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Policy and Training Recommendations Related to Police Use of CEDs: Overview of Findings From a Comprehensive National Study

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Geoffrey P. Alpert¹
and Roger G. Dunham²

Abstract

The authors report the policy and training recommendations derived from a comprehensive national study that examined conductive energy device (CED) use, resulting injuries, departmental policies and training, and reports from officers, trainers, and suspects concerning CED incidents. The overall purpose of the national project was to examine CED use from a variety of methods. Although the specific analyses and findings from each of the different methodologies are published separately, the authors integrate the findings of the various components of the study, and from the general literature, into a comprehensive set of policy and training recommendations. This article helps us understand how and why injuries occur to police and citizens during these use-of-force events and recommends a comprehensive set of policies and principles for training police officers on CED use. The major conclusions address not only the importance of CEDs to law enforcement but also the potential for abuse of CEDs by the police, and how such abuse can be avoided.

Keywords

use of force, conducted energy devices

¹University of South Carolina, Columbia

²University of Miami, Florida

Corresponding Author:

Geoffrey P. Alpert, Department of Criminology and Criminal Justice, University of South Carolina, Colu, SC 29208

Email: geoffa@mailbox.sc.edu

The use of force by the police is the last resort to control a suspect's resistance to a legal command. Although a rare event in routine police work, its study is important because its use can cause injuries to officers and/or citizens and is the major police issue that leads to community unrest and negative attitudes toward the police. It is estimated that less than 2% of police-citizen encounters result in a use of force, but any of these events can result in an injury to a suspect or an officer (Alpert & Dunham, 2004; Durose et al., 2005). The principle behind most use-of-force policies and training is for officers to use lowest reasonable level of force needed to control a suspect while keeping injuries to the officer and suspect to a minimum. Police agencies have been searching for ways not only to reduce the incidents of force in which their officers become involved but also to reduce injuries that might result from using force. The introduction of conductive energy devices (CEDs) into the officer's continuum of force is one recent attempt to reach these goals more efficiently.

Over the years, innovations have helped the police negotiate with suspects and deal with them in ways that reduce the likelihood of a physical altercation. Skills such as verbal judo, violence reduction training, and other useful interpersonal communication skills have all helped reduce the prevalence of police use of force (Fyfe, 1995). However, even these innovative approaches to negotiate with suspects will fail sometimes and police are left with no other alternative than to use force to control unruly suspects. When force is used, there is always a possibility that someone, either an officer or a suspect, will be injured. Technology, including the development of chemical and mechanical less lethal weapons, has reduced the likelihood of injuries during these use-of-force incidents (Smith et al., 2007). The most recent statistics from TASER International (October 23, 2009 press release) assert that almost 15,000 law enforcement and military agencies in more than 40 countries have purchased approximately 448,000 Taser brand CEDs. The company estimates that there have been 843,000 field deployments of their CEDs. The benefits of using CEDs, however, come with potential costs (e.g., health risks to some people and inappropriate use by officers). This article discusses policy and training recommendations based on findings from a recent national study that evaluated the effectiveness of using CED weapons and their effect on the rate of officer and suspect injuries. After discussing the role of less lethal technology, the strengths and weaknesses of less lethal weapons including conducted energy devices (CEDs), we will discuss the lessons learned from a national study and make suggestions for policies, training, and future research.

The purpose of this article is to present and interpret findings from the various components of the comprehensive national study of CEDs and to formulate policy and training recommendations. This article does not include the original analyses of the findings from each of the components, as this would be impossible to incorporate into one article. Specific findings from each of the component methodologies have been discussed elsewhere individually (Fridell, 2008, MacDonald et al., 2009; Rojek et al., 2009). Although the reports of each component of the national study include some recommendations for policy and training, these discussions are fragmented and isolated from each other. Our important task is to integrate the findings from each of these

components, and from related literature, to establish a comprehensive set of policy and training recommendations based on a broader knowledge.

