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Automatic External Defibrillators in Today's Police Vehicles

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by
Rodolfo Muzquiz

The University Of Texas Health Science Center San Antonio
Police Department
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ABSTRACT

The development of Automatic External Defibrillators (AED) has changed the way law enforcement officers respond to medical emergencies. Police officers have long been trained in first aid, but CPR is the extent to which medical training is provided. Many police departments around the world are adapting the use of AED by making them standard equipment in their patrol units. The widespread availability and simple use of AED has promoted this concept and furthermore made many police departments rethink their position when assessing their role as first responders. This brings up an important question; should all police departments distribute AED in every patrol vehicle?

There are those who believe that since some police agencies respond to medical emergencies, they should be equipped to handle crisis like cardiac arrests. While still many others feel medical assistance should be left to Paramedics or EMTs. Several studies have been conducted through the recent years that cover both sides ofthis debate. In order to assess if the use of AED had a positive effect, a review of literature, research and surveys were conducted. The conclusions were simple; AEDs save lives but they are not for every police department.

Departments need to first evaluate their response times and assess the need for these instruments. Although technology now allows police officers, as well as the common citizen, to treat cardiac arrests "at the scene", the reality is that other steps must be met in order to achieve the full benefits of the AED. Early notification, rapid deployment and secondary medical attention is needed in order to strengthen the chances of survival. Police Departments who blindly adopt this system will not experience the full benefits of AED.

TABLE OF CONTENTS

Page

INTRODUCTION

In medical emergency situations it has long been known that time is critical. The quicker a person receives first aid the greater the chances are that person will survive. This holds particularly true for persons who have suffered cardiac arrest. An incident once seen as a medical emergency which could only be treated in a fully equipped hospital by highly trained personnel has now become a situation that can be treated "at the scene."

The purpose of this paper is to discuss the use and need for equipping police vehicles with Automated External Defibrillators or AEDs as they are commonly known today. This research will present the reader with a brief history of defibrillators and continue by examining the issues that have risen since AEDs were first introduced to the non-medical professions. The most common of these issues being:

-Should police officers be performing emergency medical care beyond CPR?

-What liability will police departments face if a defibrillator is used incorrectly?

-Will equipping police vehicles with AEDs have any positive *effect* on the survival rate of cardiac arrest victims?

Police officers are trained in First Aid, but are usually limited in the amount of emergency medical care they can perform on a person. On many occasions police officers are the first to arrive at a medical emergency scene where a person has suffered cardiac arrest. In cases where the victims has no life signs, (no pulse and has stopped breathing), the most a police officer can do is start CPR and hope that EMS arrives in time to provide better emergency medical care.

Even though technology has decreased the response time by EMS, police still hold the

advantage because they are "out in the field" and can usually respond faster from their mobile locations rather than a unit who is dispatched from a fixed point. In cardiac arrest situations a few minutes can mean the difference between life and death.

Today, AEDs are not limited to emergency medical service units. They have also begun to appear in airports, amusement parks and virtually every location where a large number of people gather. A review of literature regarding defibrillators will inform you that AED are not devices that are replacing CPR but are actually only a link in a "chain of survival" which improve the chances surviving cardiac arrest. What once involved long extensive knowledge and training has now been made easier and faster through these life saving devices. This paper will discuss and attempt to answer the question; if the general public now has the ability to react to these types of medical emergencies, shouldn't agencies who regularly respond to all types emergencies also be equipped with the same tools.

The methods used by police departments to deal with different issues and emergencies is constantly changing. Police now have the tools to assist and serve the public in more than a law enforcement role. It is hypothesized that this research will find significant information to support the premise which indicates that a faster response time to persons who have suffered cardiac arrest will mean an increase in survival rates. A review of previously conducted surveys and extensive literature available will be studied in order to attempt to find if AED have a positive or no effect on survival rates.

