

# **An Analysis of Automated External Defibrillator Implementation and Related Risk Management Practices in Health/Fitness Clubs**

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Sudden cardiac arrest (SCA), when a person's heartbeat stops abruptly and unexpectedly, is a leading cause of death in the United States (England, Weinberg, & Estes, 2006). The American Heart Association (AHA, 2005) estimates that approximately 250,000 people die, outside the hospital setting, in the U.S. every year due to SCA. SCA, which is also a leading cause of disability and health care costs, afflicts people of all ages and usually strikes without warning (AHA, 2004). The AHA has traditionally used four links to illustrate the vital steps that can create a "chain of survival" for SCA victims. These include: (a) early recognition of the emergency event and activation of the emergency medical services (EMS) system (i.e., calling "9-1-1"), (b) early administration of cardiopulmonary resuscitation (CPR), (c) early administration of a shock with a defibrillator, and (d) early advanced life support (i.e., airway establishment, administration of medications). Today, trained laypeople and bystanders can perform the first three links in this chain. Publicly accessible automated external defibrillators (AEDs) have been advocated by the AHA, since the mid-1990s, for the prevention of death from SCA (Aufderheide et al., 2006; Hazinski et al., 2005). However, the AHA has emphasized the importance of organization, planning, and training to maximize the effectiveness of public access (lay rescuer) defibrillation (PAD) programs (Aufderheide et al., 2006). The primary purpose of this research was to examine (a) AED implementation and associated risk management practices, and (b) the perceived constraints to AED implementation in health/fitness facilities in Florida. The state of Florida was chosen for this study due to its number of health/fitness facilities (N=566) and research

support received from the American Heart Association's Florida/Puerto Rico Affiliate.

## REVIEW OF LITERATURE

### AED Purpose and Function

A SCA victim collapses, is not responsive to gentle shaking, and stops breathing normally. Soon thereafter the heart stops pumping blood effectively. Brain damage can occur within 4 to 6 minutes after the heart stops circulating blood (AHA, 2006). Shortly after collapse, many victims of SCA exhibit an irregular heart rhythm known as ventricular fibrillation (VF). VF is a rapid and chaotic rhythm that is often caused by inadequate blood flow to the heart muscle, which in turn causes the heart to quiver so that it does not pump blood effectively. Reversal of VF requires the delivery of an electrical shock from a defibrillator (Aufderheide et al., 2006). The process of delivering a shock to the heart with the intent of reversing VF and restoring a normal heart rhythm is called defibrillation. Many victims who experience VF SCA can survive if bystanders act immediately (Hazinski et al., 2005). Death may be prevented if the victim receives immediate CPR and defibrillation within a few minutes after collapsing.

Lay rescuers can use a battery-operated, computerized device about the size of a laptop computer, known as an AED, to deliver a shock to victims of VF SCA. The rescuer attaches the AED to the victim by placing adhesive pads (electrodes) on the victim's chest wall. The AED analyzes the victim's heart rhythm, informs the rescuer if a shock is necessary, and provides audio prompts to direct the rescuer through all the steps of AED use. AEDs will only deliver a shock when VF or its precursor, rapid ventricular tachycardia, is present and will not deliver a shock to someone with a normal heart rhythm (Hazinski et al., 2005).

AEDs were designed for use by trained lay rescuers and first responders to reduce the time from collapse to defibrillation for victims suffering VF SCA. Two factors have a major impact on survival from VF SCA: the time from collapse to CPR administration, and the time from collapse to defibrillation. If CPR is not provided, for each minute of delay from collapse to defibrillation, the victim's chance of survival from VF SCA decreases by 7% to 10%. If CPR is administered immediately after collapse, the decrease in survival rates is more gradual, falling approximately 3% to 4% for each minute from collapse to defibrillation. When VF SCA victims receive immediate bystander CPR and defibrillation within 3 to 5 minutes of collapse, survival rates of 49% to 74%

have been reported in airport terminals, commercial airlines, casinos, and in police AED programs (Aufderheide et al., 2006). These high survival rates, however, are only attained in programs that reduce time from collapse to defibrillation (Aufderheide et al., 2006; Hazinski et al., 2005). SCA survival rates, when early defibrillation is not provided, are only about 5% (AHA, 2006).

### AEDs in Health/Fitness Facilities

Regular physical activity is an important public health goal. This may be accomplished in a number of settings, including health/fitness facilities. As of January 2006, there were an estimated 29,069 health/fitness facilities in the United States with a membership totaling 41.3 million (IHRSA, 2006a). U.S. health club membership is expected to reach 50 million by 2010 (IHRSA, 2003). In addition to the increasing number of clubs and members, member demographics have also changed. The typical health club member in the past was young and healthy, but due to an aging population this has changed. Actually, the IHRSA claims that over the past 15 years, the "defining characteristic" of the industry has been the increase in the numbers of older health club members. For example, in 2005, there were 8 million members over the age of 55, an increase of 314% from 1990 (IHRSA, 2006b). Furthermore, physical activity programs for older individuals and people with chronic diseases, such as coronary heart disease, are becoming increasingly popular as these individuals become more interested in physical activity at the same time clubs are attempting to recruit more members (McInnis et al., 2001). Older individuals and those with coronary heart disease are at an increased risk of SCA. The chance of a cardiovascular event occurring during exercise among those with cardiac disease is estimated to be greater than or equal to 10 times that among apparently healthy individuals (Albert et al., 2000).

