

Attitudes of Ohio Dentists and Dental Hygienists on the Use of Automated External Defibrillators

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Abstract: The American Heart Association reports that approximately 220,000 people die each year of sudden cardiac arrest. In ventricular fibrillation (VF), the most common abnormal heart rhythm that causes cardiac arrest, the heart's electrical impulses suddenly become chaotic, often without warning. Death will follow within minutes if the victim is not treated appropriately, and the only known treatment is defibrillation. An automated external defibrillator (AED) can restore a victim's normal heart rhythm by providing defibrillation. The purpose of this study was to gather data from dentists and dental hygienists in Ohio on their use of and attitudes toward using AEDs in dental offices. Six percent of Ohio dentists and dental hygienists were randomly selected to receive a twenty-three question survey related to their use of and attitudes toward their use of AEDs in dental offices. Thirty-three percent (244) of the surveys were returned; 41 percent of the respondents were dentists, and 59 percent were dental hygienists. Six percent said they have had to administer nitroglycerin to a patient during a dental visit; 5 percent have performed CPR on a patient in the dental office; and 78 percent said their last CPR training course included training on an AED. Eleven percent said there was an AED at their dental office. With the increased likelihood of dealing with a cardiac emergency in the dental office setting and the willingness of dental professionals to use an AED, all dental offices should consider obtaining an AED. Dental educators should become familiar with current protocols for handling cardiac medical emergencies in the dental office and prepare dental and dental hygiene students with the skills necessary to manage patients with cardiac emergencies. Graduating dental students entering private practice may want to consider the AED as part of their medical emergency office protocol.

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The American Heart Association (AHA) states that approximately 220,000 people die each year of sudden cardiac arrest. That number is equivalent to 600 people per day and twenty-five people per hour. Sudden cardiac arrest often results from arrhythmias or abnormal heart rhythms.¹ Ventricular fibrillation (VF) is the most common abnormal heart rhythm that causes cardiac arrest. The AHA defines VF as a condition in which the heart's electrical impulses suddenly become chaotic, often without warning. These chaotic impulses cause the pumping heart to stop, resulting in loss of consciousness, loss of regular respiratory activity, and lack of a pulse. Death will follow within minutes if the victim is not treated appropriately, and the only known treatment for VF is defibrillation.

Defibrillation is the technique of applying an electrical shock to restore normal heart rhythm. If the electrical shock is delivered within a few minutes of cardiac arrest, it can save that person's life. A victim's chance of survival decreases 7-10 percent every minute without defibrillation. After ten minutes, chances of survival are unlikely.¹ Emergency medical technicians (EMTs) can defibrillate an individual if they arrive soon enough, but response times vary due to traffic conditions and the location of the victim at the time of the cardiac arrest.

An automated external defibrillator (AED) can restore a victim's normal heart rhythm by providing defibrillation. AEDs are relatively inexpensive (between \$2100 and \$3000),^{2,3} lightweight, effective, and safe. AEDs do not require extensive medical

training to operate.³ In fact, AEDs are “computer-driven, voice-prompted, electric shocking devices that can be used by virtually anyone who has had brief CPR training.”⁴

The AHA now includes defibrillation in its “chain of survival,” and since 1998, hands-on AED training is included in all AHA Healthcare Provider and Heartsaver courses. It is incorporated into the Basic Life Support training; the steps are now ABCD: airway, breathing, circulation, and defibrillation.⁴ Indeed, Mancini and Kaye argued that AEDs should be used prior to CPR to assist patients in cardiac arrest, unless an AED is not readily accessible.⁵

The AHA and the American Red Cross support the placement of AEDs in doctor’s offices as well as other public places such as malls, workplaces, airplanes, and sports arenas.⁶⁻⁹ Legislation at the state and federal level has decreased legal concerns regarding AED use under the Good Samaritan laws.¹⁰ According to Caffrey et al., individuals with no personal responsibility or training to aid victims of cardiac arrest successfully used AEDs located in public areas of Chicago airports to assist patients in cardiac arrest.¹¹ Even though AEDs are located in many public areas, areas considered high-risk locations for cardiac arrest may still be without AEDs; these include health clubs and gyms.¹²

