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Automated External Defibrillators in Health/Fitness Facilities Supplement to the AHA/ACSM Recommendations for Cardiovascular Screening, Staffing, and Emergency Policies at Health/Fitness Facilities

Writing Group

Gary J. Balady, MD, Chair; Bernard Chaitman, MD; Carl Foster, PhD; Erika Froelicher, PhD;
Neil Gordon, MD; Steven Van Camp, MD

In 1998, the American Heart Association (AHA) and American College of Sports Medicine (ACSM) published recommendations^{5,6} for health/fitness facilities regarding the screening of clients for the presence of cardiovascular disease, appropriate staffing, emergency policies, equipment, and procedures relative to the client base of a given facility. Accordingly, health/fitness facilities are defined as organizations that offer exercise-based health and fitness programs as their primary or secondary service or that promote moderate-to vigorous-intensity recreational physical activity. These range from level 1 (unsupervised exercise room) to level 5 (medically supervised exercise program), and their specific characteristics are outlined in Table 1. Details regarding emergency readiness are provided in the AHA/ACSM recommendations^{5,6} and emphasize that all health/fitness facilities must have written emergency policies and procedures that are reviewed and practiced regularly, and that in all supervised facilities, exercise leaders must be trained in basic cardiopulmonary resuscitation (CPR). Because of the publication of the 1998 AHA/ACSM recommendations, 47 states have since passed Good Samaritan legislation, and the federal government has passed the Cardiac Arrest Survival Act and the Rural Access to Emergency Devices Act as components of the federal Public Health Improvement Act of 2000.⁷ These state and federal laws now serve to expand Good Samaritan legal protections to users of automated external defibrillators (AEDs) throughout the nation. Therefore, the purpose of this statement is to supplement the 1998 AHA/ACSM recommendations^{5,6} regarding the purchase and use of AEDs in health/fitness facilities. Similar to the parent document,^{5,6} these recommendations are based on a review of the literature and consensus of the writing group after having undergone extensive peer review and final approval by AHA

and ACSM. The recommendations are not mandatory or all encompassing, nor do they limit provision of individualized care by health/fitness facilities exercising independent judgment.

Role of AEDs in the Chain of Survival

An AED is a device that incorporates a rhythm-analysis system and a shock-advisory system for victims of cardiac arrest.¹ The AED advises a shock, and the operator must take the final action to deliver the shock. The International Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care² conclude that early CPR is the best treatment for cardiac arrest until the arrival of an AED and advanced cardiac life support care. The chain of survival includes a series of actions designed to reduce mortality associated with cardiac arrest. Early CPR plays an important role in the chain of survival that includes the following links: 1) early recognition of cardiopulmonary arrest, 2) early CPR, 3) early defibrillation when indicated, and 4) early advanced cardiac life support care.³ Early CPR can prevent ventricular fibrillation from deteriorating to asystole, may increase the chance of successful defibrillation, contributes to the preservation of heart and brain function, and significantly improves survival.⁴ Importantly, for victims of sudden, shockable cardiac arrest (ventricular fibrillation or pulseless ventricular tachycardia), the single greatest determinant of survival is the time from collapse to defibrillation. A recent review¹⁷ summarizes the data comparing the time-to-shock between first responders (i.e., firefighters, police, and emergency medical system (EMS) basic life support personnel) versus paramedics and demonstrates significantly shorter times among first responders in three of five studies. A survival rate, among victims of witnessed ventricular fibrillation cardiac arrest, as high as 90% has been reported when defibrillation is achieved within the first minute of collapse.^{8,11,14,15,21} Survival rates decline 7–10% with every minute that defibrillation is delayed, such that a cardiac arrest victim without defibrillation beyond 12 minutes has only a 2–5% chance of survival.¹ The highest survival rates for out of hospital cardiac arrest have been reported in cardiac rehabilitation programs equipped with defibrillators (i.e., Table 1: level-5 facilities), where survival approaches 90%.^{8,11,14,15,21} The International Guidelines² conclude that public access to defibrillation (PAD) accomplished by the placement of AEDs in selected locations for immediate use by trained laypersons may be the key

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Health/Fitness Facilities—Emergency Plans and Equipment*