The number of SCAs that occur in health/fitness facilities is not known; however, recent data suggest that they may occur more often than expected. For instance, one study indicated that 17% of health/fitness clubs reported a myocardial infarction, SCA, or both over a five-year period (McInnis et al., 2001). Another study described 71 cardiac deaths in a two-year period in one national health club chain (Franklin, Consiver, Stewart, Lasch, & Timmis, 2001). Becker Eisenberg, Fahrenbruch, and Cobb (1998) indicated that health clubs were among the top ten most likely public places with the highest incidence of cardiac arrests.



### Published Standards and Guidelines on AEDs in Health/Fitness Facilities

Given the importance of AEDs as lifesaving devices, many professional associations have published standards and guidelines regarding AED placement and use in health/fitness facilities. For example, the American College of Sports Medicine's (ACSM) *Health/Fitness Facility Standards and Guidelines* (3<sup>rd</sup> ed., 2007) include two standards related to AEDs. First, it states "Facilities must have as part of their written emergency response system a public access defibrillation (PAD) program" (p. 2). It further states "Fitness and healthcare professionals engaged in pre-activity screening, instructing, monitoring, or supervising of physical activity programs for facility members or users must have current automated external defibrillation and cardiopulmonary resuscitation (AED and CPR) certification from an organization qualified to provide such certification" (p. 2).

The AHA/ACSM Joint Position Statement on *Automated External Defibrillators in Health/Fitness Facilities* (Balady et al., 2002) states:

Effective placement and use of AEDs at all health/fitness facilities is encouraged, as permitted by law, to achieve the goal of minimizing the time between the recognition of cardiac arrest and successful defibrillation. Until further definitive data are available, AED placement is strongly encouraged in those health/fitness facilities with a large number of members (i.e., membership > 2,500); those that offer special programs to clinical populations (i.e., programs for the elderly or those with medical conditions); and in those health/fitness facilities in which the time from the recognition of cardiac arrest until the first shock is delivered by the EMS is anticipated to be > 5 minutes. In unsupervised exercise rooms such as those that might be located in hotels, apartment complexes, or office buildings, the AED should be part of the overall public access to defibrillation plan for the host facility (p.1148-1149).

The YMCA's *Automated External Defibrillators in YMCAs: A Technical Assistance Paper* states "The Medical Advisory Committee of the YMCA of the USA endorses the American Heart Association's position on the use of automated external defibrillators, and strongly recommends that YMCAs have them available in their facilities and programs" (McInnis & Herbert, 2006, p.3).

Similarly, the Medical Fitness Association's (MFA) *The Medical Fitness Model: Facility Standards and Guidelines* (MFA, 2006) state:



With physician oversight in place, the Medical Fitness Center must have at least one AED unit that is easily accessible for use. In the case of multiple story buildings or large facilities (greater than 30,000 sq. ft.), additional AEDs should be considered. AED placement should be determined by response time/distance for the AED to be brought to the victim. American Heart Association recommended response time is three minutes or less. All staff should have current CPA/AED (Automated External Defibrillator) training (p. 9).

Although the National Strength and Conditioning Association's (NSCA) *Strength and Conditioning Professional Standards and Guidelines* (NSCA, 2001) do not specifically address AEDs, beginning January 1, 2007, the NSCA required AED certification as a prerequisite for taking their Certified Strength and Conditioning Specialist (CSCS) and Certified Personal Trainer certification examinations (Baechle, 2006).

While the above published standards and guidelines advocate the placement of AEDs in health/fitness facilities, the IHRSA states:

After significant research, IHRSA has concluded that there is not yet a legal standard of care that requires automated external defibrillators (AEDs) be in all fitness centers. However, if legislation passes mandating the installation of AEDs in club facilities, for those clubs to whom the law applies, continued IHRSA membership will be contingent upon compliance with the law. The association encourages health club operators to consider the advantages of installing AEDs in their facilities (IHRSA, 2002, p.1; IHRSA, 2006c).

#### AED Legal Mandates

Although there is not a legal standard of care that requires AEDs in all fitness centers nationwide, state legislators have become increasingly active in recent years, with several states passing legislation that mandates the placement of AEDs in establishments broadly defined to include health clubs. For example, Arkansas (ARK.CODE ANN. §20-13-1306(b)(1), 2006), California (CAL. HEALTH & SAFETY CODE §104113(a)(1), 2006), Illinois (§210 ILL. COMP. STAT. 74/15(a), 2006), Louisiana (LA. REV. STAT. ANN. 40:1236.13(D)(1), 2006), Michigan (MICH. COMP. LAWS §333.26312, 2006), New Jersey (N.J. REV. STAT. §2A:62A-31, (2007)), New York (N.Y. GEN. BUS. LAW §627-a (1), 2006), Oregon (ORE. REV. STAT. §431.680(2), (2006)), and Rhode Island (R.I. GEN. LAWS §5-50-12(a), 2006) have each enacted legislation requiring health and fitness establishments to have at least one AED on the premises. Some states, however, make this requirement