Another logical place to find an AED is the dental office. Dental offices are seeing an increasing number of medically compromised and geriatric patients. This trend will lead to an increased number of cardiac emergencies.^{3,4} A study by Becker et al. calculated an annual incidence of 142 cardiac arrests in medical or dental practices over a six-year period.¹³ Even though AEDs are relatively simple to use, there is concern regarding the layperson’s use of an AED and the success of defibrillation.¹⁴ A study by Rocchia et al. on the use of AEDs among various groups of individuals revealed an overall 80 percent failure rate on using an AED among the general population. The failure rate decreased significantly when participants were dental students, dentists, or dental hygienists. The authors concluded that training on an AED was essential and that the dental curriculum should be expanded to include use of the AED in medical emergency courses.¹⁵ Many dental professionals are trained to handle medical emergencies. This training includes the use of AEDs as well as the recognition of symptoms of cardiac emergencies.¹⁶

A review of the literature indicates a lack of data concerning the presence of AEDs in the dental office. Currently, Ohio does not mandate the presence

of an AED in the general dental office. The purpose of this research project was to assess Ohio dentists’ and registered dental hygienists’ attitudes toward the use of AEDs in the dental office setting. Learning how to adequately deal with medical emergencies is a significant component of dental and dental hygiene education. Dental and dental hygiene students should be aware of current techniques in dealing with medical emergencies in the dental office setting. As the general population is aware that a device such as an AED is available in a medical emergency, the public expectation is that an AED will be available in situations, such as a dental office, where a cardiac emergency may occur. The American Dental Association supports the use of AEDs in dental offices and awards its Seal of Acceptance to several brands of defibrillators. However, there are possible legal concerns for dental offices not having an AED available in the dental office, especially those offices providing conscious and unconscious sedation.

Methods

In February 2004, a one-time mailing was sent to Ohio dentists and dental hygienists to gather the self-reported data. Each mailing included a cover letter stating the purpose of the survey, a two-page survey instrument, and a postage-paid return envelope. A 6 percent sample of subjects was randomly selected from all Ohio licensed dentists and dental hygienists using the Statistical Package for the Social Sciences (SPSS). The 6 percent sample consisted of 381 dentists and 350 dental hygienists. The sample size was determined to be a manageable sample size taking into account the budget constraints of printing and mailing costs. The use of a survey/questionnaire was determined to be the most cost-effective form of data collection. The survey was anonymous, and no identifying personal information was connected to the results.

After receiving approval from the Internal Review Board of Youngstown State University, a small pilot study was conducted for validity. SPSS was used to establish basic descriptive frequencies about the survey respondents.

Results

The response rate of the initial survey mailing to 731 potential respondents was 244 (33 percent). Ninety-nine (41 percent) of the respondents were

dentists, and 144 (59 percent) of the respondents were dental hygienists (Figure 1). Two hundred thirty (94 percent) indicated they worked in private practice, seven (3 percent) in an educational setting, three (1.2 percent) in a hospital, two (.8 percent) in a clinic; less than 1 percent indicated they worked in the public health setting.

One hundred thirty-seven (91.9 percent) dental hygienists worked primarily with dentists in general dentistry, five (3.4 percent) in pediatric dentistry, four (2.7 percent) in periodontal practices, and three (2 percent) worked for other types of dentists. Seventy-nine (74.5 percent) dentists indicated they were general dentists. Three (2.8 percent) indicated they were periodontists, seven (6.6 percent) were pediatric dentists, six (5.7 percent) were oral surgeons, two (1.9 percent) were endodontists, and nine (8.5 percent) indicated they practiced another type of specialty. Most who selected "other" indicated they worked in an orthodontic practice. One hundred seventy-two (70.5 percent) of all respondents indicated they worked full-time, defined as working thirty or more hours a week. Approximately 29 percent indicated they worked part-time, less than thirty hours a week.

Twenty-six (10.7) of those surveyed indicated they have called an ambulance or emergency medical technicians (EMTs) for a patient in the dental chair because of a cardiac emergency. Two hundred eighteen (94 percent) indicated that 911 was the emergency number they would dial from their work setting. When asked for estimates of the response time for EMTs or an ambulance to arrive at the dental office in which they primarily work, seventy-two (30.2 percent) felt it would take less than three minutes, 119 (50 percent) selected three to five min-