	Level 1	Level 2	Level 3	Level 4	Level 5
Type of facility	Unsupervised exercise room (e.g., those in hotels, commercial buildings, and apartment complexes)	Single exercise leader	Fitness center for general membership	Fitness center offering special programs for clinical populations	Medically supervised clinical exercise program (e.g., cardiac rehabilitation)
Personnel†	None	Exercise leader Recommended: medical liaison	General manager Health/fitness instructor Exercise leader Recommended: medical liaison	General manager Exercise specialist Health/fitness instructor Medical liaison	General manager Exercise specialist Health/fitness instructor Medical liaison
Emergency plan	Present	Present	Present	Present	Present
Emergency equipment	Telephone in room Signs Encouraged: PAD plan with AED as part of the composite PAD plan in the host facility (e.g., hotel, commercial building, apartment complex)	Telephone Signs Encouraged: blood pressure kit, stethoscope, PAD plan with AED	Telephone Signs Encouraged: blood pressure kit, stethoscope, PAD plan with AED (the latter are strongly encouraged in facilities with membership >2500 and those in which EMS response time is expected to be >5 minutes from recognition of arrest)	Telephone Signs Blood pressure kit Stethoscope Strongly encouraged: PAD plan with AED	Telephone Signs Blood pressure kit Stethoscope Oxygen Crash cart Defibrillator‡

AED, automatic external defibrillator; PAD, public access to defibrillation.

*This table should replace the bottom half of Table 5 of the AHA/ACSM Recommendations.^{5,6}

†Detailed definitions and competencies for personnel positions are outlined in the ACSM Guidelines.¹⁰

‡Standard equipment in level 5 facilities includes a defibrillator.^{5,6,22}

intervention to significantly increase survival from an out-of-hospital cardiac arrest. Two recent observational studies report impressive results regarding the effectiveness of PAD in persons with witnessed cardiac arrest, who are in ventricular fibrillation, with AED placement in casinos²⁰ and on airplanes.¹⁹ The cardiac arrest survival rates to discharge from the hospital were 53% and 40%, respectively.

Cardiovascular Risks of Exercise

The AHA/ACSM Recommendations^{5,6} provide details regarding the cardiovascular risks of exercise. It is clear that the risk of adverse cardiovascular events including death is greater among those individuals with cardiovascular disease than among presumably healthy individuals.^{5,6,9} As the demographics of the more than 30 million individuals who exercise at health/fitness facilities demonstrate a steady increase in the number of members older than 35 yr (approximately 55% of current membership),¹⁶ it is reasonable to presume that the number of members with cardiovascular disease (and other comorbidities) is rising as well. Although there are no data regarding the incidence of cardiac arrest at health/fitness facilities, two recent surveys provide some important insight. A large database consisting of more than 2.9 million members of a large commercial health/fitness facility chain demonstrates 71 deaths (mean age 52 ± 13 yr; 61 men, 10 women) occurring over a 2-year period, yielding a rate of 1 death/100,000 members/year. The death rate was highest among those members who exercised less frequently, such that nearly half of exercise-related deaths were in those who exercised less than once/week.¹² The cardiac arrest rate

was not reported but was presumably higher than the death rate. A recent survey of 65 randomly chosen health/fitness facilities in Ohio¹⁸ reports the occurrence of sudden cardiac arrest or heart attack in 17% of facilities during a 5-year period. Notably, only 3% of facilities had an AED on site. Thus, it is prudent to conclude that health/fitness facilities should be considered among the sites in which PAD programs should be established.

Recommendations

It is essential to acknowledge that emergency equipment alone does not save lives. The ACSM/AHA Recommendations^{5,6} emphasize the importance of written emergency policies and procedures that are reviewed and practiced regularly. Well-trained health/fitness facility staff members are essential to maintain strong links in the chain of survival for their clients. Effective placement and use of AEDs at all health/fitness facilities (Table 1: levels 1–5) is encouraged, as permitted by law, to achieve the goal of minimizing the time between 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 > 2500; (> median size health/fitness facility¹⁶)); those that offer special programs to clinical populations (i.e., programs for the elderly or those with medical conditions (level 4)) (note that in level-5 facilities, current equipment standards require defibrillators^{5,6,22}; and 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 (level-1 facilities), such as those that might be located in hotels, apartment complexes, or office buildings, the AED should be part of the overall PAD plan for the host facility. At the least, an unsupervised exercise room should have a telephone available in the room with clearly posted numbers to call in case of emergency. In supervised settings, it is essential that designated health/fitness facility staff members who are trained in CPR be present during all hours of operation. CPR should be initiated as soon as a cardiac arrest is recognized and should be continued until the AED is placed on the victim and is activated. In cases of cardiac arrest not due to ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), AEDs are of no value, and CPR must be maintained. Also, after successful termination of VF/pulseless VT, the rescuer must be able to open the airway and support ventilation and circulation with chest compressions as needed until the arrival of EMS personnel.

