The Bill Blackwood
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An Evaluation of the Austin Airport Police Department (AAPD) Automated External Defibrillator and Public Access Defibrillator Program

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An Administrative Research Paper
Submitted in Partial Fulfillment
Of the Requirements for Graduation from the
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Abstract

A call goes out over the radio dispatching officers to a possible cardiac arrest in a crowded airport terminal. Within minutes, a police officer with an Automated External Defibrillator (AED) applies the AED and begins Cardio Pulmonary Resuscitation (CPR). The timing is critical to what is known in the emergency medical profession as the "Chain of Survival"(American Heart Association, 2000). National AED legislation within the last five years has raised public awareness of the need for AED and Public Access Defibrillation (PAD) training programs and initiatives. Indeed, AEDs are an invaluable tool to increase the chances for patient survival of Sudden Cardiac Arrest (SCA). This paper provides an overview of the AED and PAD program established by the Austin Airport Police, as well as reports the rates of survival for persons who suffered from Sudden Cardiac Arrest (SCA), and compares the rates to other AED programs and the national average. The methodology, findings, and conclusions are the result of an original study conducted by this author. Analysis shows that the APPD AED/PAD program has been successful in the overall survival or "save" rates of the victims of SCA, which have occurred at Austin Bergstrom International Airport (ABIA). The data were collected from Austin Travis County Emergency Medical Patient First Responder Forms (ATCEMS PFR). All airport, public safety and medical communities have a vested interest in AED and PAD programs and their outcomes.

Introduction

A call goes out over the radio dispatching officers to a possible cardiac arrest in a crowded airport terminal. Within minutes, a police officer with an Automated External Defibrillator (AED) applies the AED and begins Cardio Pulmonary Resuscitation (CPR). The timing is critical to what is known in the emergency medical profession as the "Chain of Survival"(American Heart Association, 2000). With each passing moment the rate of successful patient recovery diminishes. In this scenario, a life was saved in March of 2001 because of the accessibility of the AED and the quick application of the same. The life saved was Gary Terry, the immediate past president of the Texas affiliate of the American Heart Association. Ironically, one year prior to having a heart attack at Austin Bergstrom International Airport (ABIA), Mr. Terry had lobbied in the Texas Legislature to have these devices placed in public venues like airports. National AED legislation within the last five years has raised public awareness of the need for AED and Public Access Defibrillation (PAD) training programs and initiatives.

Cardiac arrest incidents similar to the one above occur daily in American cities and rural communities. Over "400,000 people die from sudden cardiac arrest (SCA) in the United States, and in Texas, SCA kills more than 26,000 annually" (Keep the beat alive, January 2003, p.2). The key to success is the accessibility and quick application of an AED, preferably within 60 seconds of an arrest. Every minute is critical and with each minute that passes the patient's survival rate is reduced by 7-10% (American Heart Association, 2003).

There is no question that AEDs are an invaluable tool to increase the chances for patient survival of SCA. In the global community of airports, a combination of PADs and AEDs placed within all public safety officers' vehicles gives not only the traveling public, but also workers

within the airport community, increased odds of survival if they fall victim to a SCA. In 1998 the Austin Airport Police purchased 3 AEDs, which were taken to every medical emergency regardless of the nature of the call as per the Austin/Travis County EMS Standards of Care (SOCs). All officers were trained and certified by the American Heart Association's standards for CPR and AED. The AED provided a new level of "customer service" to the airport community by giving those persons suffering from a "cardiac event" all the necessary resources to increase survival rates. Thus, the AEDs provide police officers and the community immediate access to a critical component to the "Chain of Survival" (American Heart Association, 2000).

On March 27, 2000 ABIA became the first airport in Texas and the fourth in the nation to provide PAD by strategically placing AEDs within a minute's response to any location in the Barbara Jordan Terminal. Additional AEDs were purchased in 2001 and in 2003 and were placed in the patrol units for access during "cardiac events" which may take place on the 18-hole city –owned golf course, in the parking lots and garage or other buildings located on or near ABIA property, as well as the Barbara Jordan Terminal.

