Implementing Cardiopulmonary Resuscitation Training Programs in High Schools: Iowa's Experience

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Objective To understand perceived barriers to providing cardiopulmonary resuscitation (CPR) education, implementation processes, and practices in high schools.

Study design Iowa has required CPR as a graduation requirement since 2011 as an unfunded mandate. A cross-sectional study was performed through multiple choice surveys sent to Iowa high schools to collect data about school demographics, details of CPR programs, cost, logistics, and barriers to implementation, as well as automated external defibrillator training and availability.

Results Eighty-four schools responded (26%), with the most frequently reported school size of 100-500 students and faculty size of 25-50. When the law took effect, 51% of schools had training programs already in place; at the time of the study, 96% had successfully implemented CPR training. Perceived barriers to implementation were staffing, time commitment, equipment availability, and cost. The average estimated startup cost was <$1000 US, and the yearly maintenance cost was <$500 with funds typically allocated from existing school resources. The facilitator was a school official or volunteer for 81% of schools. Average estimated training time commitment per student was <2 hours. Automated external defibrillators are available in 98% of schools, and 61% include automated external defibrillator training in their curriculum.

Conclusions Despite perceived barriers, school CPR training programs can be implemented with reasonable resource and time allocations. *(J Pediatr 2017;181:172-6).*

Survival of out-of-hospital cardiac arrest (OHCA), defined as survival to hospital discharge, has remained unchanged at 10%-12% over several decades.[1,2] Despite these overall poor survival outcomes, studies have identified several predictors that improve survival in OHCA: witnessed arrest, bystander cardiopulmonary resuscitation (CPR), ventricular fibrillation as the initial rhythm, early defibrillation, and minimized delay in the arrival of emergency services personnel.[3] In a witnessed arrest, prompt initiation of bystander CPR can double a patient's likelihood of survival.[4] The Public Access Defibrillation trial also documented that survival for victims of cardiac arrest doubled, with a low risk of adverse events, in communities where automated external defibrillators (AEDs) were available and cardiac arrest emergency response plans were implemented.[5] Various studies have demonstrated that training in basic life support, including knowledge of high-quality CPR and the use of AEDs, increases the likelihood of bystander intervention and victim survival.[6-8] However, the overall prevalence of CPR training in the US is low. Anderson et al[9] looked at individual counties in the US and found that median prevalence of CPR training in the middle tertile was 2.4% per year.

Many US states have adopted school instruction to improve the number of persons trained in CPR. To date, 32 states have passed legislation with variable language requiring high school students be trained in CPR techniques before graduation. In the majority of cases, the legislation does not contain specific language or guidelines as to how to implement or pay for these programs. Iowa has had CPR training as a high school graduation requirement since 2011 through a legislative mandate that provided no funds to the schools to pay for the programs. The objective of this study was to evaluate the implementation process, practices, and perceived barriers to providing CPR and AED education to high school students. We surveyed all Iowa high schools to help provide guidance for new programs based on over 4 years of experience.

Methods

A cross-sectional study was performed through electronic surveys sent to all 346 Iowa high schools. A 20-item multiple choice questionnaire was developed to obtain descriptive data (**Appendix**; available at www.jpeds.com). Email contact addresses for each school principal or superintendent were obtained from publicly available athletic association directories. Each survey was accompanied by a short introductory email explaining the purposes of the questionnaire. Compensation was not provided for participation in the survey. Prospective participants were contacted

AED	Automated external defibrillator	OHCA	Out-of-hospital cardiac arrest
CPR	Cardiopulmonary resuscitation		

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Table. Demographics of responding schools and characteristics of CPR training programs

	Mode	Range
School size	100-500	<100 to 2500-5000
Faculty size	25-50	<25 to >250
Staff members trained in CPR	<10	<10 to >50
Start-up cost	<$500	<$500 to >$5000
Maintenance cost	<$500	<$500 to >$5000
Time commitment	90-120 minutes	<30 minutes to >2 hours

up to 3 times via email: the initial survey followed by a reminder 2 weeks after distribution and a final reminder in 6 weeks. The survey distributed online was open for response for 60 days after distribution from March 2, 3015, to May 1, 2015. We used the Qualtrics (Provo, Utah), Internet-based survey software that allows viewing and completion across multiple platforms, to distribute, collect, and analyze the data. The responses of the survey were recorded and tabulated in real time and the submitted data could be viewed as individual responses or in aggregate for ease of analysis. The survey did not require approval by the University of Iowa Institutional Review Board because it did not collect identifying information. Data are presented as most common response (mode) with range.

