active role and deliver that early, lifesaving shock.

The numbers generated from the surveys of this project indicate that those agencies responding have recorded a 19 percent success rate. Although the actual numbers may be considered low, this is a significant percentage and bears further analyzation. It could be argued that any life saved is significant and worth any expense.

The conclusion that one can draw from these statistics is that law enforcement officers using AED's can and do save the lives of victims of sudden cardiac arrest.

References

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American Heart Association. (2000b). The Links in the Chain of Survival. [On-line] Available: www.proed.net/ecc/Chain/links.html

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APPENDIX

To Whom It May Concern:

I am conducting a survey on the use of automated external defibrillators by patrol officers. This information will be used to help justify the purchase of AED's by the Grand Prairie Police Department for use by its patrol officers. Please take a few minutes to complete this questionnaire and return it in the enclosed envelope. If you are interested, I will share the results of this survey with your agency. Thank you for your time and assistance.

Respectfully,

Lieutenant Karl J. Hubler
Grand Prairie Police Department 801
Conover
Grand Prairie, Texas 75051 972-
237-8819
972-237-8781 (Fax)
khubler@ci.grand-prairie.tx.us

1. Does your agency deploy AEO's in Patrol vehicles?
2. What is the population of your jurisdiction?
3. How many officers are assigned to Patrol?
4. How many officers work during a given shift?
5. How many AEO's are assigned to Patrol vehicles?
6. How long have you had the AEO's?
7. How many times have they been used by officers to help someone?
8. Of those times, how many saves have been documented?
9. Have you documented any problems with either equipment or training when using an AEO in an actual emergency? If so, what were they and how were they remedied?
10. Does your agency intend to purchase additional AEO's in the future?