The purpose of this Administrative Research Paper (ARP) is to provide an overview of the AED and PAD program established by the Austin Airport Police. Additionally, this paper will outline the program, training, and costs associated with the program through a literature review, as well as provide an impact analysis of SCA survival rates since the program's inception.

All airport, public safety, and medical communities have a vested interest in AED and PAD programs and their outcomes. With this information it is anticipated that public safety agencies and airports can make an informed decision as to whether or not to implement an AED

and/or PAD program in their respective environments. However, the primary beneficiaries of this project would be those at risk for a Sudden Cardiac Arrest.

Review of the Literature

According to the American Heart Association (AHA) one in four Americans will die from heart disease, making cardiovascular disease (CVD) the number one killer, with someone dying every 33 seconds (AHA, 2003). The indiscriminate killer, CVD knows no gender, ethnicity, or age limits when choosing a victim. In 2003, historical trends and risk factors taken from among all ethnic groups in the United States, reveals an estimated 946, 000 people will die from CVD (AHA, 2003). Furthermore, it has been reported that approximately "one-third of these deaths are due to cardiac arrest, the sudden and unexpected loss of heart function" ("Cardiac Arrest and Automated External Defibrillators (AEDs)", n.d., p.1).

The most common SCA is the result of ventricular fibrillation (VF) or ventricular tachycardia (VT). The deadly chaotic rhythm causes the heart muscle to quiver uncontrollably. The quivering heart muscle does not allow for normal blood flow through the heart. The patient will then exhibit the signs of an SCA: unconsciousness, absence of breathing or agonal respirations, and no detectable pulse. Without treatment, a victim of SCA can begin to have irreversible brain damage within 4 to 6 minutes (AHA, 2002). If the normal heart rhythm cannot be restored in a timely manner, the victim will ultimately succumb to death as a result of VF. One device that can greatly increase the odds of survival from VF or VT is the AED.

The AED was introduced in 1979 with the intention of distributing throughout the non-medical community an intervention tool that would allow laypersons the capability to defibrillate a cardiac victim with a VF or VT heart rhythm (Fromm, Weltge, Varon, 2002). The AED is a microprocessor controlled and verbally automated device, which when applied to the SCA

victim using electrode pads, analyzes the victim's heart rhythm ("Call Clear & Shock", par. 1). The AED also acts as a heart monitor and full coverage informational recorder during the SCA incident. Verbal and visual cues are given to the rescuer as to what course of action, if any needs to be performed. If a VF or VT rhythm is detected by the AED, a "shock" will be advised. The AED will state the following verbally: "shock advised, do not touch the patient", while simultaneously illuminating a "shock" button (Heartstream, n.d., p.17). The rescuer would then press the button delivering a waveform or "shock" which should restore the heart to normal rhythm. Most AEDs use biphasic waveforms, which deliver both positive and negative current ("Call Clear & Shock", par. 6).

One way early AED access has been achieved is by having those who are most likely to respond to emergencies equipped with AEDs. Thus, not only have traditional medical personnel, such as EMS, been outfitted with AEDs but also fire and police units. Additionally, airline personnel have been trained to deal with SCA emergencies that occur while in flight. During a two year period from 1999 to 2000, the Occupational Safety and Health Administration (OSHA) reported 815 out of 6,339 (13 %) of the work place fatalities were due to SCA ("Cardiac Arrest and Automated External Defibrillators (AEDs)", n.d., p.1).

The second way for AED access is Public Access Defibrillation (PAD). PAD allows for AEDs to be placed in highly populated areas such as airports, malls and casinos, so the general public can gain quick access. With as little as four hours of CPR and AED training, first responders and the general public are now capable of delivering critical lifesaving measures. This is a critical step in the "Chain of Survival" which includes four links: contacting 911, CPR, defibrillation, and the transfer to advanced critical care (AHA, 1999). The question that arises with the use of any technology, especially when used in conjunction with "lifesaving" measures,

is liability. All 50 states have a "Good Samaritan Law" which provides immunity for those laypersons that are properly trained to use an AED ("Call Clear & Shock", par. 4).