REVIEW OF LITERATURE

Even though there are still many police officers who are not yet familiar with Automatic External Defibrillators these apparatuses and the method used to shock people or "jump start" their hearts has been around for many years. "The first successful electrical defibrillation was described in 1947, when Claude Beck used open-chest massage and alternating current internal defibrillation to resuscitate a 14 year-old boy whose heart was in ventricular fibrillation" (Brown, 2000, pI438). Ventricular fibrillation or VF as it is more commonly known is a form of cardiac arrest. The medical field has come a long way from finding cures for heart disease that cause cardiac arrest, but what exactly is a cardiac arrest. The American Heart Association (2001) best describes it as follows; "Cardiac arrests that lead to sudden death occur when the electrical impulses in the diseased heart become rapid (ventricular tachycardia) or chaotic (ventricular fibrillation) or both." According to the American Heart Association "sudden death (also called sudden cardiac death) is death resulting from the sudden, abrupt loss of heart function (cardiac arrest) in a person who mayor may not have diagnosed heart disease". In most cases death occurs instantly or shortly thereafter. The heart loses it's ability to function and no longer pumps blood.

In 1998 cardiac arrest was the leading cause of death according to the American Heart Association, beating out traffic accidents. At the moment the only way to make the heart regain its rhythm and work properly is to ')ump start" it with an electric current. The electric shock enables the heart to jump start the electrical waves naturally produced by the heart and usually regains it normal rhythm. This method of shocking the heart is called defibrillation. If not treated withing a few minutes a person dies.

After Beck's successful resuscitation the medical field began to experiment with

defibrillators. Within a few years the medical field improved its knowledge in defibrillation and by the early 1960's defibrillators were used in hospitals all around the world. In 1966 doctors began to experiment with mobile defibrillators carried in helicopters and other large mobile units which later laid the foundation for widespread acceptance of mobile defibrillators. By 1970 most EMS units were equipped with mobile defibrillators but were still limited in their use because of their size. Another factor that limited the use of defibrillators was the extensive medical training needed in order to properly survey a patient and determine wether defibrillation was appropriate. With the advances in technology the size and training needed to operate defibrillators were substantially reduced. In 1980 the first Defibrillation which automatically evaluated the patient by analyzing their vital signs no longer required the user to have a extensive medical training. This technological leap gave birth to the new generation of units known today as Automatic External Defibrillators.

Even with its simplistic operation AED still required the user to take one very important step in increasing the patients chances of survival; arrive at the scene as quickly as possible. "With each minute that defibrillation is delayed, the chances of successful resuscitation decreases by 2% to 10%" (Brown, 2000, p.1438). Since "down time to shock" is one of the most important factors in surviving cardiac arrest the access to defibrillators has become an issue recently.

Presently most first responders are equipped with AED but since they are usually dispatched from a fixed point they loose valuable time which negates the function of defibrillators. In a medical situation where time is one of the most critical factors the issue of who should be allowed to carry these devices was answered by many police departments. Since police officers regularly respond to medical emergencies and many times arrive before EMS the use of AED by police departments has recently gained more acceptance.

There is no definite answer as to which police department began implementing AED first but much research and studies have been conducted on the subject. A review of literature found several studies which asked the question; Does supplying first responders and police officers with AED increase the chance of survival for people who have suffered cardiac arrest? Even though at first the answer to this seems pretty simple, it actually is not. Several studies have been conducted give opposite answers to this question but the end result is still the same. The concept of just providing first responders with AED doesn't always improve the survival rate. There are other factors that need to be considered.

Sweeny, Runge, Gibbs, Raymond, Scafermeyer, Norton, and Boyle-Whitesel conducted a survey in Charlotte, North Carolina from 1992 to 1995 and found that the difference in survival was almost minuscule when including AED in a two tier EMS response system. "Addition of AED to

this EMS system did not improve survival from cardiac death" (Sweeny et aI, 1998, p.239). Sweeny et aI. further stated "The concept of equipping as many emergency responders as possible with AED has been widely adopted, but it should be not be blindly adopted without improving the EMS system at all levels. This decision should be individualized to each EMS system based on all variables on EMS response." Although Sweeny's research did not involve adding AED to police vehicles he did make a very valuable point. In areas where EMS has similar response times as first responders or law enforcement, the use of AED will increase the chance of survival by only a small amount. This brings up a very important topic ofthe research. Should all police departments include AED as part of their equipment in their police vehicles. The obvious answer would be no because not all departments respond to medical emergencies. Even though it would be almost impossible to find out how may police departments around the United States respond to medical emergencies a study was found that supplied a good idea of just how many.