Therefore, the establishment of a PAD at all health/fitness facilities is encouraged. This plan should include the following:

- Have written emergency policies and procedures that are practiced regularly (i.e., at least once every 3 months).
- Designate staff members who are trained in CPR and function as first responders in the health/fitness facility setting during all hours of operation.
- Train staff to recognize cardiac arrest.
- Activate EMS—assign staff to meet the emergency response team at the entrance of the facility so that they can be promptly guided to the victim.
- Provide CPR.
- Attach/operate AED (detailed instructions are provided by the specific equipment manufacturer and general recommendations are outlined in the Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.¹)
- The use of AEDs in infants and children < 8 yr of age is not recommended.¹

Health/fitness facilities should coordinate their PAD program with the local EMS, because many dispatch systems use local phone-directed protocols to assist rescuers in the use of AED and may notify local EMS en route that an AED is being used at the scene. Moreover, the local EMS may assist with program planning and quality improvement, including medical direction, AED deployment and protocols, training, monitoring, and review of AED events.¹ Emergency drills should be practiced at least once every 3 months or more often when staff changes occur.^{5,6} When new staff are hired, new team arrangements may be necessary. The simulated use of AEDs in drills offers the best opportunity for skills maintenance. Maintaining the AED device in proper working condition according to the manufacturer's recommendations is essential. PAD programs must comply with local or regional regulation and legislation.

Costs

Details regarding the technical aspects of AEDs are available elsewhere.^{1,17} At present, the cost of an AED is approx-

imately \$3000–\$4500 per unit. It is expected that the price of AEDs will likely decrease as their use becomes more widespread. The National Heart Lung and Blood Institute (NHLBI), in partnership with the AHA and industry, is conducting a multisite, controlled, prospective study to determine the efficacy and cost-effectiveness of placing AEDs in a variety of public settings. A recent independent study¹³ has demonstrated that a program of placing AEDs on large (>200 passenger) and medium (>100 passenger) capacity aircraft attain generally accepted levels of cost-effectiveness. However, the cost-effectiveness of AED deployment on smaller aircraft is, at this time, less certain. Similarly, as the cost-effectiveness of AED placement in health/fitness facilities is unknown, it is expected that these recommendations will be reviewed and updated when such data become available. At this time, individual health/fitness facilities are encouraged to maintain data on the utility of their PAD programs and perhaps engage in a collaborative effort with other health/fitness facilities to assess the success of their programs.

Summary of Key Points

- The Cardiac Arrest Survival Act and the Rural Access to Emergency Devices Act, as components of the federal Public Health Improvement Act of 2000, as well as Good Samaritan laws passed in 47 states, expands Good Samaritan legal protections to users of AEDs throughout the nation.
- The placement of AEDs in selected locations for immediate use by trained laypersons may be the key intervention to significantly increase survival from an out-of-hospital cardiac arrest.
- The chain of survival includes a series of actions designed to reduce mortality associated with cardiac arrest and includes the following links: 1) early recognition of cardiopulmonary arrest, 2) early CPR, 3) early defibrillation when indicated, and 4) early advanced cardiac life support care.
- Well-trained health/fitness facility staff members are essential to maintain strong links in the chain of survival for their clients.
- Effective placement and use of AEDs at all health/fitness facilities (Table 1: levels 1–5) is encouraged, as permitted by law, to achieve the goal of minimizing the time between 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 > 2500); those that offer special programs to clinical populations (i.e., programs for the elderly or those with medical conditions (level 4)); and 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 (level-1 facilities), such as those that might be located in hotels, apartment complexes, or office buildings, the AED should be part of the overall PAD plan for the host facility.

- Health/fitness facilities should coordinate their PAD program with the local EMS.
- Emergency drills should be practiced at least once every 3 months or more often when staff changes occur.
- PAD programs must comply with local or regional regulation and legislation.