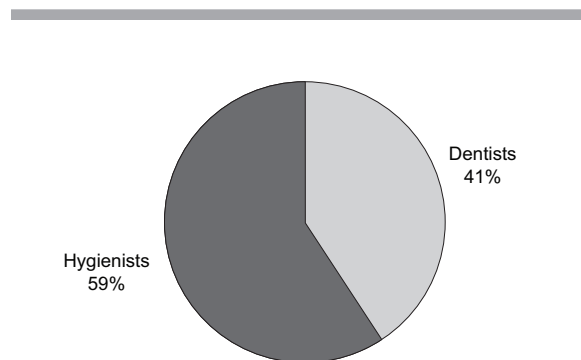


Figure 1. Responders to the survey

utes, thirty-four (14.3 percent) selected six to eight minutes, eleven (4.6 percent) indicated nine to eleven minutes, and two (.8 percent) felt it would take eleven minutes or longer. An additional comment written in for a respondent who checked longer than eleven minutes stated "no estimate; it took 13 minutes" and one person wrote "don't know."

Fourteen (5.8 percent) indicated they have had to administer nitroglycerin to a patient during a dental visit. Eleven (4.6 percent) indicated they had performed CPR on a patient in the dental office setting. One hundred eighty-six (78.2 percent) of those surveyed indicated that their last CPR training course included training on an AED. One respondent who checked "no" wrote, "but we did discuss it and how it works." Twenty-five (11 percent) of those surveyed indicated there was an AED available at the dental office setting in which they were currently working (Figure 2). Two hundred forty-one (98 percent) indicated they have not used an AED in the dental office setting, and three (2 percent) left that question unanswered (Figure 3). Four (2 percent) of the respondents indicated that they have used an AED on an individual outside the dental office setting (Figure 4). One person who selected "no" wrote, "We are 3 buildings away from a major hospital," and another who selected "don't know" wrote, "It's on the grounds, but not in our building." Comments written in this section included "we have one on order," "we are interested in buying," and "we are currently researching them to purchase."

Cross-tabulation of the data (dentist/dental hygienist plus other questions listed below) using SPSS resulted in the following. Twenty-one (21 percent) dentists feel that AEDs should be mandated in the dental office setting, while sixty-eight (48 percent) dental hygienists feel they should be mandated. Fifty-two (53 percent) dentists indicated they felt that AEDs should not be mandated in the dental office setting, and thirty-two (23 percent) dental hygienists felt they should not be mandated. Twenty-six (26 percent) dentists said they did not know if AEDs should be mandated, and forty-one (29 percent) dental hygienists indicated they did not know if the devices should be mandated (Figure 5).

One hundred ninety-five (81 percent) of both dentists and dental hygienists indicated that they would use an AED on a patient experiencing a cardiac emergency if one were available to them. Eight (8 percent) dentists and four (3 percent) dental hygienists stated that they would not use an AED if one were available. Eleven (11 percent) dentists and

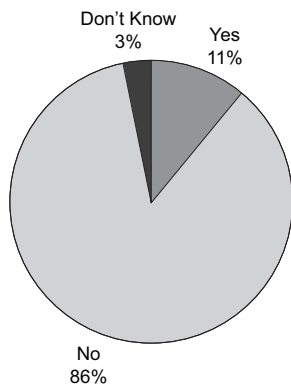


Figure 2. Is there an AED in the dental office or setting you are currently working in?

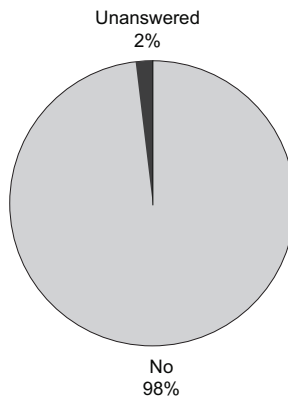


Figure 3. Have you ever used an AED on a patient in the dental office setting?

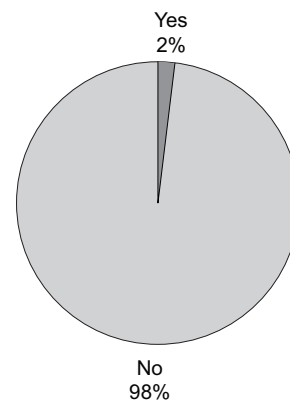


Figure 4. Have you ever used an AED on an individual outside the dental office setting?