What We Know

Police-citizen contacts usually involve an officer managing a variety of situations with communication skills and the knowledge that he or she can invoke the powers of the government, if necessary. The level of this authority ranges from verbal direction to deadly force, with most problems solved by using strong verbal commands or physical coercion. The few interactions that result in citizen resistance to the police show of authority are usually resolved with minimal force, but there is always the potential for the officer to use high levels of force to remove a threat created when citizens fight with them. These physical confrontations are resolved most effectively when the police utilize the appropriate tools and rely on competent training to overcome physical resistance without using unreasonable force or causing unnecessary injuries. A key element in the successful resolution of these confrontations is the availability of these options in the officer's toolbox for responding to a citizens' threat.

Research has been conducted on police use of force for more than 40 years (Alpert & Dunham, 2004). Empirical investigations have discovered a great deal of information about the nature and extent of force used by the police as they experience resistance from suspects. A recent issue created by the proliferation of CEDs such as the Taser® and Stinger®, concerns the safety of such weapons and what their impact has been on injuries and in-custody deaths (Amnesty International, 2004; see Miami-Dade Grand Jury, 2005). Although CEDs present new and complex issues for the police and the public, history tends to repeat itself, and we need look back only to the 1990s to find a similar set of circumstances surrounding the introduction of pepper spray into the officer's arsenal of potential weapons.

During the 1990s, the use of oleoresin capicum (OC) or pepper spray was spreading rapidly among American police forces. Interestingly, many of the questions and arguments that are being made in 2010 concerning CEDs echo the concerns raised in the 1990s about the use and potential abuse of OC spray (Amnesty International, 1997). Several studies were conducted that investigated the safety and effectiveness of OC spray (Edwards, Granfield, & Onnen, 1997; Granfield, Onnen, & Petty, 1994; National Institute of Justice, 2003), while others examined its use and resulting injuries (Kaminski, Edwards, & Johnson, 1998; Lumb & Friday, 1997; Morabito & Doerner, 1997; Smith & Alpert, 2000). Overall, the use of OC spray was determined to be quite effective (85%-98%) and its use was strongly correlated to a reduction of injuries to both officers and suspects when compared to traditional "hands-on" police use of force.

Regardless of the empirical findings, there were some who thought that specific and rare applications of OC spray, that were related to in-custody deaths, justifies the argument that OC spray is an inappropriate tool. These critics argued that its use is tantamount to torture and it should be banned from police use (American Civil Liberties Union of Southern California, 1995; Amnesty International, 1997, 2004). Since the

initial criticisms of OC spray, research findings on its relationship to lowering suspect and officer injury has reduced the public outcry to a relative silence. It has been almost a decade since there were loud calls for police to put away their OC spray and return to a time in which their only option to control a suspect was a hands-on, physical tactic.

During the past few years, we have seen a similar pattern of concern raised about the use of CEDs. Although CEDs are now in use by more than 10,000 law enforcement agencies in the United States (see General Accounting Office, 2005),¹ research findings are just beginning to inform policy makers and trainers about best practices and potential problems (see White & Ready, *in press-b*). There is no doubt that the CED is a popular tool among the police, and perhaps the most critical concerns are where to place the CED on a use of force continuum, how much electricity should be placed into a person's body, whether or not the application of a CED contributes or leads to death, and the inappropriate use of CEDs by officers such as officers resorting to CED use too quickly as a substitute for lower levels of force. The CED shocks a person with 50,000 volts and creates immense discomfort by involuntary contractions of skeletal muscles, even when used in a 5-s cycle.² Many question whether a person should be exposed to the shock from a CED and how many cycles are reasonable to use to control a suspect without being life-threatening?

Recently, there have been several important contributions concerning CEDs as a less lethal weapon. For example, White and Ready (2007) investigated the effectiveness of CEDs during the 3-year period between 2002 and 2004 in the New York City Police Department. They reported that most suspects on whom CEDs were used (243 cases) exhibited signs of mental illness, were involved in violent behavior, and almost one third were armed, but only a few were under the influence of alcohol or drugs. Importantly, in 80% of the cases, officers reported satisfaction with the effectiveness of the CED and 85% of the suspects were subdued and taken into custody. There were no cases where a suspect was seriously injured or died.