conditional on membership numbers. For example, Illinois requires that the establishment serve at least 100 individuals (§210 ILL. COMP. STAT. §74/15(2)(b)), Louisiana requires at least 50 patrons (LA. REV. STAT. ANN. 40:1236.13(D)(1)), and New York requires at least 500 members (NY CLS Gen Bus § 627-a (1)). Some states also establish exclusions to the requirement based upon the type of establishment. For example California (Cal Health & Saf Code § 104113(g)), Illinois (§210 ILL. COMP. STAT. §74/15(2)(b)), Michigan (2006 MICH. PUB. ACTS §23(2)(b)), and Oregon (ORE. REV. STAT. §431.680(2)) exclude from the AED requirement a hotel or motel that provides physical fitness equipment or activities. Other jurisdictional specific exclusions include outdoor facilities, hospitals, weight reduction centers, and sport-specific training centers.

Of the aforementioned states that mandate the placement of an AED in health clubs, all require at least one on-duty staff to be properly trained in AED use. Other requirements found in some or all of the AED mandated legislation include; (a) proper and regular maintenance and testing of AEDs, (b) user activation of the emergency services system in a timely manner, (c) reporting of AED use to the licensed physician and local emergency medical services, and (d) having a written medical emergency plan. Where health clubs in states with legislative mandates fail to either meet the requirement to possess an AED, or meet additional requirements relevant to its use, civil monetary penalties may apply. Jurisdictions with penalties include Illinois, Michigan, and New Jersey. Rhode Island has a more rigorous law, stating that a knowing or willful violation of the law requiring AEDs in health clubs may result in suspension or revocation of the health club's registration (R.I. GEN. LAWS §5-50-12(a), 2006).

In addition to state legislators mandating AEDs in health/fitness facilities, some municipalities have required them. Legislation has also been passed in Suffolk County, NY, Weston, FL, and Montgomery County, MD (IRHSA, 2006d). As laws are often subject to change, it is imperative that health and fitness professionals receive competent legal advice regarding the applicable law in their jurisdiction before making decisions regarding AED implementation.

The impetus for legislation that mandates the placement of AEDs in health/fitness facilities often results from the passionate efforts of surviving SCA victims or family members of deceased victims. Foundations have been established and outspoken support has been provided by those whose lives have been influenced by SCA. Their efforts have inspired the passage of legislation that mandates AED use and implementation in various venues, including health/fitness facilities. An example is the Illinois legislation that



mandates AED placement in health/fitness clubs. The legislation was inspired by, and named for Colleen O'Sullivan, a young staff attorney for the Illinois House of Representatives who died of heart complications after exercising at a health/fitness facility (Illinois Government News Network, 2005). It is believed that an AED would have saved her life. Additionally, the California health/fitness facility legislation was strongly supported and influenced by a man whose life was saved by an AED (Keep the Beat, 2005).

#### Florida Statutory Requirements for AED Use, Implementation, and Immunity.

While the state of Florida does not currently mandate the implementation of AEDs in health/fitness facilities, it does require that all persons who use an AED obtain appropriate training, which includes completion of a course in CPR or successful completion of a basic first aid course that includes CPR training, and demonstrated proficiency in the use of an AED (Fla Stat. § 401.2915, 2006). Immunity from civil liability for any harm resulting from the use or attempted use of an AED requires the AED acquirer to do several things including but not limited to (a) notifying the local EMS medical director regarding the placement of the AED within a reasonable period of time after the AED was placed, (b) properly maintain and test the AED, and (c) provide appropriate training to employees or agents who would have been reasonably expected to use the device (FLA. STAT. ANN. §768.1325, 2006).

#### Research on Cardiovascular Emergency Preparedness and AEDs in Health/Fitness Facilities

While it is very important from a risk management standpoint to plan and prepare for cardiac emergencies, two studies suggested that many health/fitness facilities were not adequately doing so. A study of health/fitness facilities in Massachusetts revealed that approximately one half of the programs that responded to the survey did not practice their medical emergency action plans in accordance with published standards and guidelines (McInnis, Hayakawa, & Balady, 1997). Another study reported that the majority (53%) of the Ohio health/fitness clubs that responded to a survey did not have a written emergency response plan and 92% failed to conduct quarterly emergency response drills as recommended in the AHA/ACSM Joint Position Statement *Recommendations for Cardiovascular Screening, Staffing, and Emergency Procedures at Health/Fitness Facilities* (Balady et al., 1998). The data also revealed that more than one-fourth (28%) of the responding clubs failed to utilize pre-participation screening to identify those with cardiovascular signs, symptoms, and/or histories, even though 17% reported a



cardiovascular emergency (i.e., acute heart attack or SCA) during the previous five years (McInnis et al., 2001).

