Automated External Defibrillator Availability and CPR Training Among State Police Agencies in the United States

Lior M. Hirsch, BS, Sarah K. Wallace, AB, Marion Leary, BSN, RN, Kathryn D. Tucker, BA, Lance B. Becker, MD, Benjamin S. Abella, MD, MPhil

From the Center for Resuscitation Science and Department of Emergency Medicine (Hirsch, Wallace, Leary, Tucker, Becker, Abella), the Doris Duke Clinical Research Fellowship Program (Wallace), and the HeartRescue Pennsylvania Project (Leary, Tucker, Becker, Abella), University of Pennsylvania, Philadelphia, PA.

Study objective: Access to automated external defibrillators and cardiopulmonary resuscitation (CPR) training are key determinants of cardiac arrest survival. State police officers represent an important class of cardiac arrest first responders responsible for the large network of highways in the United States. We seek to determine accessibility of automated external defibrillators and CPR training among state police agencies.

Methods: Contact was attempted with all 50 state police agencies by telephone and electronic mail. Officers at each agency were guided to complete a 15-question Internet-based survey. Descriptive statistics of the responses were performed.

Results: Attempts were made to contact all 50 states, and 46 surveys were completed (92% response rate). Most surveys were filled out by police leadership or individuals responsible for medical programs. The median agency size was 725 (interquartile range 482 to 1,485) state police officers, with 695 (interquartile range 450 to 1,100) patrol vehicles (“squad cars”). Thirty-three percent of responding agencies (15/46) reported equipping police vehicles with automated external defibrillators. Of these, 53% (8/15) equipped less than half of their fleet with the devices. Regarding emergency medical training, 78% (35/45) of state police agencies reported training their officers in automated external defibrillator usage, and 98% (44/45) reported training them in CPR.

Conclusion: One third of state police agencies surveyed equipped their vehicles with automated external defibrillators, and among those that did, most equipped only a minority of their fleet. Most state police agencies reported training their officers in automated external defibrillator usage and CPR. Increasing automated external defibrillator deployment among state police represents an important opportunity to improve first responder preparedness for cardiac arrest care. [Ann Emerg Med. 2012;60:57-62.]

Please see page 58 for the Editor’s Capsule Summary of this article.

INTRODUCTION

Background

Approximately 300,000 people experience sudden cardiac arrest annually in the United States. Access to both automated external defibrillators and first responder cardiopulmonary resuscitation (CPR) are key determinants of survival from cardiac arrest. State police represent a unique class of potential first responders to medical emergencies in that they patrol a large network of highways within the United States, as well as the numerous travel plazas and rest stops along the interstate highway system. According to a recent Centers for Disease Control and Prevention–sponsored analysis of a US cardiac arrest surveillance registry, an estimated 20% of out-of-hospital cardiac arrests occur in public locations; of these, approximately 25% happen on highways and streets.

Importance

Previous investigations have shown that law enforcement officers can be trained to effectively operate automated external defibrillators and that police automated external defibrillator programs are cost-effective. In addition, studies have demonstrated that automated external defibrillator–equipped law enforcement agencies within large metropolitan cities achieve a decrease of call-to-shock time provided by police and are associated with an increase in patient survival from out-of-hospital cardiac arrest. Because an increase in survival from out-of-hospital cardiac arrest was observed from the availability of early defibrillation supplied by out-of-hospital providers in rural communities, the deployment of automated external defibrillators among state police patrolling the highway...
system may represent an important opportunity to improve care capabilities to address out-of-hospital cardiac arrest.7

Goals of This Investigation
Few investigational studies have been published assessing the prevalence of automated external defibrillators among law enforcement agencies in the United States. The most recent publication found an increase in availability of automated external defibrillators among a random selection of law enforcement agencies, from 2.6% in 1997 to 31% in 2006.8 However, the current prevalence of automated external defibrillators and CPR training within the US state police system has not been ascertained. The goal of this work was to determine the accessibility of automated external defibrillators and CPR training among state police agencies across the United States.

MATERIALS AND METHODS
Study Design and Setting
This was a cross-sectional survey study performed in the United States between April and August 2011 to determine the accessibility of automated external defibrillators and CPR training among state police agencies. An official exemption letter was obtained from the Hospital of the University of Pennsylvania institutional review board.

Selection of Participants and Data Collection and Processing
Representatives of state police agencies from all 50 states were contacted by telephone or electronic correspondence. We targeted officers in state training academies and medical units, as determined from publically available state police Internet sites. If contact was successful, representatives were asked to fill out an Internet-based survey to the extent that they felt comfortable (SurveyMonkey.com, Palo Alto, CA; available at http://www.surveymonkey.com). A number of survey responders corroborated their responses with other individuals at their agencies; no discrepancies were found through this confirmation process (data not shown).