In a follow-up article reporting on 375 cases, White and Ready (*in press-a*) assessed the impact of the using CEDs on suspect resistance in an effort to predict favorable deployment outcomes. Suspect body weight over 200 pounds, being intoxicated, and being too close to the suspect (3 ft or less) predicted a reduced level of effectiveness of deployment outcome, as measured by continued resistance and officer satisfaction. Unfortunately, the small number of cases and injuries did not allow White and Ready to assess the impact of CED deployment on injury reduction.

Use of Force and Injuries

Although empirical research on police use of force has grown over the past four decades, only limited attention has been paid to officer and suspect injuries resulting from police-citizen encounters. The research literature concerning injuries to officers during use-of-force encounters reveals that between 10% and 38% of encounters result in some type of injury (Alpert & Dunham, 2004; Henriquez, 1999; Kaminski et al., 2004; Kaminski, & Sorensen, 1995). Most of the reported injuries were relatively minor

and include scrapes, bruises, and contusions (Alpert & Dunham, 2000; Brandl & Stroshine, 2003).

One line of research examines officer injury and the tactics used by officers. Alpert and Dunham (2000, 2004) demonstrated that the greatest likelihood of officer injury occurs when they attempt to control a suspect by punching, kicking, take-downs, wrestling, and joint locks. These tactics account for almost 70% of injuries. Research findings also suggest that suspects have a greater likelihood of injury when officers use canines, bodily force, and impact weapons, such as batons or flashlights (Alpert & Dunham, 2004). Clearly, both officers and suspects are most likely to be injured when hands-on physical force is used to control or resist. An important policy and training implication of these findings is the need to adopt appropriate ways for police officers to control suspects without using physical hands-on tactics and impact weapons. It is believed that the movement to develop less lethal weapons, such as OC spray and CEDs, was in response to the injuries suffered by officers and suspects when physical hands-on tactics and impact weapons are used.

The Impact of Less Lethal Weapons on Injuries

The research literature from the 1990s has strongly supported the use of OC spray, whereas more recent research has focused on the use of CEDs. There have been two basic types of research examining the use of CEDs. Epidemiological studies have looked at the relationship between CEDs and nonfatal injuries, and medical research has examined the physiological effects of CEDs on animals and humans (Kroll & Ho, 2009). Although most of the research on CEDs has been limited to single sites or short time periods, the conclusions have concurred that the use of OC and CEDs, when compared to hands-on combat, reduces injuries to officers and suspects.

Recently, independent investigators have examined the relationship between CED use and nonfatal injuries. These researches are making their way through the peer-review process and appear to reach conclusions similar to the findings reported by law enforcement agencies that compare the rates of injuries to officers and suspects before and after the implementation of CEDs. Without exception, these investigations report substantial declines in officer and/or suspect injury rates following the adoption of CEDs. Reductions in suspect injuries ranged between 40% and 79%, while reductions in officer injuries ranged between 3% and 93% depending on the data and methods used (Charlotte-Mecklenburg Police Department, 2006; Hougland, Mesloh, & Henych, 2005; Jenkinson, Neeson, & Bleetman, 2006). These straightforward "before and after" analyses suffer from threats to internal validity and did not measure the effect of CEDs on injury risk controlling for situational factors and other types of force used in conjunction with CEDs during any given force incident. In spite of these limitations, the initial studies and analyses of agency records all appear to confirm the success of CEDs in reducing injuries to officers and suspects.

The medical studies assessed the physiological effects of using CEDs on animals and humans. Although there have been only minor controls on animal studies, the research

on humans has been limited to healthy participants who are not under the intoxicating influence of drugs or alcohol and who have not been struggling or fighting. Research on pigs has generated some controversy as multiple, lengthy exposures of more than a minute led to ventricular fibrillation (VF) and induced death in some pigs (Dennis et al., 2007; Walter et al., 2008). Research by Nanthakumar et al., (2008) found that simulating a "worst case scenario" by placing TASER barbs across the hearts of pigs led to stimulation of the heart muscle, whereas placing the barbs across the abdomen did not create the same response. Nanthakumar et al. (2008) caution that if preexisting conditions such as heart disease, alcohol or drug intoxication, "excited delirium," or other circumstances were present, heart stimulation might induce VF. Lakkireddy et al. (2008) attempted to answer this warning by shocking five pigs before and after infusions of cocaine. His results suggest that having ingested cocaine may not create a greater risk for VF when being shocked with a CED compared to participants not having cocaine in their system. However, this research did not control for interactions among cocaine, other intoxicants, or heart disease, and exposure to CEDs was limited to swine participants in this study.