> On May 21, 1999, the Senate passed Texas House Bill 580, which defines, outlines and gives specific guidelines for the use of AEDs. Subsequently, the Civil Practices and Remedies Code Chapter 74, Good Samaritan Law: § 74.001 Liability for Emergency Care was amended on September 1, 1999 to state the following: (a) A person who in good faith administers emergency care, including using an automated external defibrillator, at the scene of an emergency but not in a hospital or other health care facility or means of medical transport is not liable in civil damages for an act performed during the emergency unless the act is willfully or wantonly negligent. § 74.002, Unlicensed Medical Personnel, further outlines the Good Samaritan Law stating, persons not licensed in the healing arts that in good faith administer care, as emergency medical service personnel are not liable in civil damages for an act performed in administering the care unless the act is willfully or wantonly negligent.

There are potential legal ramifications that could plague the future for those municipalities, and organizations that choose not to participate in AED and PAD programs. This may be a direct result of studies in which the early AED application and defibrillation have been statistically proven to increase the out of hospital SCA survival rates (Valenzuela, Roe, Nichol, Clark, Spaite, and Hardman, 2000). This issue was raised in the case of, Somes v. United Airlines, 33 F. Supp. 2d 78 (1999). The plaintiff, Jamie Somes brought suit against United Airlines under the Massachusetts wrongful death statute, Mass. Gen. Laws, ch. 229, § 2. Her husband, Steven Somes suffered a fatal SCA on October 18, 1995 while on board a United Airlines flight. Somes presented arguments stating United Airline was liable for the death of her husband stating United Airlines should have provided an AED as standard medical equipment on board the aircraft. Airline cases similar to Somes have prompted the FAA (Federal Aviation Administration) to issue a rule requiring defibrillators on all domestic and international flights (Keep the beat alive, January 2003). Busch Gardens was found to be negligent by a Florida jury in a case where a 13-year-old boy died at the park. The negligence resulted from employees of

the park failing to provide emergency care and equipment to include the use of an AED (Keep the beat alive, January 2003).

Minimizing an agency's legal risk in the use of AED and PAD programs can be accomplished through familiarization with state law regarding the use and implementation of AED and PAD programs (Keep the beat alive, 2003). Additionally, the Food and Drug Administration legally requires a doctor's written prescription for AED and PAD program administration. Medical direction from a Medical Director will also insure the soundness of the program (Keep the beat alive, 2003). Device selection, recognizable AED and PAD signage and site locations and indemnification plans from liability insurance can also reduce litigation. One of the most important factors in the reduction of liability is proper training.

Training hours involved for CPR and AED programs vary, but in general an adult or pediatric skills CPR/AED course can be accomplished in as little as four hours. A combined course, which allows for written and "hands on" skill proficiency in both adult and pediatric CPR, is eight hours (AHA, 2002). Recurrent training should be accomplished every two years. AED and CPR courses are offered from a variety of organizations such as American Heart Association, American Red Cross, and the National Safety Council to name a few. Training initiatives and the success of AED and PAD programs relies not only on proper training, but also the training of as many personnel as possible within an organization as well as the general public.

The average cost of an AED ranges from $2000 to $4000, and annual maintenance costs ranges from $50 to $300 per AED (Groeneveld, et al., 2001). Annual maintenance can include replacing defibrillator pads and batteries. AED training programs, as based on the airline cost effectiveness study, indicated a range from $20,000-$100,000 (Groeneveld, et al., 2001). This

would include training devices and the salaries of the employees while being trained. In 2001, the hourly wage for airline employees generally ranged from $17 to $30 an hour (Groeneveld, et al., 2001). This pay range is very similar to the average hourly wage of most police agency's officers and first line supervisory personnel. Generally, AED and PAD program grants are also available for organizations and police agencies that wish to start AED and PAD programs, but are concerned with the costs.