Telephone and e-mail follow-up was performed for individuals who failed to respond to initial outreach. We tracked which states replied to the survey; however, no individual identifying information (such as name of responder) was collected. Hawaii, which does not have state police, was surveyed at the county level.

Methods of Measurement
The 15-question online survey (Figure 1) requested information about accessibility of automated external defibrillators and emergency medical training. The survey questions were developed through an iterative process among authors that included consultation with survey experts. The questions were pilot tested internally before distribution.

Data were collected on how many state police officers worked for the agency, how many patrol vehicles (squad cars) the agency used, whether police or their vehicles were equipped with automated external defibrillators, where automated external defibrillators could be found if not in vehicles, whether training in automated external defibrillator use or CPR was provided, time since police last used an automated external defibrillator or performed CPR, and information about the agency’s medical response plan. A cover letter at the beginning of the Internet survey outlined reasons for our survey and ensured anonymity for individuals.

Primary Data Analysis
Our unit of analysis was the individual state. In the case of Hawaii, which does not have state police, Honolulu County was used as a surrogate because it has more than twice the population of all other Hawaiian counties combined. Data were downloaded into a statistical software package (Stata, version 11.2; StataCorp, College Station, TX) for analysis. Descriptive statistics (item counts, percentages) were used to characterize the data and create graphics. We used Fisher’s exact tests and simple logistic regression to determine whether any agency characteristics (such as size, integration with the emergency medical services [EMS] system, and nature of training) or state characteristics (including population density, state budget gap, and vehicles miles traveled on state highways) were associated with state police agencies equipping their vehicles with automated external defibrillators.

RESULTS
Surveys were completed by representatives from 46 of 50 states, yielding a response rate of 92%. The Table reports a
The internet-based survey form consisted of 15 questions evaluating the prevalence and accessibility of automated external defibrillators among state police. AED, Automated external defibrillator.

Figure 1. The internet-based survey form consisted of 15 questions evaluating the prevalence and accessibility of automated external defibrillators among state police. AED, Automated external defibrillator.

summary of responses by question. Most surveys were completed by police leadership or individuals responsible for medical programs, including training officers (39%; 18/46); medical training officers (13%; 6/46); dedicated EMS coordinators, instructors, or commanders (11%; 5/46); safety officers (7%; 3/46); physicians or nurses in the agency (4%; 2/46); and public information officers (4%; 2/46). Remaining surveys were completed by other personnel, including an assistant operations commander, a director of recruiting and training, and a fleet manager.

The median number of state police officers per agency was 725 (interquartile range 482 to 1,485). The smallest agency had 138 police (North Dakota), whereas the largest had approximately 7,400 (California). The median number of patrol vehicles per agency was 695 (interquartile range 450 to 1,100), with a range of 145 (North Dakota) to approximately 3,000 (Massachusetts) vehicles.

Thirty-three percent of responding agencies (15/46) reported that their state police vehicles were equipped with automated external defibrillators (Figure 2). Among the agencies that equipped their vehicles with automated external defibrillators, only 47% (7/15) equipped greater than half of their fleet with devices: North Dakota, New Mexico, Hawaii, Minnesota, Delaware, Ohio, and New York. Other than in vehicles, automated external defibrillators were noted to be located in district stations, barracks, or posts (54%; 23/43); state office buildings (33%; 14/43); the academy or training center (23%; 10/43); headquarters (14%; 6/43); and as part of a separate medical detachment (5%; 2/43).
Eighty-nine percent of agencies (40/45) reported that their state police officers knew where to obtain an automated external defibrillator if one was needed. Regarding automated external defibrillator and CPR training, 78% of agencies (35/45) reported training their police in automated external defibrillator use and 98% (44/45) reported training them in CPR. Thirty-six percent of reporting agencies (16/45) said one of their police officers had used an automated external defibrillator within the last 12 months. Eleven percent of agencies (5/45) reported a police officer using one within the past month. Forty-seven percent of survey responders (21/45) did not know the last time an automated external defibrillator had been used. About half of reporting agencies (51%; 23/45) said one of their police officers had performed CPR within the year. Among these, 20% (9/45) reported an officer having performed CPR within the past month. Forty percent of responders (18/45) did not know the last time CPR was performed by a state police officer.