The research on humans has been limited to healthy individuals who volunteer to be shocked with a CED (see Kroll & Ho, 2009). Results from this research generally indicate that exposure to either a 15-s sustained exposure or intermittent three 5-s exposures to a CED has no negative effects on participant's heart functions. Vilke et al. (2007) attempted to simulate a real-world environment by exposing 8 participants to a 5-s shock from a CED following an exercise regime. Participants were monitored for an hour and no lasting changes in blood pressure or cardiovascular levels were reported. In addition, Ho et al. (2007) reported no problems after participants were shocked by a CED for up to 15 s after simulated physiologic states including acidosis, exercise-induced exhaustion, and alcohol consumption were produced (see Chan & Vilke, 2009). One important consideration to remember is that once the electrical discharge from the CED ends, so does the discomfort as well as one's inability to perform basic motor skills. There certainly needs to be more research conducted on CED-related effects on humans and the level of risk a CED creates. In addition, research needs to be conducted on CED-related deaths.³

Generally, there is agreement in the research community that the use of a CED on healthy participants for a relatively short exposure (15 s) is comparatively safe, but CEDs are not risk free (National Institute of Justice, 2008; Vilke & Chan, 2007). In fact, a recent report by the Braidwood Commission (2009) concluded that there are multiple medical threats caused by a CED. These threats include

The intense pain, coupled with anxiety and stress, can cause an outpouring of adrenalin that can stimulate the heart and lead to dangerous arrhythmias. Skeletal muscle contractions can lead to acidosis, which affects the electrolyte balance, making the heart more susceptible to ventricular fibrillation. Also, an electrical current coinciding with the T-wave peak may induce fibrillation with a threshold 25 or more times lower than at other times in the heartbeat cycle. (p. 14)

In addition, there are multiple populations and situations where the use of a CED may cause serious injuries or death (see Strote & Hutson, 2008). Research results help us understand the impact and effect of CEDs on animals and healthy humans, and these studies must guide the policies and practices of law enforcement. Three well-known events influenced public opinion of the CED. University of Florida student Andrew Meyer memorialized the phrase "Taze me bro" when he disrupted a John Kerry speech and was shocked multiple times. UCLA student, Mostafa Tabatabaiejad, was shocked multiple times; even when he was controlled and handcuffed after refusing to leave the university library. Neither student was violent but each resisted lawful police orders. Many questioned whether they should they have been shocked with a CED based on their level of resistance or whether the police should have used other tactics to take them into custody? Most recently, the death of Robert Dziekanski at the Vancouver, British Columbia International Airport on October 14, 2007 created a national investigation by the Braidwood Commission (2009). Although our methods and data do not allow us to address the specific cases of Mr. Meyer, Mr. Tabatabaiejad, or Mr. Dziekanski, our research does allow us to evaluate when a CED should be used generally and the consequences of its use.

To summarize, previous research on CEDs is accumulating important information as researchers evaluate police use of force, which includes this new tool. Because examining the use of CEDs is a relatively new area of research, most of these studies are preliminary and limited to single sites with relatively small numbers of deployments. These limitations have led to concerns about generalizability of reported findings. In addition, most of the studies have relied solely on official police records. A common theme among these researches is the call for multimethod evaluations using more comprehensive samples of police agencies. White and Ready (in press-a) effectively argue this point:

Nonetheless, additional research on this topic is necessary not only because the technology is relatively new but also because different agencies are adopting the weapon to varying degrees and developing different standards and expectations concerning its proper use. A multisite analysis of police agencies that have incorporated the Taser into routine practice based on different approaches would yield valuable comparative data. This type of cross-site approach . . . would allow researchers to begin asking more complex questions about police use of the Taser. (pp. 28-29)

The present study, which generated the findings that provide the basis for our policy and training recommendations, was an effort to address many of the shortcomings inherent in the previous research.