Results

Completed surveys were received from 84 high schools across Iowa, a response rate of 26%. A flow diagram of the completed surveys demonstrates the breakdown of responses (**Figure 1**; available at www.jpeds.com). When the law took effect in 2011, 51% of schools had training programs already in place, and at the time of the survey 96% of schools had successfully implemented CPR training. Responding high schools were distributed throughout the state and represented a range of student body sizes, from fewer than 100 and up to 2500-5000 students (**Figure 2**; available at www.jpeds.com). The **Table** provides the school demographics and characteristics of CPR training programs. Perceived barriers to implementation, ranked by number of responses, were staffing, time commitment, equipment availability, and cost in decreasing order (**Figure 3**). No responding schools identified liability concerns as a barrier.

The training facilitator was a school employee or unpaid volunteer in 81% of schools; 19% reported a paid instructor. Average estimated time commitment for training was <2 hours per student and training most commonly occurred during school hours; only 7% of schools responded that their students and staff participated in training outside of established school hours (**Figure 4**, A). The most common estimated startup costs were ≤$1000 and the yearly maintenance costs were <$500, with funds typically allocated from existing school district funds (**Figure 4**, B). Training equipment was obtained from diverse sources (**Figure 4**, C). The AEDs are available in 98% of responding schools, but only 61% of schools include AED instruction in their training curriculum. The AEDs were purchased or obtained from various sources (**Figure 4**, D). Schools were also asked if there had been a sudden cardiac arrest on their campus since 2010, just before the state mandate took effect. Five percent of schools responding to the survey reported that there had been a witnessed cardiac arrest on their school grounds within the last 5 years.

Survey results also show a low proportion of staff is trained in CPR: 43% of schools have <10 staff members who are CPR trained and 88% of schools do not ask about CPR training during the faculty hiring process.

Discussion

The results of our survey of Iowa high schools show that, once the training programs were started successfully, anticipated obstacles did not match with the reality of implementation. The perceived barriers identified by the responses to the multiple

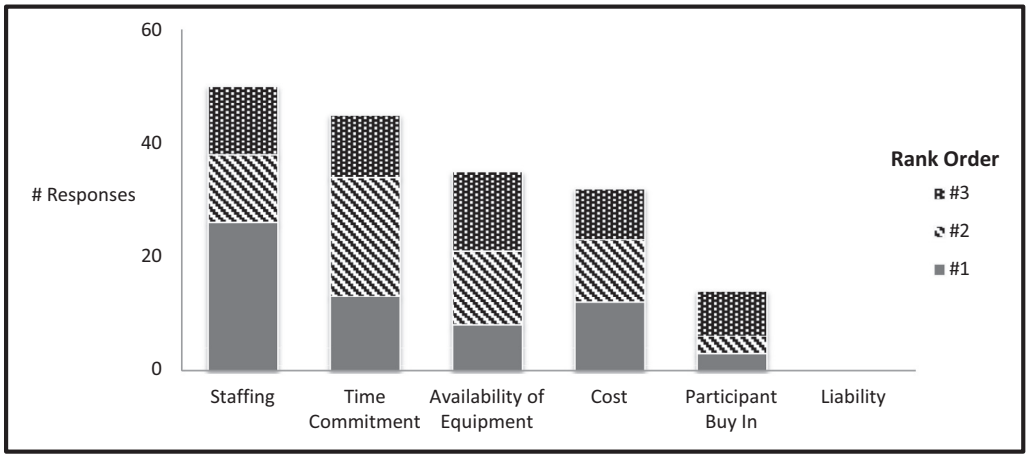

Figure 3. Perceived barriers to implementation of CPR training. Respondents were asked to rank perceived barriers from 1 (most significant) to 3 (least significant).