Sixty-four percent of state police agencies (25/39) reported working closely with local EMS groups as part of their state’s coordinated emergency medical response plan. More than half (54%; 21/39) said their police were certified as first responders and were working closely with local EMS groups as part of their state’s coordinated emergency medical response plan.

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US states are widely heterogeneous with respect to population size, rural versus urban composition, geography, socioeconomics, and highway usage. State police agencies likewise vary in terms of their size, resources, and relationship to EMS. In a secondary analysis, we attempted to determine whether state-specific factors (including area, population, population density, median household income, state budget gap, and vehicle miles traveled on highways) were associated with availability of automated external defibrillators among state police vehicles. They were not, and we concluded that agency characteristics may be more important associated factors. However, there may be unmeasured confounders affecting states’ determination to obtain automated external defibrillators.

**DISCUSSION**

Out-of-hospital cardiac arrest carries a high mortality when it occurs on a highway; only 17.9% of patients experiencing an arrest on a highway or street in the United States survived to hospital discharge according to a recent investigation, compared with 28.9% in a recreational or sport facility and 27.0% in an airport. Quick initiation of bystander CPR and early defibrillation are key factors for improving outcomes in out-of-hospital cardiac arrest. State police are strategically positioned to respond quickly to out-of-hospital cardiac arrests occurring on highways and in rest areas, locations generally less accessible to EMS personnel. This is especially important because an estimated 240 million vehicles travel more than 3 trillion miles on the US highway system each year. Because a reduction of call-to-shock time may improve survival to hospital discharge, state police represent an important class of first responder to out-of-hospital cardiac arrests in the United States.

In this descriptive study, 92% (46/50) of US states were successfully surveyed. The majority of state police agencies reported training their officers in basic cardiac arrest care, providing CPR or automated external defibrillator education. About two thirds of agencies reported working closely with EMS as part of their state’s medical response plan, and more than half reported that some or all of their police were certified as first responders to medical emergencies. Yet only one third of state police agencies reported that their vehicles were equipped with automated external defibrillators to any extent, with most noting that less than half of their fleet had devices. Automated external defibrillators were more likely to be located in district stations, barracks, or posts than in vehicles, not appropriately located for emergency use when state police out on patrol are called to respond to an out-of-hospital cardiac arrest. In summary, despite being capable of responding to out-of-hospital cardiac arrests and generally expected to play a role in the medical response system, state police in most states may be lacking the resources to provide advanced, lifesaving cardiac arrest care in a timely fashion.

Hawkins et al found an increase in the availability of automated external defibrillators among a random selection of law enforcement agencies, from 2.6% in 1997 to 31% in 2006. Our study found that automated external defibrillator availability among state police vehicles was 33% in 2011. Because the former study had different inclusion criteria than ours, no direct comparison can be derived.

We found striking variability between state police agencies with regard to automated external defibrillator accessibility and usage. Certain agency characteristics were associated with having automated external defibrillators available in fleet vehicles; states that reported a close working relationship with EMS and training on automated external defibrillators were more likely to have their vehicles equipped to some degree. Meanwhile, state characteristics such as population density, area, budget gap, and vehicle miles traveled on highways were not found to be significantly associated with having automated external...
defibrillators available among the patrol fleet. Agency size and number of vehicles were likewise not significantly associated with automated external defibrillator deployment. A 2002 National Center for Early Defibrillation report identified several attributes of effective law enforcement defibrillation programs, the ability to respond quickly to emergencies, presence of a medical response culture, integration with the EMS system, a proactive medical director, and effective initial and refresher training. Our analysis likewise suggests that agency factors, such as robust training programs and the presence of an EMS culture, may play a more important role in the development of broadly implemented state automated external defibrillator programs than state-specific characteristics.

One third of state police agencies surveyed equipped their vehicles with automated external defibrillators; among those that did, more than half equipped only a minority of their fleet. Most state police agencies reported training their officers in automated external defibrillator usage and CPR and working closely with EMS as part of their state’s medical response plan. In this analysis, agency factors were more significantly associated with broad automated external defibrillator availability among state police than state factors such as area, population density, and vehicle miles traveled on highways. Increasing automated external defibrillator deployment among state police patrolling the US highway system represents an important opportunity to improve first responder care for cardiac arrest in the United States.

The authors acknowledge representatives at participating state police agencies for taking the time to respond to the survey and all state police officers for protecting the safety of the American public and playing an important role in the chain of survival from cardiac arrest.

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Address for correspondence: Benjamin S. Abella, MD, MPhil, E-mail benjamin.abella@uphs.upenn.edu.

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