Overview of Method

The major study from which these recommendations for policy and training are drawn included several complementary research strategies (see Smith et al., 2008). First, a

nationally representative survey of U.S. state and local law enforcement agencies was conducted to provide a snapshot of how less lethal force technologies are being used, what policies guide their use, and the type of training given to police officers. Second, agency-supplied use of force datasets from three agencies—Seattle, Washington, Miami-Dade, Florida, and Richland County, South Carolina—were analyzed separately in an effort to identify individual and situational predictors of injuries to officers and citizens during use of force events. More than 24,000 use-of-force records from 12 police agencies were combined and analyzed using multilevel and fixed effects models to investigate the relationship between situational and policy-related factors and the likelihood of injury to police and citizens. Finally, a longitudinal analysis was conducted that explored the effect on injury rates of the adoption of the Taser by the Austin, Texas and Orlando, Florida police departments. Third, to provide context to the quantitative analyses and gain insight into how use of force encounters unfold, in-depth interviews were conducted with more than 200 officers and 20 citizens who were involved in use of force events in two midsize law enforcement agencies. Finally, training sessions on CEDs were attended and interviews were conducted with trainers and training supervisors. These discussions with training officers will be used to provide perspective to our interpretation of findings and to our formulation of policy and training recommendations. In this article, we provide a brief summary of the important findings of each component of the study (for which detailed analyses are discussed elsewhere) and integrate all that was learned from the four components of the national study into a comprehensive set of policy and training recommendations.

National Survey

The national survey component of the project was conducted in the summer of 2006 by the Police Executive Research Forum (PERF). Surveys were sent to a stratified sample of 950 municipal, county, and state agencies and responses were received from 518 agencies resulting in a 54.5% response rate. Although the survey was comprehensive and included a wide variety of questions concerning use of force issues, the findings summarized here are limited to the results that are relevant to our discussion of when CEDs can be deployed, how often, and for what duration. The data from the agencies show that slightly less than 50% (47.1%) provide officers with CEDs and three fourths of the agencies that deploy CEDs first deployed them between 2004 and 2006 (see Fridell, 2008 for a discussion and analysis of these data).

A second part of the survey incorporated scenarios involving police/citizen interactions in which officer force can be justified. Agency representatives were asked to choose the appropriate type of force, which included the use of a CED. The purpose of this aspect of the survey was to measure behavioral responses to a variety of situations involving CED use, rather than just obtaining attitudes of the officers. The responses from agencies with different CED policies would be compared to determine the effect of different policies on CED use. Five scenarios involved the same officer, participant, and general circumstances, but were varied in terms of the participant's level of resistance.

The officer (who is the same gender, height, and weight as the participant) initiates a traffic stop during daylight hours for a minor moving violation and determines that the participant is wanted on a “warrant for a misdemeanor-level, criminal domestic violence offense.” The officer is by himself—with no citizens nearby and his backup is 10 min away. For each level of resistance characterized in the scenario, agency respondents indicated whether or not the officer would be authorized pursuant to agency policy or training standards to use each of six types of less lethal force, including use of chemical weapons, a CED in probe mode, and CED used in drive stun mode as a first response.⁴

The data show that one in five agencies that deploy CEDs authorize its use in probe mode against a participant who refuses, without physical force, to comply with commands. Thirty percent (29.6%) of the agencies allow CED use in probe mode in these circumstances and 44.9% authorize use of a chemical weapon. Slightly fewer than 60% (58.7%) of the agencies authorize use of the CED in probe mode against a participant who tenses and pulls for 15 to 20 s against the officer who is attempting to cuff him. Two-thirds of the agencies (65.2%) authorize the CED in probe mode and four out of five agencies (82.4%) allow officers to use chemical weapons in this circumstance. In the third scenario, the participant turns and runs away from the officer. The scenario reads, “When the officer and suspect are 12 ft apart, the suspect slows down and looks over his shoulder, but does not stop running.” Three fourths (73.8%) of the agencies that deploy CEDs would allow this officer to use the CED in probe mode and 68.8% would allow CED use in drive stun mode. Eighty-five percent (85.0%) authorize use of chemical sprays. The final two scenarios describe a participant who is threatening the officer with his hands raised in a boxer’s stance and swinging his closed fist at the officer, respectively. Agencies authorize CED use in probe mode in those circumstances at 94.8% and 97.1%, respectively, and in drive stun mode at 89.8% and 93.8%, respectively. Virtually all agencies would authorize the use of chemical weapons under these two sets of circumstances (at 98.6% and 99.0%, respectively).