In Rochester, Minnesota, where approximately 85% of the police vehicles carry AEDs, the survival rate for VF was 45% (Kreiter, 1996). This success rate was credited to the quick response times of the police to an emergency medical call (Kreiter, 1996). Police on the average arrive 2.8 minutes before paramedics (Kreiter, 1996). The issue is getting police officers that arrive first on the scene to apply the AED immediately rather than waiting on EMS personnel. In a study entitled, Automated External Defibrillator (AED) Utilization Rate and Reasons Fire and Police First Responder Did Not Apply AEDs, it was determined the number one reason (74 %) given by police units for not applying the AED was that the transporting ambulance defibrillator had already been applied (Lerner, Billittier, Newman, & Groh, 2002). However, when first responder response times, which included police and fire, were compared to the transporting ambulances response times, the results revealed the ambulances arrived after the first responders 23% of the time, simultaneously 45% of the time, and before the first responders 32% of the time (Billittier, et al., 2002).

Getting an accurate picture of the effectiveness of AED and PAD programs can be achieved through the examination of other programs and focusing on the rates of survival of SCA victims. Furthermore, the programs examined note implementation successes and failures as observed by the managers of such AED programs. Similar to airline AED programs, casinos

and airports are, in essence, controlled environments. These environments are designated as controlled because of the high volume of people and the greater potential for a witnessed arrest. Likewise, these environments have the common element of stress. Airports and airplanes are unique settings for SCA and "air travel may expose or exacerbate medical conditions" (Page, et al., 2000). "Contributing factors include the stress associated with flying, exertion in reaching the gate, disruption of circadian rhythms, and reduced oxygen tension in the cabin" (Page, et al., 2000 p.1214). The availability of AEDs in high stress environments is crucial.

The placement of AEDs is critical and can be controlled in the program implementation. Ideally, the AED should be within 180 seconds of any patient who arrests (Keep the beat alive, 2003). This includes the time for a person to get the AED and return to the SCA victim. A demonstration of AED placement can be observed by looking at AED programs implemented in casinos. A study conducted by Valenzuela, et al. entitled "Outcomes of Rapid Defibrillation by Security Officers After Cardiac Arrest in Casinos" (2000) exemplifies a highly effective AED program. Approximately 1350 security officers from 10 casinos were given 5 to 6 hours of training which consisted of the following: introduction to cardiac arrest, objectives of defibrillation training, basic anatomy and physiology of cardiac arrest, patient assessment, AED orientation and protocols, along with small group practice, written and hands on skills testing and review (Valenzuela et al, 2000). Mock scenario SCAs were conducted by security officers. The officers were then dispatched to the scene as a "sick person" call allowing officers to practice response, as well as determine the best possible location for AED placement within the 3-minute response time (Valenzuela et al, 2000, p.1207). By March 1, 1997 the officers were trained and equipped with AEDs. Outcome variables were determined by using the following: time of collapse, time of initiation of CPR, and the time the AED was used to calculate the predictor

intervals from collapse to CPR and from collapse to defibrillation (Valenzuela, et al., 2000). The primary outcome variable, however, was survival to discharge from the hospital (Valenzuela, et al., 2000). A sample size of 100 subjects who suffered SCA as a result of VF with a standard error of no more than 5% was utilized for the study (Valenzuela, et al., 2000). Subjects who had undergone defibrillation within 3 minutes of a witnessed collapse were compared to those who had undergone defibrillation in more than 3 minutes (Valenzuela, et al., 2000). The final results revealed the survival rate to be 74% for those who received AED defibrillation within 3 minutes after a witnessed collapse and 49% survival rate for those who received defibrillation after 3 minutes (Valenzuela, et al., 2000). The study concluded that the survival rates were greater when defibrillation was administered within the first 3 minutes of a witnessed SCA. The goal of 3 minutes to the application of an AED is enhanced by proper identification and training of personnel in the use of AEDs and the deployment of AEDs within a 3-minute location of any possible SCA (Valenzuela, et al., 2000).

A study conducted by Page, et al. (2000) entitled "Use of Automated External Defibrillators by a U.S. Airline" also exemplifies a successful AED program. The study focused on a major airline that began implementing an AED program in 1997. The data was examined from a period of June 1, 1997 to July 15, 1999 in which the AED was used in 200 instances, 191 on the actual aircraft and 9 occasions in the terminal near the aircraft (Page, et al., 2000). Using the standard of survival, from the use of the AED to hospital discharge, the overall survival rate for the AED program studied was 40% (Page, et al., 2000). This rate of survival using an AED is still considered favorable for an out of hospital setting.