In 2001, IHRSA conducted a survey of its members regarding AED installation (IHRSA, 2002). Of the 162 clubs that responded, 25% had at least one AED on site. The data revealed that the common reasons for having AEDs in these IHRSA clubs included: high number of older and/or deconditioned members, local EMS response time is too long, in response to a previous medical emergency at club, belief that an AED is as essential as CPR training, prices have dropped in recent years, media coverage of lives saved, marketing/public relation value, state's Good Samaritan law offers protection, request of members, club offers cardiac rehabilitation, and a concern that AEDs are becoming an industry standard. The data also provided the following common reasons for the participant's not having AEDs in their IHRSA facilities: concerns about liability in the event of improper use or not used at all, close proximity of emergency medical services, difficulty training staff and ensuring that trained personnel are on duty at all times, cost, certification is too involved and time-consuming, desire to keep club out of medical field, and concerns about insurance coverage (IHRSA).

The New York State Attorney General's office surveyed health and fitness clubs in New York to assess compliance with NY CLS Gen Bus § 627-a, which went into effect July 2005, and requires all New York health/fitness clubs with 500 or more members have an AED on their premises and at least one employee or authorized volunteer who holds a valid certification to operate an AED and perform CPR (Club Industry Fitness Business Pro, 2006; New York State Attorney General's Office, n.d.). Survey forms were sent to 319 health/fitness clubs in all regions of the state. After a response date passed, reminder notices were sent to non-respondents. Subsequently, telephone calls were made to the managers or owners of clubs that continued to ignore the request for information. A total of 231 surveys were returned. Data indicated that 19.6 percent of the clubs that had more than 500 members did not have the required AED and trained operators on site.

A study, which involved a chain of health/fitness facilities in the United Kingdom that installed AEDs in all of 76 their clubs, monitored the number of SCAs that occurred at the clubs and gauged the success rate by noting the percentage of cases in which (1) SCA was reversed and the victim revived at the health club, and (2) the victim survived the event until the time of their discharge from the hospital (McInnis et al., 2003). During the year-long study, eight members suffered SCAs while exercising at the clubs. In each case, the club's staff performed CPR and utilized an AED prior to paramedics arriving on the scene. In six of the eight (75%) victims, SCA was reversed by staff

utilization of the AED at the club. Of the eight, four (50%) victims were discharged from the hospital neurologically intact (McInnis et al., 2003).

These data suggest the likelihood of surviving a SCA in health/fitness facilities with an AED program is considerably greater than the success rate reported for the vast majority of witnessed, out-of-the hospital SCA, which is approximately 5%. Furthermore, anecdotal evidence provides several accounts of AEDs being successfully utilized in health/fitness clubs. For example, it was reported that AEDs saved six lives at Town Sports International (TSI) clubs over a span of 18 months after the company installed the devices in all 141 TSI club locations (Club Industry, 2006).

### Statement of the Problem

To date, no studies have been published that investigate AED implementation and related risk management practices, and the perceived constraints to AED implementation in health/fitness facilities. The few previously published studies that pertained to AED implementation in health/fitness facilities did not address related risk management practices. Studies reporting constraints to AED implementation in health/fitness facilities may have been conducted with instruments that lacked validity, and were not analyzed and/or reported with statistical rigor. The primary purpose of this study was to examine (a) AED implementation and associated risk management practices, and (b) the perceived constraints to AED implementation in health/fitness facilities in Florida. The state of Florida was chosen for this study due to its number of health/fitness facilities (N=566) and research support received from the American Heart Association's Florida/Puerto Rico Affiliate.

### METHOD

The methods of this study are presented in three sections: (a) participants, (b) formulation of the questionnaire, and (c) research procedures.

#### Participants

The population for this study included managers from all identified health/fitness clubs, open to the general public, in Florida. Facilities intended to serve worksites (e.g., employee fitness programs), solely clinical populations (e.g., cardiac or orthopedic rehabilitation programs), and specialty facilities (e.g., personal training studios, spas) were excluded from the study. Telephone directories and the Internet were utilized to identify 566 applicable



health/fitness clubs. Of that total, 108 health/fitness facilities participated in the study.

### Formulation of the Questionnaire

Based on a comprehensive review of the literature, interviews with practitioners (health/fitness club owners and managers), the use of a Delphi panel of experts (AED instructors, physicians, and experts in survey development), and a pilot study, a survey was developed to measure (a) AED statute knowledge, implementation, and related risk management practices, and (b) the perceived constraints to AED implementation in health/fitness facilities. Questions pertaining to AED-related risk management practices were based upon the AHA/ACSM (Balady et al., 2002), AHA (2004) recommendations, and Florida statutory requirements (FLA STAT. ANN. §401.2915 & §768.1325, 2006). The perceived constraint variables were based upon the literature and interviews with practitioners (e.g., health/fitness club owners and managers). The survey was divided into four sections: (a) personal background variables, (b) organizational background variables, (c) AED implementation and related risk management practice variables, and (d) AED implementation perceived constraint variables. Measurement formats included Likert scales, multiple choice, and open-ended responses. Additional questions on demographic variables were also formed in a multiple-choice format. A calculation of test-retest reliability revealed that the items had acceptable stability.