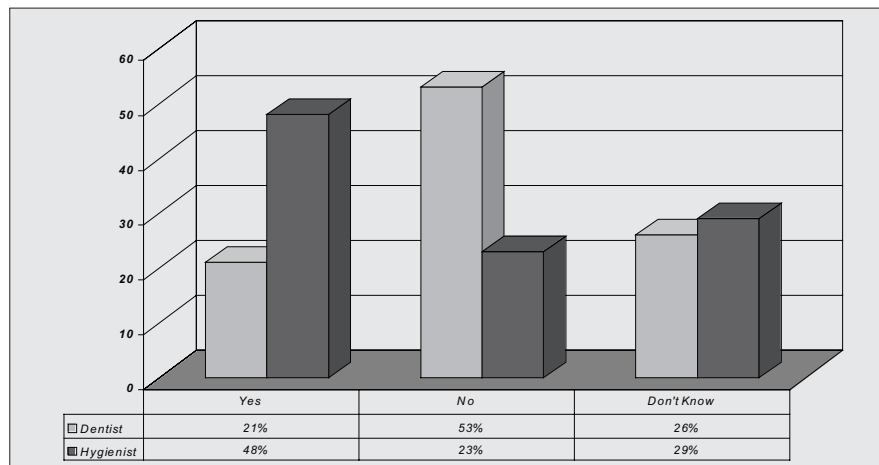


Figure 5. Should AEDs be mandated in the dental office setting?

twenty-three (16 percent) dental hygienists indicated that they did not know if they would use an AED if one were available (Figure 6).

Respondents were asked: “Considering the possibility of having to deal with a medical emergency in the dental office setting, do you feel it is important to have an AED on the premises?” A total of fifty-two (54 percent) dentists and 112 (79 percent) dental hygienists indicated they felt it was important. Twenty-nine (30 percent) dentists and fourteen (10 percent) hygienists said that they did not feel it was important. Sixteen (16 percent) dentists and sixteen

(11 percent) hygienists indicated that they did not know if they felt it was important (Figure 7).

Respondents were also asked: “What factor would you consider the most important obstacle when considering having an AED in the dental office setting?” The data represent combined responses of dentists and dental hygienists. Respondents could choose more than one answer. Overall, 107 (44 percent) indicated the cost of the AED was an obstacle. Fifty-five (22 percent) indicated a perceived lack of need for AEDs. Forty-three (18 percent) indicated the potential liability was an obstacle, and thirty-four (14

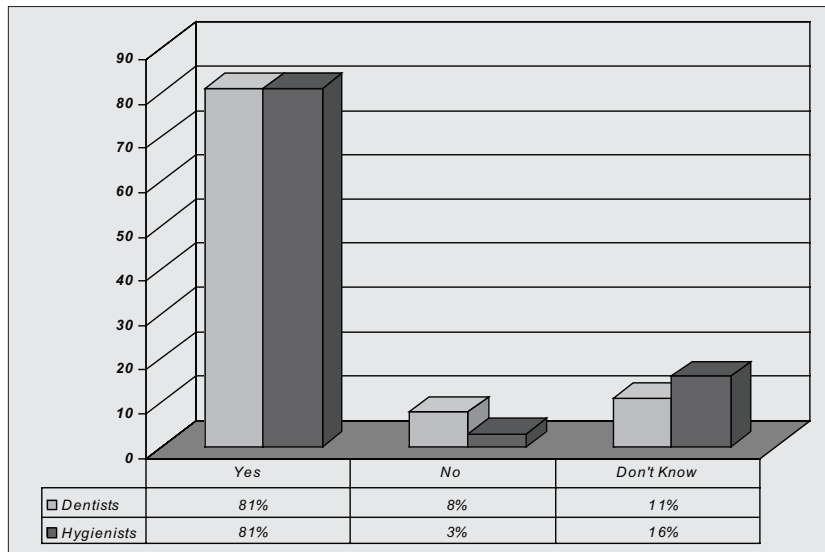


Figure 6. Would you use an AED if one were available?