Airports provide an excellent environment for the implementation of AED and PAD programs. Chicago O'Hare International Airport's Heart Save™ Program was initiated on June

1, 1999. Since program inception, the survival rate for patients in VF is 61% (Isaacs, 2002). The successfulness of the program is credited to the Chicago Airport Systems' commitment to the program in placing the AED no further than 1.5 minutes away from any location where they may be needed (Isaacs, 2002). Likewise, the training of over 3,500 airport employees in the use of the AED has contributed to the success rate (Isaacs, 2002).

Not all airports have had such success with AED and PAD programs. This was not an issue with the use of the AED devices themselves but with a lack of proper placement and training initiatives. San Francisco International Airport released the preliminary findings on their PAD program entitled Airport Rapid Resuscitation Early Shock Trail (ARREST) Phase I. The results were a survival rate of 7.1% or one patient out of 14. The cost of the program was found to be feasible and the study noted four areas in which survival rates could be improved (Isaacs, 2003, p.6):

1. Dramatically increasing the number of non-EMS personnel trained in the use of AEDs.
2. Increase public education and community awareness of the ARREST program.
3. Improve the signage and visibility directing airport personnel and the public to the nearest AED.
4. Decrease response time to 180 seconds, the AHA recommended time, thus increasing the number of PAD installations.

An AED and PAD program is only as successful as the implementation methods used by program overseers. Additionally, the saturation of AEDs in the community along with training and education of not only emergency personnel but also the community on AED applications is essential to increasing the survival rates of those who suffer SCA. Communities like airports, malls, casinos and high public traffic areas are the optimum environments for AED and PAD programs.

Methodology

In 1998, the Austin Airport Police (AAPD) purchased three AEDs, which were taken to every medical emergency regardless of the nature of the call as per the Austin/Travis County EMS Standards of Care (SOCs). The AEDs provided a new level of service to the local and global community and provided those persons suffering a "cardiac event" all the necessary resources to increase their chances for survival. The AEDs provided a critical component to the "Chain of Survival." The AAPD AED/PAD program at its inception had two primary goals. The first was to train all sworn personnel in the use of CPR and the AED. The second goal was to provide an AED or PAD within a minute response to any location within the terminal building.

AAPD has 54 sworn personnel, all of which have been trained in the use of CPR and the use of the AED. The ABIA community includes over 300 Department of Aviation employees and over 3,000 airline employees including airport related businesses. Over 157 of these personnel have been trained by AAPD personnel to administer the AED/CPR. On March 27, 2000, ABIA became the first airport in Texas and the fourth in the nation to provide PAD by strategically placing AEDs within a minute response to any location in the Barbara Jordan Terminal. Additional AEDs were purchased in 2001 and in 2003. These AEDs were placed in the patrol units for access during "cardiac events" which have taken place on the 18-hole golf course, in the parking lots and garage, and other buildings located on or near ABIA property. Officers also provide for continued medical response in the Barbara Jordan Terminal. As of May 2003, 28 AEDs are maintained and in service for ABIA, 8 AEDs are PADs, 8 AEDs are located in patrol units, 5 AEDs are located in administrative offices, 2 AEDs are located in the AAPD Medical Room in the AAPD offices, 4 AEDs are located in Airport Operations and Field

Maintenance vehicles, and 1 AED is located in the police medical cart (Hatch, 2003). AAPD Officers are the primary first responders to all medical emergencies at ABIA and the AED goes with an officer to all medical calls.

The Austin Airport Public Safety Division has an active AED/PAD program. Currently, AAPD has 4 certified instructors who train all AAPD officers and recertify the same every two years. Additionally, AAPD instructors train City of Austin Department of Aviation, airline and airport personnel, who wish to attend and meet the requirements of the AHA CPR/AED 4 and/or 8 hour Course. In general CPR/AED courses will include the following training objectives teaching the student to (Keep the beat alive, January 2003, p.8):

1. Recognize warning signs of a heart attack;
2. Why and how to activate the emergency medical system;
3. How to buy time by performing CPR until the AED arrives;
4. How to assess the need for and properly attach and use the AED;
5. How to ensure safety for rescuers, victims and bystanders;
6. How to deal with unusual situations.