### Research Procedures

After obtaining Institutional Review Board approval, a packet including a cover letter, an informed consent form, the survey, and a self-addressed, stamped envelope was sent via U.S. mail to all identified health/fitness clubs in Florida. The cover letter stressed that all responses were confidential and that the researchers would not attempt to make any judgments regarding any individual respondents and/or facilities. The anonymous surveys were coded by the researchers for identification purposes. All packets were mailed to the attention of the health/fitness facility manager. After two weeks, a second packet was sent to non-respondents. A week after the second mailing, telephone calls were made to non-respondents to ensure they received the packet. A total of 33 surveys were returned via U.S. mail and attempts to obtain a correct mailing address were unsuccessful. Eventually, a total of 108 completed surveys were received for a response rate of 20.3%. Version 12.0 of the SPSS for Windows (SPSS, 2002) was utilized for the statistical analysis.



## RESULTS

The findings are presented in the following four sections: (a) personal background, (b) organizational background, (c) AED implementation and related risk management practices, and (d) perceived constraints to AED implementation.

## Personal Background

Research participants ( $N=108$ ) were managers of health/fitness facilities in the state of Florida. Of the respondents, 60% were males, and 40% had a 4-year college degree while 22% had a postgraduate degree. The respondents had worked in their positions from one year to over 20 years ( $M=6.20$ ;  $SD=5.66$ ). A majority (87%) of them were CPR certified, while 43.5% were First Aid certified and 20% were AED certified. Descriptive statistics for the personal background variables are found in Table 1.

TABLE 1. DESCRIPTIVE STATISTICS FOR THE PERSONAL BACKGROUND VARIABLES (N = 108)

Variable	Category	N	%
Gender	Male	64	59.8
	Female	43	40.2
Education Level	High School Graduate	11	10.2
	Some College	30	27.8
	College Graduate	43	39.8
	Postgraduate Degree	24	22.2
Number of Years Working in Current Position (M = 6.20; SD = 5.66)	0-2 years	34	32.1
	3-5 years	28	26.4
	6-10 years	26	24.5
	11-20 years	15	14.2
	Over 20 years	3	2.8
Professional Certifications	CPR Certified	94	87.0
	CPR Instructor	2	1.9
	AED Use	22	20.4
	AED Instructor	2	1.9
	First Aid	47	43.5
	First Aid Instructor	1	0.9
	EMT/Paramedic	2	1.9
	Other	5	4.7

## Organizational Background

These managers supervised an average of 8 full-time staff members ( $M=8.03$ ;  $SD=13.43$ ), 18 part-time staff members ( $M=17.55$ ;  $SD=24.05$ ), and 2 volunteer staff members ( $M=2.07$ ;  $SD=2.10$ ). The number of members at the respondent's facilities ranged from under 500 to over 15,000, with 37% having less than 500 members. A majority (72%) of the respondents indicated that their club required staff to hold current CPR certification; however, 28% indicated that they do not always have a CPR certified staff member on site. Seventy percent of the respondents indicated that their club required a pre-activity screening prior to beginning exercise. Descriptive statistics for the organizational background variables are presented in Table 2.

TABLE 2. DESCRIPTIVE STATISTICS FOR THE ORGANIZATIONAL BACKGROUND VARIABLES (N = 108)

Variable	Category	N	%
Number of Full-time Paid Staff (M = 8.03; SD = 13.43)	0 staff	4	5.1
	1-2 staff	24	30.8
	3-5 staff	23	29.5
	6-10 staff	15	19.2
	11-20 staff	5	6.4
	21 to 40 staff	4	5.2
	Over 40	3	3.9
Number of Part-time Paid Staff (M = 17.55; SD = 24.05)	1-2 staff	16	17.1
	3-5 staff	19	20.3
	6-10 staff	17	18.0
	11-20 staff	16	17.0
	21 to 40 staff	17	18.0
	Over 40	9	9.6
Number of Volunteer Staff (M = 2.07; SD = 2.10)	0 staff	9	30.0
	1-2 staff	12	40.2
	3-5 staff	6	20.0
	6-10 staff	3	10.0

Current Program/Club Membership	Under 500 people	39	36.8
	500-1,000 people	16	15.1
	1,001-3,000 people	25	23.6
	3,001-5,000 people	15	14.2
	5,001-10,000 people	7	6.6
	10,001-15,000 people	2	1.9
	Over 15,000 people	2	1.9
Is Your Program/Club a Member of IHRSA?	Yes	34	31.8
	No	73	68.2
Does Your Program/Club Require Staff to Hold Current CPR Certifications?	Yes	87	80.6
	No	21	19.4
Does Your Program/Club Always Have a CPR Certified Staff Member Present?	Yes	78	72.2
	No	30	27.8
Does Your Program/Club Require a Pre-activity Screening for All Prior to Beginning Exercise?	Yes	74	69.8
	No	32	30.2

### AED Implementation and Related Risk Management Practices

Regarding AED implementation, 19% of the respondents indicated that their clubs had at least one AED. Of those that had at least one AED, 85% had an AED-certified staff member on duty during all operating hours, and 85% of them conducted in-service AED-related training, which ranged from training every month to training every 12 months. An AED had been used in an emergency situation in 20% of the clubs that had AEDs. A physician provided medical oversight for at least 70% of the AED programs, and local EMS had been consulted by at least 85% of the clubs that had AEDs.