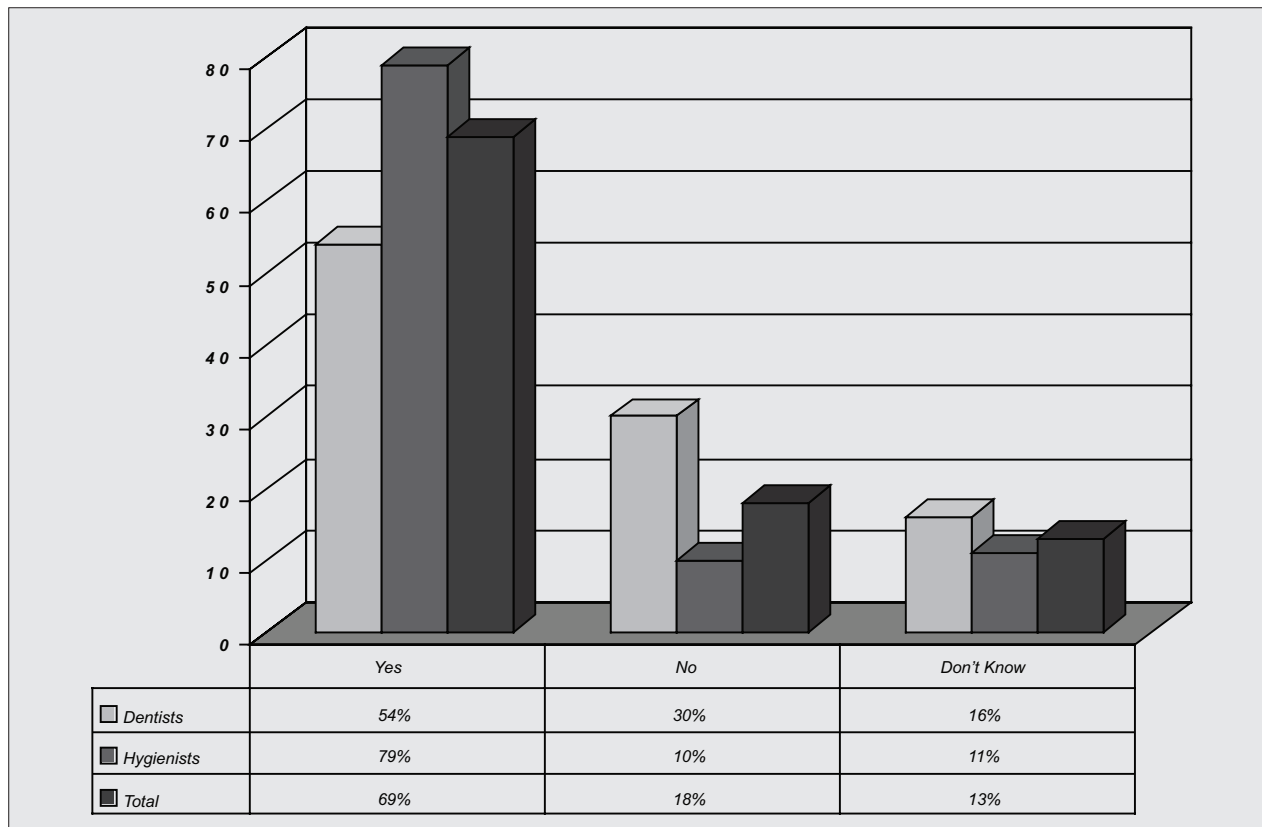


Figure 7. Considering the possibility of having to deal with a medical emergency in the dental office setting, do you feel it is important to have an AED on the premises?

percent) stated lack of training. Thirty-one (13 percent) selected absence of regulations requiring AEDs. Five (2 percent) selected "other." Comments written in the "other" category included "maintenance of AED" and "may not be competent unless trained biannually." No respondents indicated "difficulty of use."

Discussion

Results from this study suggest that, of those dentists and dental hygienists surveyed, most do not have an AED available to them. However, most of those respondents would use an AED if one were available to them. Additionally, many of those surveyed indicated that cost was a primary concern when considering whether to place an AED in the dental office/clinic setting.

Respondents were also asked in this survey to indicate if there were times when they had to administer nitroglycerine or perform CPR on a patient in the dental environment. These questions were included to ascertain the frequency of dealing with potential cardiac emergencies. Nearly 11 percent of respondents indicated they had administered nitroglycerine or performed CPR in the dental office setting. Again, the public is becoming aware that the best protocol for dealing with cardiac emergencies is the use of an AED and may expect that medical environments including dental offices will be well equipped to deal with cardiac emergencies should they arise.