Some signs and symptoms of a "cardiac event" prior to arrest include the following (Austin/Travis County EMS AED Instructor Program, 2000, p.3):

1. Chest pain/discomfort/ "misery"
2. Pressure or "squeezing"
3. Sweating
4. Nausea/vomiting
5. Shortness of breath
6. Eventual sense of "impending doom"
7. Denial

Data were collected from medical calls for service using the standard Austin/Travis County First Responder Patient Record or Patient First-Responder Record (PFR). The following informational variables were extrapolated from the 1080 collected PFRs and documented in a 2000 Excel spreadsheet (Table 1).

Table 1 Total Medical Calls for Service

YEAR	*TOTAL MEDICAL CALLS FOR SERVICE*
1998	92
1999	209
2000	225
2001	236
2002	233
2003 (JAN-JUN 1)	85
Total	1080

All AAPD response was under 3 minutes to a "witnessed" arrest, with the exception of patient number 9, who was not a "witnessed arrest", so this variable was taken out of Table 2.
Table 2 Data collected from PFRs

Patient ID	*Date of Incident*	*Witnessed*	*Gender*	*Age*	*AED Applied*	*Defibrillation*	*Save*	*Cause of Death*
1	1998	Yes	Male	Unk	Yes	Yes	Yes	*******
2	8/1998	Yes	Female	59	Yes	No	No	Aneurysm
3	12/1998	Yes	Male	71	Yes	No	Yes	*******
4	9/1999	Yes	Male	42	Yes	Yes	Yes	*******
5	6/2000	Yes	Male	54	Yes	No	No	Detached Pacemaker
6	8/2000	Yes	Male	52	Yes	Yes	No	SCA
7	3/2001	Yes	Male	53	Yes	Yes	Yes	*******
8	10/2001	Yes	Male	71	Yes	Yes	No	Arteriosclerotic Cardiovascular Disease (ACD)
9	1/2002	No	Female	63	Yes	No	No	ACD/ Obstructive Pulmonary Disease (OPD)
10	8/2002	Yes	Male	60	Yes	Yes	Yes	*******
(11)	1/2002	Yes	Male	25	Yes	No	Yes	*******

This impact analysis relied on "survival rates" as the primary outcome variable. Survival rates included all SCA victims who survived an incident to hospital discharge since the

implementation of the AAPD AED/PAD program in 1998 (Hatch, 2003). The sample size included patients or targets chosen non-randomly by having a SCA. Likewise, the exposed targets in which the AED was applied were contrasted with net outcome measures identified as survival rates from existing CPR/AED programs (Rossi, Freeman, Lipsey, 1999).

For the purposes of this study, a "save" was defined as a patient actually leaving the hospital on his or her own volition or surviving to discharge from hospital care. In some medical studies, a "save" is further defined as the patient having full cognitive function. This enhanced definition was not used for this study. Survival rates for comparison groups include the "save" averages, which have been found in casino environments 74% (2000), as well as the averages of San Francisco International Airport 20% (2000) and Chicago Airport Systems 61% (1999). In situations where targets did not survive SCA to hospital discharge, these extraneous confounding factors were identified by the cause of death column in Table II. These included non-shockable heart rhythm such asystole, (which existed in patient 3), or medical conditions in which the SCA was a secondary cause of death, such as an aneurysm, (which existed in patient 2). Dennis Longmire, Ph.D., of Sam Houston State University and Edward Racht, M.D., Medical Director of Austin Travis County EMS, provided assistance with data analysis and offered additional consultation.

It was hypothesized the data collected should show the AAPD AED/PAD program has been successful in the overall survival or "save" rates of the victims of SCA. The results were also predicted to show the program to be very successful when measured against the comparison groups. Likewise, the results were thought to indicate and confirm existing AED/PAD studies that the use of the AED within the first 3 minutes of a witnessed SCA increases the victim's chance of survival.