Many (45%) of the respondents indicated that they had no knowledge of Florida's AED immunity statute, 25% only knew that a state AED statute that protects certain parties existed, and 18% indicated that they understood the basic concepts of the state's AED statute. When asked if they would like more information on state law regarding AED use, 75% indicated they would. Descriptive statistics for AED implementation and related risk management practices are found in Table 3.



TABLE 3. DESCRIPTIVE STATISTICS FOR AED IMPLEMENTATION AND RELATED RISK MANAGEMENT PRACTICES

Variable	Category	N	%
Level of Familiarity with Florida AED Immunity Laws	I understand specific immunity provisions	4	3.7
	I understand basic parties and activities covered	9	8.4
	I understand the basic concept of the law	19	17.8
	I only know that a law exists that protects certain parties	27	25.2
	I have no knowledge of state immunity laws	48	44.9
Does Your Program/Club Have at least One AED?	Yes	20	18.7
	No	87	81.3
Would You Like More Information on State Law Regarding AED Usage?	Yes	46	75.4
	No	15	24.6
How Many AEDs Does Your Program/Club Have?	0 AED	89	82.4
	1 AED	14	13.0
	2 AEDs	3	2.8
	3-4 AEDs	2	1.8
Do You Have Paid Staff Members in Your Program/Club That Are Currently AED Certified?	Yes	20	18.5
	No	88	81.5
Is a Staff Member Who is Currently AED-Certified On-Duty During all Hours of Operation?	Yes	17	85.0
	No	3	15.0
Has an AED Ever Been Used in an Emergency Situation at your Program/Club?	Yes	4	20.0
	No	15	75.0
	Not Sure	1	5.0
Do You Conduct In-Service Training for AED Users?	Yes	17	85.0
	No	3	15.0

How Often Do You Conduct AED Training?	Beginning Employment/Volunteer	1	5.9
	Every Month	2	11.8
	Every 2 Months	2	11.8
	Every 3 Months	4	23.5
	Every 6 Months	3	17.6
	Every 12 Months	5	29.4
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Does a Physician Provide Medical Oversight of Your AED Program?	Yes	4	20.0
	No	14	70.0
	Not Sure	2	10.0
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Has Anyone Consulted with Local EMS Regarding Your AED Program?	Yes	17	85.0
	No	2	10.0
	Not Sure	1	5.0

### Perceived Constraints to AED Implementation

The data revealed that the manager's highest overall perceived constraint to AED implementation in health/fitness facilities involved costs. Utilizing a 5-point Likert scale (with 1=no constraint to 5=very strong constraint), the four greatest constraints involved costs; cost of the AED ( $M=3.71$ ), cost of in-service training ( $M=3.20$ ), cost of AED certification ( $M=3.08$ ), and cost of AED maintenance ( $M=2.99$ ). The next four greatest constraints to AED implementation included the manager's lack of information regarding protection from liability ( $M=2.92$ ), required certification and training ( $M=2.82$ ), supervisory responsibilities ( $M=2.77$ ), and use and operation of AEDs ( $M=2.65$ ). The data suggested that the ninth and tenth greatest constraints were management concerns regarding fear of litigation ( $M=2.64$ ), and that AEDs were not a current standard practice ( $M=2.61$ ).

The least perceived constraints to AED implementation in health/fitness clubs included a lack of support from national professional association ( $M=2.03$ ), legal counsel ( $M=2.14$ ), and health/fitness club upper administration/owner ( $M=2.16$ ). Additionally, the data suggested that protection offered by waivers ( $M=2.16$ ) and staff reluctance to an AED ( $M=2.17$ ) were also not perceived as strong constraints to AED implementation. Descriptive statistics for the perceived constraints to AED implementation variables are presented in Table 4.

TABLE 4. DESCRIPTIVE STATISTICS FOR PERCEIVED CONSTRAINTS TO AED IMPLEMENTATION VARIABLES

Variable	Response %					<i>M</i>	<i>SD</i>
	1	2	3	4	5*		
<b>Costs</b>							
Cost of the AED	12.1	4.4	22.0	23.1	38.5	3.71	1.34
Cost of in-service training	15.6	15.6	26.7	17.8	24.4	3.20	1.38
Cost of certification	16.9	16.9	28.1	18.0	20.2	3.08	1.36
Cost of maintenance	22.5	13.5	27.0	16.9	20.2	2.99	1.43
<b>No Need</b>							
Proximity of local EMS	30.5	18.3	22.0	18.3	11.0	2.61	1.38
Perceived low probability of cardiac arrest	34.9	20.5	31.3	7.2	6.0	2.29	1.20
Medical screening procedures sufficient	34.5	21.4	29.8	6.0	8.3	2.32	1.24
CPR alone is adequate	30.1	30.1	24.1	10.8	4.8	2.30	1.16
Protection offered by waiver	47.6	15.9	18.3	9.8	8.5	2.16	1.35
<b>Lack of Support</b>							
Insurance company	40.8	15.8	26.3	7.9	9.2	2.29	1.33
Risk manager	42.7	17.3	22.7	10.7	6.7	2.21	1.29
Legal counsel	47.9	15.1	21.9	5.5	9.6	2.14	1.34
National professional association	48.6	18.9	20.3	5.4	6.8	2.03	1.24
Upper management or owner	51.3	10.0	18.8	11.3	8.8	2.16	1.39
<b>Lack of Information</b>							
Protection from liability	22.4	16.5	24.7	20.0	16.5	2.92	1.39
Supervisory responsibilities	25.0	15.5	31.0	14.3	14.3	2.77	1.36
Required certification and training	28.2	9.4	25.9	24.7	11.8	2.82	1.39
Purpose and function of AEDs	38.1	13.1	21.4	20.2	7.1	2.45	1.37
Use and operation of AEDs	31.8	13.1	21.4	20.2	7.1	2.65	1.41
<b>Management Concerns</b>							
Staff reluctance	50.6	13.8	13.8	11.5	10.3	2.17	1.42
Not a current standard practice	35.7	9.5	29.8	8.3	16.7	2.61	1.47