In 1995 Alonso-Serra, Delbridge, Auble and Mosesso conducted a survey of five hundred and forty police departments around the United states and asked what percentage of departments actually responded to medical emergencies. " Responses indicated that 442 (80.7%) agencies responded to one or more specific types of medical emergencies and 263 (50.3%) provided some type of patient care" (Alonso-Serra et aI, 1997, p. 497). Alonso-Serra further found that law enforcement officers arrived at the scene of medical emergencies approximately 81 % of !he time before EMS. Even though there seemed to be a large consensus of police officers arriving at medical emergencies first the survey also found only 14% used AED. Furthermore about half of the police chiefs polled indicated that providing "EMS related activities" would interfere with their law enforcement duties, but more than 60% indicated that their police officers would be willing to learn

more about medical emergency response. Alonso-Serra clearly shows that the majority of police departments are responding to medical emergencies but few are equipped to handle cardiac arrests. A reason for this type of results could be the cost of AED or the liability many police departments believe they will face and are just not willing to incur.

Because of the nature of the job police departments and municipalities have always been the recipients of liability lawsuits. In response to this issues several states have begun to recognize the use of AED which have resulted in changes to laws to defend police officers and their departments in the use of AED. In 1997 Texas addressed this issue by adding section §§ *779.006. Liability Exemption* to the Health and Safety Code. The law specifically stated that police officers were not liable when the AEDs were used. Even with the addition of new laws why aren't more police departments adapting AEDs with their patrol cars? An answer to this question could be that the effectiveness of defibrillators by police officers is not well known.

This research found numerous studies which involved the effectiveness of AEDs when added to police patrol vehicles. From 1990 to 1992 Mosesso conducted a study which included seven suburban communities. The area police departments were supplied with AEDs and proper training. All patrol vehicles with AEDs were dispatched concurrently with EMS to emergency medical scenes. The study found that police officers arrived at the scene first 58% of the time. "Patients who had shocks administered by police were 10 times more likely to survive than those not shocked by police"(Mosesso, 1998, p. 205).

A similar study was conducted by White for a seven year period which had equivalent results. The study was broken down into two parts. The first article was from the initial part of the study which occurred from 1990 through 1995. This study also dealt with a two tier emergency respond

system in which police officers an paramedics were dispatched at the same time. The study found that when police officers shocked the patients they demonstrated a higher survival to discharge rate. The study indicated that a major factor in this was the quicker response time. "Call to shock time for all patients was less in the police group than in the paramedic group (5.6 versus 6.3 minutes, P=.038)"(White, 1996, p. 480).

The second portion of this study was not published until 1998 but the results were still the same. As the study progressed more AEDs were added to the police department vehicles which could be an explanation for the higher success rate. In addition to the high success rate the study also found that medical training had no effect on survival. "A relatively high discharge rate from VF ORCA was achieved by making rapid defibrillation available in an EMS system employing both police and paramedics for response. Survival-to-discharge is critically dependent upon how rapidly defibrillation is accomplished and not the level of skill of the provider; even small differences in call-to-shock time influence both response to shock and discharge survival"(White, 1998, p. 150).

Finally a review of literature also found a study which indicated that adding AEDs to the EMS system didn't always improve survival. A study conducted by Sweeny from 1992 through 1995 involved a two tier EMS system. The two tiered system involved first responders equipped with AEDs and Paramedics; both were concurrently dispatched to calls. Even though police were not included in this study it strengthened the hypothesis that time is critical. White noted that because the EMS response time to emergency locations was already timely, adding AEDs to first responders had little if any effect on the survival rate. White indicated "the concept of equipping as many emergency responders as possible with AEDs has been widely adopted, but it should not be blindly adopted without improving EMS system at all levels. The decision should be individualized to each

EMS system based on all the variables in EMS response. As an isolated enhancement, it is doubtful that addition of AEDs will provide a measurable survival benefit."(White, 1998).

METHODOLOGY

Though the use of AED by other than paramedics is a fairly new concept, there are several professional articles which have been written on this subject. The literature researched in this paper will review both the favorable and unfavorable results of AED in police vehicles. With the information found this officer will attempt to answer the question wether AEDs are truly effective when used by police officers and should all police departments begin to implement an AED program.

The method of inquiry for this research entailed mostly review of studies and articles completed on the subject. A formal survey of feelings by police officers towards AED was not conducted because of what was already available. A survey which consisted of eight hundred police departments was used in this research. The study which was made up of a twenty question survey was conducted in 1995 by five doctors from the University of Pittsburgh and University of Rochester. It was directed at police chiefs around the United States who indicated in their responses that their department was the primary law enforcement agency in their community. The response rate for this survey was seventy percent. In addition to the literature review, six studies were located and mentioned in this research paper. All included the pros and cons of implementing an AED program by police departments.