Findings

Upon collection of the data from the ATCEMS PFRs, the results as listed in Table 2 along with the original ATCEMS PFRs were taken to Dr. Racht on May 28, 2003, for preliminary analysis. Upon closer examination of patient number 11, Dr. Racht determined that although patient 11 presented apneic and without a detectable pulse, this in fact was a seizure resulting from head trauma and not a cardiac event (Dr. Racht, personal communication, May 28, 2003). A first responder attempting to take the pulse of an actively seizing patient may have difficulty in finding a pulse and, in most cases, will not be able to obtain a pulse. Likewise, during a seizure the patient will not exhibit proper breathing function. Thus, patient 11 was removed from the statistical data sets. The AED in this case was appropriately applied to the patient, as the aforementioned conditions are AHA standards for AED application. The remaining 10 cases were then used for determining the actual rates of survival (Dr. Racht, personal communication, May 28, 2003).

From an analysis of the Table 3 totals, AAPD has applied the AED 10 times and of those 10 times, in 6 cases the patients were actually defibrillated. There have been 5 patients "saved". This results in an overall save rate of 50%. In the case of patient number 3 it should be noted, the patient was in the non-shockable rhythm of asystole. The AED was applied and the patient was revived with CPR alone. The variable of VT and VF was also incorporated in the raw percentages and added to Table 3. Remember, the AED only delivers shocks when either of these deadly rhythms is present. The 4 out of the 6 patients who were in VF or VT survived 67% of the time. Clearly, these results indicate the AED to be very effective in the SCA cases where VT or VF cause the SCA (Hatch, 2003).

The 67 % success rate of the AAPD AED/PAD program, according to ATCEMS Medical

Director Edward Racht, makes ABIA the "safest place in Austin to have a cardiac arrest" (Dr. Racht, personal communication, May 28, 2003). Even the overall AAPD average of 50% shows the AAPD program to be successful, as the national SCA survival average is only 1% to 5% for out-of-hospital cardiac arrest (U.S. Department of Labor, Occupational Safety and Health Administration, TIB 01-12-17). The only more successful AED/PAD programs were found in the casino environments with a "save" average of 74% (2001).

Table 3 Percentage of total patient "saves" and "saves" in VT/VF (shockable rhythm)

Patient ID	***Defibrillation***	***Save***	***VF/VT***
1	Yes	Yes	Yes
2	No	No	No
3	No	Yes	No
4	Yes	Yes	Yes
5	No	No	No
6	Yes	No	Yes
7	Yes	Yes	Yes
8	Yes	No	Yes
9	No	No	No
10	Yes	Yes	Yes
Total	6 Defibrillated	5	4 of 6
Percentage	60 %	Saves 50 %	Survived in a shockable rhythm 67 %

Discussion/Conclusions

The AAPD AED/PAD program results demonstrate a high rate of success. However, with any program, improvements and revisions can always be recommended and accomplished. One such recommendation is for less "aesthetically" pleasing PAD signage and more "eye-catching" and easily identified signage. Currently, the PAD signs at ABIA are gray background with the standard AED red heart with a lightning bolt centered on the heart. This particular design tends to blend in with the gray walls of the Barbara Jordan Terminal. Although, all AAPD and ABIA personnel are familiar with the location of the PADs, they are not as easily identifiable by members of the traveling public. Another way to facilitate the identification and location of the PADs is to have frequent public service announcements made throughout the terminal building (Hatch, 2003).

Another recommendation is to have all DOA personnel trained in the use of CPR and AEDs as a part of their DOA Employee Orientation. To facilitate the training process and to avoid training/manpower issues, which may arise upon the 2-year recertification period, additional DOA employees should be trained to be instructors for their respective divisions. Many of the airlines train their flight attendants in the use of the AED at their respective "hubs" or home base of operations. They may also train their ground station crews. However, a recommendation has also been made to train the airline and airport tenant personnel at the same time they receive their mandatory Security Identification Display Area (SIDA) and Airfield Driving courses. This would capture many of the employees who work in the airport environment that may or may not have been trained by their employers. Remember, for laypersons to use the AED and to be covered from a liability standpoint, they must receive the AED training (Hatch, 2003).