Fear of litigation	33.3	14.9	21.8	13.8	16.1	2.64	1.47
Time to implement and train staff in use	36.4	20.5	17.0	11.4	14.8	2.48	1.45
Difficulty in using an AED	45.3	16.3	17.4	8.1	12.8	2.27	1.43
Additional staff certification and training	37.2	14.0	19.8	15.1	14.0	2.55	1.47
Additional supervisory responsibilities	38.8	10.6	22.4	14.1	14.1	2.54	1.48
Lack of AED instructor availability	47.1	10.6	20.0	11.8	10.6	2.28	1.43

\* 1 = no constraint; 2= slight constraint; 3 = moderate constraint; 4 = strong constraint; 5 = very strong constraint

## DISCUSSION

Findings of this study suggest low AED implementation in health/fitness facilities in Florida. At the time this study was conducted, 87% of the respondents indicated that their health/fitness clubs did not have an AED. The state of Florida does not mandate the placement of AEDs in health/fitness clubs and this may be a reason for such low implementation and the 20.3% response rate to the survey. However, it should be noted that many health/fitness clubs have recently installed AEDs, including some national chains such as Wellbridge (Starr, 2006), Lifestyle Family Fitness (Club Industry, 2005), Town Sports International (TSI; Club Industry, 2006), Tennis Corporation of America, and Sports Club LA (McCarthy, 2001).

Cardiac emergency preparation at several clubs appears to be lacking, as 27.8% of the respondents indicated their clubs do not always have a CPR-certified staff member present during operating hours. This violates the latest recommendations published by the ACSM (2007), AHA/ACSM (Balady et al., 1998), and NSCA (2001) regarding CPR certification for health/fitness staff members. Additionally, 30.2% do not require a pre-activity screening prior to exercise. These screening tools can assist in identifying members with a higher risk of SCA and are recommended by various professional organizations such as the ACSM (2007) and AHA/ACSM (Balady et al., 1998), and NSCA (2001).

Of the clubs that did have at least one AED, the data suggested that several facilities were not following the AHA/ACSM (Balady et al., 2002) and AHA (2004) recommendations regarding AED program implementation, appropriate staff training, medical oversight, and consultation with the local EMS. The AHA (2004; Aufdherheide et al. 2006) has identified the following

four essential elements of AED programs; (a) planned and practiced response, (b) training of anticipated rescuers in CPR and the use of AED, (c) link to the local EMS system, and (d) a process of continuous quality improvement, including a plan for on-site AED maintenance and readiness-for-use checks. Many states have mandated certain aspects of these AHA recommendations including but not limited to medical oversight, training requirements, link to local EMS, and AED maintenance.

The AHA recommends planning and oversight of the AED program by an individual with expertise and experience in resuscitation programs (AHA, 2004; Aufdherheide et al., 2006). The program (medical) director decides on the number and location of AEDs, oversees training and retraining of anticipated rescuers, ensures the AEDs are properly maintained, establishes a link with the local EMS, develops a procedure to report AED use, evaluates AED use, and supports a process of quality program improvement. The AHA also recommends training anticipated rescuers, not every potential rescuer (Aufdherheide et al., 2006). The objective is to ensure that a trained rescuer is present at all times (i.e., during operating hours). Training should include practice in response to a simulated SCA at regular intervals so rescuers are familiar with their roles (Aufdherheide et al., 2006; Balady et al., 2002).

It is also recommended that at a minimum, the program director should inform the local EMS that an AED program has been implemented as well as the type and location of AED(s) on site. Quality improvement protocols should be utilized to evaluate the AED program, particularly response to any SCA. Program directors and potential rescuers should identify and eliminate factors that delay the administration of CPR or the delivery of the first shock. Therefore, when possible, AEDs should be placed where they can be obtained within a short (1 to 1½ minute) brisk walk from all areas in the program site (Aufdherheide et al., 2006).