While in the LEMIT program an informal survey was conducted of the participants to attempt to obtain their views toward AEDs and the issue of police officers responding to medical emergencies. One of the common replies found through informal conversations, indicated that responding to medical emergencies would only take away from providing "real police work". Another common response was that this type of work should be left to EMT or Paramedics.

Even with the critics found in the LEMIT program it is of this officers opinion that the use

of AED would not only save lives but would also enhance relations between the public and police. Police officers are put in a very unique position which allows them to be the first to emergency scenes. The adaptation of defibrillators by police departments in patrol cars can raise the survival rate of cardiac arrest patients. A defibrillator in every patrol vehicle will not guarantee that all persons who police attempt to defibrillate will survive, but it will insure that we at least have an opportunity to make a difference when a person's life is at stake.

FINDINGS

At first thought most would think that a piece of equipment that saves lives would only have positive response by it's users; this is not the case. As Herlitz, Bang, Axelsson, Graves and Lindqvist(1998) explained, the issue of equipping police vehicles with AED has brought positive reactions from most all areas, there are still those who say that medical emergencies should be left to EMS or the first responders. Furthermore some will argue that equipping police vehicles with AED is not cost effective and removes time and money from other services that police personnel could be providing.

In order to evaluate both sides of the argument a review of literature was conducted on the subject of AED and their use by police officers. A search was conducted on the majority of law enforcement journals but very little was found. Much of what has been written regarding AED is located primarily in medical journals rather than law enforcement publications. Also it should be noted that before this research was conducted the idea of providing a survey was proposed but later discarded when an article was located that involved a comprehensive survey of approximately eight hundred police departments in the united states.

After reviewing the literature it was found that even though AED had been around for many years they were not provided to police agencies until a much later time. Much research had been done on the effectiveness of AED and more is still being conducted to this day. One of the first studies on the effects of AED in police vehicles was conducted from 1990 to 1995. The city of Rochester, Minnesota conducted a research study in November 1990 in which all of their patrol officers were trained to use AED. AED were strategically placed in patrol cars in several districts around the city and officers were instructed to begin defibrillation when needed and when they

arrived before EMS. "Our results confirm that earlier defibrillation not only increases survival from VF OHCA(out of hospital cardiac arrest) but increases the likelihood that initial shocks will result in ROSC,(resuscitation of without need for costly and time consuming on-scene advanced life support care to restore stable circulation" (White, 1996, p. 484).

"It is well known that for every minute following sudden cardiac arrest, a victim's chance for survival decreases by 10%, and defibrillation must occur within the first eight minutes to prevent brain damage"(Losavio, 2000, p. 82). Most, if not all the findings regarding the amount of time a person experiences cardiac arrest to time of initial shock with an AED were similar. If a person is not shocked within the first ten minutes it is highly unlikely the person will survive. Therefore the research discovered during this application paper all indicated that response time was the most important factor when dealing with medical emergencies. It makes perfect sense that emergency response units be equipped with AED because of the nature of their work.

While researching this topic and attempting to find answers to the research questions, information regarding the common feelings of officers towards AED was also discussed. Even though a formal survey of participants was not conducted the most common response from officers in the LEMIT program who would ask about AED, was that they did not agree with a program that opened them up to more liability. They also indicated that they were not too enthusiastic about having to respond to medical emergencies. Most remarks to AED was that "you should leave that to the paramedics." The rationality behind this method of thinking is outdated. The findings in this research support the hypothesis. The issue of liability is no more increased with the use of AED than it is for providing CPR. It is also argued that law enforcement officers would probably be more liable by failing to act, rather than providing CPR or using an AED. Police officers as public servants

should understand this and assist the public with all the tools available to us. The threat of litigation will always exist with anything police officers do because of their position and unusual contact with the public. In addition, this research found that the laws in Texas as well as other states protects officers from this risk.