There were several limitations to this study as occurs with all self-reported data, the validity and accuracy of which must always be questioned. Self-reports are potentially unreliable because participants may not always report their actual feelings and may respond as they feel they should instead of how they truly feel. If this study were to be repeated, a larger pilot survey would be conducted. Additionally, a larger and more diversified nationwide sample would be selected. Further research is needed in this field to expand the knowledge base regarding attitudes toward AED use in the dental field. Further research is also needed to determine whether the reported ambulance response times are accurate. The next time this survey is completed it would be beneficial to survey respondents' knowledge of the practical hands-on use of an AED. Participants' knowledge of the actual cost of an AED would be collected as well since many indicated cost was a major obstacle to having an AED on the premises.

Further studies are needed regarding the incidence of lawsuits related to dental offices not having an AED readily available, keeping in mind that the most critical time to utilize an AED is during the first ten minutes of a cardiac emergency while the heart may still be in a "shockable" rhythm. The benefits of using an AED to revive a patient decrease by 10 percent each minute that passes.

Dental offices in Ohio are currently not required to have an AED on the premises. In April 2005, the Florida Board of Dentistry was the first state to pass a ruling requiring all Florida dental offices to have AEDs on the premises by February 28, 2006. Florida dentists currently attend basic life support training every two years to maintain their licenses. This basic training includes the utilization of an AED. However, CPR training is not required of dentists in all states. In Ohio, for example, dental hygienists must be certified in CPR while dentists do not have a similar requirement. As public awareness increases, the expectation will be that health care providers, including dental offices, will have an AED available for cardiac emergencies that arise.

Conclusion

Dental and dental hygiene students must be familiar with the proper protocol to follow if a cardiac emergency arises during a dental visit. Having an AED on the premises whether in a dental office or dental educational setting may soon be regarded as the standard of care to handle cardiac medical emergencies.

REFERENCES

1. American Heart Association. The case for public access defibrillation (PAD) programs. At: www.americanheart.org/downloadable/heart/1053115415595padcase.pdf. Accessed: October 5, 2003.
2. American Heart Association. Quick overview on establishing a PAD program. At: www.americanheart.org/downloadable/heart/1053115586670padoverview.pdf. Accessed: October 5, 2003.
3. Levin J. The use of automatic defibrillators in the dental office. *Issues Interdiscip Care* 2001;3(1):3-4.
4. Alexander RE. The automated external cardiac defibrillator: lifesaving device for medical emergencies. *J Am Dent Assoc* 1999;130(June):837-45.
5. Mancini ME, Kaye W. AEDs: changing the way you respond to cardiac arrest. *Am J Nurs* 1999;99(5):26-30.
6. American Red Cross. Saving more lives: Red Cross adds AED training to CPR course. At: www.redcross.org/news/archives.2000/020402saving.html. Accessed: September 14, 2003.

7. American Heart Association. AED public access to defibrillation (PAD programs). At: www.americanheart.org/presenter.jhtml?identifier=3011853. Accessed: September 14, 2003.
8. American Heart Association. The case for public access defibrillation (PAD) programs. At: www.americanheart.org/downloadable/heart/1053115415595padcase.pdf. Accessed: October 5, 2003.
9. American Heart Association. Corporate training. At: www.americanheart.org/presenter.jhtml?identifier=3011794. Accessed: September 14, 2003.
10. Takata TS, Page RL, Joglar JA. Automated external defibrillators: technical considerations and clinical promise. *Ann Intern Med* 2001;135(11):990-8.
11. Caffrey SL, Willoughby PJ, Pepe PE, Becker LB. Public use of automated external defibrillators. *N Engl J Med* 2002;347(Oct):1242-7.
12. Bartimus HA, Rea TD, Eisenberg MS. Prevalence of automated external defibrillators at cardiac arrest high-risk sites. *Prehosp Emerg Care* 2004;8:280-3.
13. Becker L, Eisenberg M, Fahrenbruch C, Cobb L. Cardiac arrest in medical and dental practices: implications for automated external defibrillators. *Arch Intern Med* 2001;161(12):1509-12.
14. Andre AD, Jorgenson DB, Froman JA, Snyder DE, Poole JE. Automated external defibrillator use by untrained bystanders: can the public-use model work? *Prehosp Emerg Care* 2004;8(3):284-91.
15. Roccia WD, Modic PE, Cuddy MA. Automated external defibrillator use among the general population. *J Dent Educ* 2003;67(12):1355-61.
16. Hernandez B, Christensen J. Automated external defibrillator intervention in the workplace: a comprehensive approach to program development. *J Am Assoc Occup Health Nurses* 2001;49(2):96-106.