Although laws have been enacted in every state that grant some degree of AED Good Samaritan immunity to various AED program constituents, it should be noted that various states impose numerous requirements on AED programs. Program requirements, restrictions, and limitations addressed by state AED statutes vary widely. Typically, topics often addressed include but are not limited to: Good Samaritan immunity, permissible AED users, medical oversight, agency (i.e., EMS) notification, AED and CPR training, AED inspection and maintenance, post-AED use reporting, and written policies, procedures, and protocols (England, Weinberg, & Estes, 2006; Lazar, 2004). For immunity to apply, it is important to adhere to all conditions of a Good Samaritan immunity statute. Therefore, health/fitness facility owners and



managers should review applicable laws very carefully when designing and implementing an AED program.

Strategies available to manage AED program risk depend on whether or not a health/fitness facility chooses to implement an AED program. As previously noted, certain jurisdictions have required, by statute, the placement of AEDs in health/fitness facilities, and others are considering it. For health/fitness facilities that elect not to implement an AED program, risk management relies on the prospect that a court will find an absence of legal duty. However, with the increasing awareness of AEDs and their benefits, the publication of standards and guidelines recommending AED installation, and recent AED installation trends, it is quite likely that more courts may find that a legal duty does exist and will impose liability on those organizations that fail to install AEDs (AED Risk Insights, 2006; Lazar, 2004). To date, however, there have been no cases that have been decided that way. For instance, in *Atcovitz v. Gulph Mills Tennis Club, Inc.* (2002), it was determined that an AED was not required at a tennis club.

In contrast, a number of risk management strategies exist for those health/fitness facilities that decide to implement AED programs. Ultimately, such strategies are controlled by the organization and include careful program design, program certification, AED manufacturer indemnification, Good Samaritan immunity, and liability insurance. Perhaps, the most effective way to manage liability is to very carefully design, implement, and operate a reasonable AED program (Lazar, 2004). Various organizations such as the AHA, AED Risk Insights, and AED manufacturers can assist with this complex and important task. It is strongly recommended that health/fitness facility owner and managers work closely with competent professionals in developing and implementing an AED program.

Several AED manufacturers offer liability indemnification to the purchasers of their products; however, the types and scope of coverage vary. Finally, liability insurance offers a way to share liability risk with an insurance company (Lazar, 2004). Some insurance companies have entered into alliances with AED manufacturers to offer purchase discounts.

#### Perceived Constraints to AED Implementation

The data suggested that the greatest perceived constraint to AED implementation in health/fitness facilities was cost related. The cost of an AED has decreased considerably over the past several years, with prices ranging from \$1500 to \$2000 depending on the model, manufacturer, and service warranty (Aufdherheide et al., 2006; AHA, 2006b). Additionally, any



IHRSA club member can purchase AEDs through IHRSA's Advantage program starting at \$1,995 per unit. Although IHRSA's official position is that there is not yet a legal standard of care that AEDs be in all health/fitness facilities, the association encourages health club operators to consider the advantages of installing AEDs in their facilities. IHRSA also has an agreement with AED manufacturer Philips Medical Systems to promote AED implementation, training, and use in its U.S. member clubs (Pomerantz, 2004). The program offers reduced pricing, an AED response plan, medical direction, and on-site training programs (Pomerantz, 2004; Walsh, 2005).

AEDs require little maintenance (Aufdherheide et al., 2006). The primary costs associated with AED maintenance involve replacing the batteries and electrode pads. One study estimated the costs of AED maintenance to be approximately \$40 per year, and a cost of \$150 each time an AED is used (Cram, Jijan, & Fendrick, 2003). Another cost involved is training staff. However, most clubs already require their fitness staff to be certified in CPR. Training costs can be reduced and training sessions can be more convenient if a club employee is trained as an AED instructor. Several organizations, including the AHA, American Red Cross, National Safety Council, and the American Safety and Health Institute, have developed CPR/AED training and instructors courses for non-medical personnel. The basic training courses are 3 ½ to 4 hours long, incorporate adult-CPR and AED training, and typically cost \$40. Certifications are valid from one to two years depending on the certifying agency.

The data also suggested that a lack of information was the second greatest perceived constraint to AED implementation in health/fitness facilities. Specifically, it was a lack of information regarding (a) protection from liability, (b) required certification and training, (c) supervisory responsibilities, and (d) use and operation of AEDs. Efforts to educate health/fitness facility owners and managers in these areas should be made. This information is available and may be obtained from state statutes, via the Internet (i.e., National Conference of State Legislatures, 2006), as well as from professional organizations such as the AHA and AED Risk Insights, Inc. Specific legal questions should be addressed to a competent attorney who is familiar with state and local laws.

## CONCLUSION

In conclusion, the present findings suggest low AED implementation in health/fitness facilities in Florida. Additionally, numerous facilities that had an AED(s) were not following the risk management recommendations published

by the leading national professional organizations (AHA, 2004, Aufdherheide et al. 2006, Balady et al., 2002). Health/fitness professionals should keep abreast of this topic as technological advances, standards and guidelines, statutes, and case law involving AEDs continue to evolve at a rapid pace. This study included a relatively small sample of public health/fitness facilities from one state. Future research in this area should be expanded to other states and regions within the United States, including states that mandate the placement of AEDs in health/fitness facilities.

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