Acknowledgments

This work is a supplement to the AHA/ACSM Recommendations for Cardiovascular Screening, Staffing, and Emergency Policies at Health/Fitness Facilities.^{5,6}

References

1. American Heart Association and International Liaison Committee on Resuscitation. Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 102(Suppl. 1):I60–76, 2000.
2. American Heart Association and International Liaison Committee on Resuscitation. Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 102(Suppl. 1):I1–375, 2000.
3. American Heart Association and International Liaison Committee on Resuscitation. Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 102(Suppl. 1):I358–370, 2000.
4. American Heart Association and International Liaison Committee on Resuscitation. Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 102(Suppl. 1):I22–59, 2000.
5. Balady, G. J., B. Chaitman, D. Driscoll, et al. American Heart Association/American College of Sports Medicine Joint Scientific Statement: Recommendations for Cardiovascular Screening, Staffing, and Emergency Policies at Health/Fitness Facilities. *Circulation* 97:2283–2293, 1998.
6. Balady, G. J., B. Chaitman, D. Driscoll, et al. American Heart Association/American College of Sports Medicine Joint Scientific Statement: Recommendations for Cardiovascular Screening, Staffing, and Emergency Policies at Health/Fitness Facilities. *Med. Sci. Sports Exerc* 30:1009–1018, 1998.
7. Cardiac Arrest Survival Act of 2000. Public Law 106–505, Sec. 401–404.
8. Fletcher, G.F., and J.D. Cantwell. Ventricular fibrillation in a medically supervised cardiac exercise program: clinical, angiographic and surgical correlations. *JAMA* 238:2627–2629, 1977.
9. Fletcher, G.F., G.J. Balady, V.F. Froelicher, L.H. Hartley, W.H. Haskell, and M.L. Pollock. Exercise Standards: A Statement for Health Professionals from the American Heart Association. *Circulation* 91:580–615, 1995.
10. Franklin, B. (Ed.). *American College of Sports Medicine Guidelines for Exercise Testing and Prescription* (6th Ed.). Baltimore: Williams & Wilkins, 2000, pp. 322–351.
11. Franklin, B.A., K. Bonzheim, S. Gordon, and G.C. Timmis. Safety of medically supervised outpatient cardiac rehabilitation exercise therapy: a 16 year follow-up. *Chest* 114:902–906, 1998.
12. Franklin, B.A., J.M. Conviser, B. Stewart, J. Lasch, and G.C. Timmis. Sporadic exercise: a trigger for acute cardiovascular events? (Abstract). *Circulation* 102(Suppl. 2):II612, 2000.
13. Groeneveld, P.W., J.L. Kwong, Y. Liu, et al. Cost-effectiveness of automated external defibrillators on airlines. *JAMA* 286:1482–1489, 2001.
14. Haskell, W.L. Cardiovascular complications during exercise training of cardiac patients. *Circulation* 57:920–924, 1978.
15. Hossack, K.F., and R. Hartwig. Cardiac arrest associated with supervised cardiac rehabilitation. *J. Cardiac Rehabil.* 2:402–408, 1982.
16. International Health, Racquet, and Sportsclub Association. 2000 Profiles in Success. Boston, 1999.
17. Marengo, J.P., P.J. Wang, M.S. Link, M.K. Homoud, and N.A.M. Estes. Improving survival from sudden cardiac arrest: the role of the automated external defibrillator. *JAMA* 285:1193–1200, 2001.
18. McInnis, K.J., W. Herbert, D. Herbert, J. Herbert, P. Ribisl, and B. Franklin. Low compliance with national standards for cardiovascular emergency preparedness at health clubs. *Chest* 120:283–288, 2000.
19. Page, R.L., J.A. Joglar, R.C. Kowal, et al. Use of automated external defibrillators by a U.S. airline. *N. Engl. J. Med.* 343:1210–1216, 2000.
20. Valenzuela, T. D., D.J. Roe, G. Nichol, L.L. Clark, D.W. Spaite, and R.G. Hardman. Outcomes of rapid defibrillation by security officers after cardiac arrest in casinos. *N. Engl. J. Med.* 343:1206–1209, 2000.
21. Van Camp, S.P., and R.A. Peterson. Cardiovascular complications of outpatient cardiac rehabilitation programs. *JAMA* 256:1160–1163, 1986.
22. Williams, M (Ed.). *American Association for Cardiovascular, and Pulmonary Rehabilitation: Guidelines for Cardiac Rehabilitation and Secondary Prevention Programs*. Champaign, IL: Human Kinetics, 1999.

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