The survey also solicited information regarding where CEDs (in probe mode) are placed by agencies on a use-of-force continuum relative to other types of force. Nearly 90% (87.9%) of the responding agencies incorporate a use of a force continuum in policy or in training. More than one half (57.0%) of the agencies place CEDs at the same level as chemical incapacitants and approximately one third (36.1%) place the CED higher on the force continuum. Almost one-half of the agencies (46.6%) places CEDs lower than strikes/punches on the continuum, and one-third of the agencies (33.1%) place CEDs at the same level as strikes/punches.

The relative ranking of CEDs compared to other types and levels of force was collapsed into three categories and compared to agency size and geographic location.⁵ The data in Table 1 shows that 26% of the agencies reported the CED at a relatively low level of force compared to other options, whereas 64% listed it as a midlevel option and 10% reserved it for a high-level use-of-force alternative. These differences were not significantly different for the size or geographic location of the agency.

A number of agencies put numerical restrictions in policy or through training on the length of time an officer can activate the CED or the number of times he or she can

Table 1. Relative Placement of CED by Agency Size and Geographic Area

Panel A ^a		Agency size			Total
		1-50 sworn	51-100	100+	
CED as a low level of force	N	24	17	35	76
	% by level of force	31.6	22.4	46.1	10
	% by size of agency	34.5	35.4	24	26
CED as a medium level of force	N	65	27	94	186
	% by level of force	34.9	14.5	50.5	100
	% by size of agency	66.3	56.3	64.4	63.7
CED as a high level of force	N	9	4	17	30
	% by level of force	30	13.3	56.7	100
	% by size of agency	9.2	8.3	11.6	10.3
Total	N	98	48	146	292
	% by level of force	33.6	16.4	50	100
	% by size of agency	100	100	100	100
Chi-square tests					
	Value	df		Asymp. Sig. (2-sided)	
Pearson chi-square	3.042	4		0.55	
Likelihood ratio	2.905	4		0.57	

Panel B ^b		Geographic region				Total
		Northeast	Midwest	South	West	
CED as a low level of force	N	8	23	17	37	85
	% by level of force	9.4	27.2	20	43.5	100
	% by size of agency	24.2	28.4	19.1	32.2	26.7
CED as a medium level of force	N	21	49	58	70	198
	% by level of force	10.6	24.7	29.3	35.3	100
	% by size of agency	63.6	60.5	65.2	60.1	62.2
CED as a high level of force	N	4	9	14	8	35
	% by level of force	11.4	25.7	40	22.8	100
	% By Size of Agency	12.1	11.1	15.7	7.0	11
Total	N	33	81	89	115	318
	% by level of force	10.4	25.5	28	36.2	100
	% by size of agency	100	100	100	100	100
Chi-square tests						
	Value	df		Asymp. Sig. (2-sided)		
Pearson chi-square	7.139	6		0.308		
Likelihood ratio	7.319	6		0.292		

a. 1 cell (11.1%) has an expected value of less than 5. The minimum expected count is 4.93.

b. 1 cell (8.3%) has an expected value of less than 5. The minimum expected count is 3.63.

activate it. Slightly less than 1 in 5 agencies (16.5%) numerically restricts activation length, but the vast majority that limit activation do so for 5 s, and just 1 in 20 (5.6%) place a numerical restriction on the number of CED activations that can be administered. Almost all of them limit it to three cycles.