An additional recommendation can be accomplished on a national level. There is a need for community service announcements. These can, through any wide variety of medias, educate the public on what AEDs and PADs are and how to obtain training in their use. Television in particular can reach a wide audience. This could effectively make the public more AED "aware" at the local, state and national levels (Hatch, 2003).

The last recommendation is two-fold. One, there is a potential need for Critical Incident Stress Management (CISM) debrief for the rescuers regardless of the patient outcome. Two, there is a need for an After Action Review (AAR) of the incident after each use of the AED. AARs typically involve a critical analysis of an incident highlighting what went wrong, what went right and what improvements, if any, need to be implemented. This is solely based on personal observations made by this researcher over the last 5 years. Because of the success of the AAPD program, many of the officers have felt remorse, loss and disappointment when a patient does not survive. Public safety personnel may feel as if they personally could have changed the outcome of the incident. CISM and AARs may help to prevent any of these feelings. Likewise, AARs of all incidents can be used to review what can be performed the next time an incident occurs, regardless of patient outcome (Hatch, 2003).

It was hypothesized the data collected should show the AAPD AED/PAD program has been successful in the overall survival or "save" rates of the victims of SCA. Clearly, the overall 50% rate of survival demonstrates the success of the program. Another way to interpret this statistic is to state there are 5 individuals out of 10 who are alive today, possibly as a direct result of the successful implementation of the "Chain of Survival" beginning with the implementation of the AAPD AED/PAD program. Likewise, the 67% survival rate of those patients who were in VF or VT confirms this hypothesis and shows a statistical significance of how early defibrillation

within three minutes can dramatically improve the chances of patient survival (Hatch, 2003).

The results were also predicted to show the program to be very successful when measured against the comparison groups. Surpassed only by the casino environments, the AAPD program has been shown to be effective. Several caveats should be noted in relation to this particular examination of the data. The casino averages highlight a collective of casinos, not just one particular casino AED program. Similarly, the AED data from other airport systems could have been more recent. Future research should be conducted using more comparisons groups with more recent data. AAPD should also continue to monitor this program continually making improvements to the same (Hatch, 2003).

The results were also thought to indicate and confirm existing AED/PAD studies that the use of the AED within the first 3 minutes of a witnessed SCA increases the victim's chance of survival. Once again, all of the AAPD responses to a "witnessed arrest" were in less than 3 minutes. The unfortunate exception was patient number 9, who was found in a restroom for some unknown time after her arrest, the other 9 patients were "witnessed arrests" (Hatch, 2003).

First Responder entities, municipalities and businesses entertaining the idea of starting an AED/PAD program should consider consulting a variety of existing AED/PAD programs before implementing one of their own. One issue to consider is the most effective locations to place the AED/PAD system. Specifically, who responds to medical emergencies first and can meet the 180-second response time for an AED to arrive on scene following a "witnessed arrest". Are the police first on scene? Fire? EMS? This is the group of public safety personnel who need to have AEDs in their respective emergency vehicles. This planning in particular can be paramount during tough budget times where only a limited number of AEDs can be purchased. This is especially true for smaller sized communities. For businesses and public facilities the question is

where best to place the AED in a PAD format, maintaining the 180-second standard. Entities must help to bring about a public awareness of the devices with proper signage and training opportunities for laypersons thereby educating the public to the benefits of the AED/PAD programs.

Another issue to consider is strong support for training initiatives and continued follow up training for employees. Devices or equipment, which can be comfortably utilized by only a few persons, is a legal liability, inefficient and frankly, a waste. This is especially true when you consider a life can be lost if the AED is not put to use. This researcher would not presume to put a specific value to a human life. However, for a small investment of $2000 to $4000, we now have the technology to give Mother Nature a hand in the life extension arena. We would be negligent as public safety officials not to use such a wonderful tool that is a large component of the “Chain of Survival”.

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