Findings regarding human error with the use of AED was also evaluated. A study of 375 analysis found that human error was very infrequent in the use of AED during emergency situations. "Only in four cases was a possible technical error judged as the underlying cause and in all cases the defibrillatory shock was delivered less than 1 min later than might have been expected. This finding indicates a high safety rate with these devices"(Herlitz et aI, 1998, p. 6). Studies like this indicate that human error does and will probably exist but it is kept to an acceptable minimum. All findings supported the need for proper and frequent inspection of AED. Even with its simple application the literature found also recommended frequent "refresher" training in the use of AED. The training recommended which consist of written tests assists the operators and can avoid the operator forgetting procedure when AED are not regularly used.

Most studies were police officers responded to medical emergencies and AED were used indicated a positive effect in survival rates. In some police departments were AED were implemented the program experienced extraordinary success. "After 1,900 of the devices were given to officers in Miami-Dade County in 1999, researchers in Florida found that the survival rate there doubled"(Nagoumey, 2001, p. 4). Although not all programs demonstrated as high a success as Miami-Dade County most did indicate an improved survival rate.

Cases were the implementation of AED did not indicate a substantial improvement in the survival rate had specific factors outlying it. As found in a study conducted in Indiana. "Out of

hospital cardiac arrest survival in suburban and rural Indiana did not improve after police were equipped with AED, likely related to poor police response"(Groh, 2001, p. 324). This study found that the Indiana Police Department suffered slow response times therefore EMS units were arriving to medical emergencies substantially quicker than police officers equipped with AED. As stated earlier on this paper, quick response to the scene is still one if not the most important step in increasing survival. "All links in the chain of survival must be strengthened, but equipping the police with semi-automatic defibrillators may be the most useful intervention to improve survival"(Waa1ewijn, 1998, p. 160). Furthermore all studies researched for this paper found that rapid response was always a factor. "The AHA estimates that 100,000 deaths could be prevented each year with rapid defibrillation"(Cantwell, 1998, p. 33).

As noted earlier proper steps must be taken in order for the chance of survival to rise. The studies and research conducted for this paper indicate that AED are effective when used properly in the chain of survival. This means that witnesses must still respond to a cardiac arrest by first calling 911. The next step is to begin CPR and apply an AED if available. If the person regains a normal heartbeat and advanced life support is provided their chances of survival are increased dramatically.

DISCUSSION/CONCLUSIONS

According to the American Heart Association and the Center for Disease Control the following statistics are indisputable:

- About 220,000 people a year die of coronary heart disease without being hospitalized.
- Most of these are sudden deaths caused by cardiac arrest
- Brain death and permanent death start to occur in just four to six minutes after someone experiences cardiac arrest
- Cardiac arrest can be reversed in most victims if it's treated within a few minutes with an electric shock to the heart to restore a normal heartbeat
- A victim's chances of survival are reduced by 7--10 percent with every minute that passes
- Few attempts at resuscitation succeed after 10 minutes.
- In cities where defibrillation is provided within five to seven minutes, the survival rate from cardiac arrest is as high as 49 percent.
- If every community could achieve a 20 percent cardiac arrest 'survival rate, an estimated 45,000--50,000 people could be saved each year from CHD alone. (AHA Website, 2001)

When defibrillators were first introduced to hospitals and EMS units, the bulky size and skills required to analyze the patients needs were large and extensive. "In the past 20 years, defibrillators have been miniaturized and simplified, and inbuilt rhythm analysis systems now determine automatically whether defibrillation is appropriate and provide a "shock" or "no shock" decision. This has substantially reduced the skills required to defibrillate a patient with cardiac arrest" (Smith, 2000, p. 385). Police departments no longer have an excuse not to equip their vehicles with AED,

with the exception of money. Even though the research found that not all departments would benefit as greatly as others, the majority of the findings found that AED do save lives.

The discussion wether we should leave the medical work to doctors of first responders is outdated and wrong. Police officers should not only be trained on the powers of arrest and mediation. AED training should also be included. The approximate time to train a person to use an AED is four hours. Today the cost of AED is approximately $3,500 and these prices continue to drop as the popularity of these devices are beginning to grow. Furthermore many groups are donating money to purchase AED or to train officers. Police officers need to understand that it is not only our duty to protect but also to assist the public wether it be a stranded motorist or a person who has suffered cardiac arrest. In a time of Community Policing and neighborhood programs AED can serve as a way to help police departments get more assistance and support from the public. Police strive everyday to make the job o flaw enforcement officers a professional field. In order to achieve this the profession must evolve.

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