According to the survey results, nearly half of police agencies allow for the use of OC spray to overcome passive resistance (e.g., suspect sits down and refuses to comply with police commands, without action), while another 20% to 30% of agencies authorize the use of a CED under these circumstances. When resistance increases to the typical defensive level (an action such as suspect tenses and pulls against officer's attempt at handcuffing), 82% of agencies authorize OC spray and about 60% allow for the use of a CED. Once the suspect's resistance level becomes threatening or assaultive, CED authorization increases to about 70%, whereas OC spray remains at about 85%. In terms of a relative level of force for agencies, the majority use the CED as a mid-level option and a small number of agencies restrict it to a high-level force option. These differences in policy are not explained by size or location of the agency and must be based on the philosophy and values of the command staff.

Training

The survey solicited information from each agency that deploys CEDs regarding the number of training hours received by the most recent class of recruits. Officers receive between 0 and 40 hr of training before they are permitted to carry the CED. Most agencies provide initial training lasting 4 hr (28.8%) or 8 hr (46.6%); although some agencies provide significantly less training. Most agencies require officers/deputies to pass a written exam (96.5%) and/or practical exam (94.1%) before a CED is issued. Over half of the agencies (57.5%) train their officers/deputies on the topic of Excited Delirium. Almost one in five agencies (17.3%) does not require any retraining of deputies/officers who carry the CED. In contrast, two thirds (64.0%) require retraining every year and 13.5% and 4.0% of agencies require training every 2 years or 3 years, respectively. Most agencies provide 2 (23.5%), 4 (31.7%), or 8 (21.2%) hr of retraining.

Agencies report a wide variety of restrictions on the use of a CED. Almost all agencies (96.7%) that restrict the number of activations set the maximum at three. One in five agencies (16.5%) restricts the activation length and most of those (99.6%) limit it to 5 s. Just 5.4% restrict the total time a person can be under CED activation. Slightly greater than 60% (63.7%) of the respondents that utilize CEDs require that their officers experience activation during training.

Summary of Survey Findings

Most agencies do not allow the CED to be used against a participant who refuses a command without some threat of violence. Six in 10, however, allow for the use of a CED against a participant who tenses and pulls when the officer tries to cuff him. Agencies generally place the CED at the same level as chemical agents in their force

continuum but vary as to the placement of CEDs relative to strikes/punches. Agencies generally place CEDs at a lower level on a force continuum than impact weapons. As expected, when the level of resistance increases, the use of a CED becomes more acceptable and justified. The data also show that many agencies allow the CED as a response to a relatively low level of resistance. Most allow it against midlevel resistance and 10% reserve the CED for a response to a high level of resistance. Interestingly, neither the size nor geographic location of the agency make any difference in their location of the CED on a use-of-force continuum. The findings indicate that there is a movement toward standardization of practices within agency policies regarding the placement of CEDs. As with OC spray, and other new technologies, the initial usage is likely to vary among agencies by size and location. However, our data indicate that there has been a movement toward the standardization of the use of CEDs.

Agencies report a wide variety of training for CEDs. There is no pattern or trend on the length or type of training. A majority of agencies have no restrictions on CED use on a participant threatening deadly force, fleeing on foot, who is emotionally disturbed, and/or seems to be experiencing excited delirium. Vulnerable populations and risky situations are protected against the use of CEDs by some agencies but not the majority. Only using a CED near-flammable substance is prohibited by a majority of agencies. Interestingly, most policies are silent on CED use on many populations traditionally considered vulnerable.

Agency-Supplied Data Sets: Use of Force, Type of Force, and Injuries

The assessment of official agency records involving use of force and injuries, including both cross-sectional and longitudinal data sets (our elements 2-4), has received the most attention by researchers (Alpert & Dunham, 2004; Kroll & Ho, 2009; MacDonald et al., 2009; Smith et al., 2007).

One of the more interesting aspects of the study is the relationship between situational and policy-related factors and the likelihood of injuries in police use-of-force incidents. Administrative data from 12 agencies was analyzed and provided information on the basic population characteristics of citizens involved in force events, including suspect race, gender, and age (only 10 agencies), the level of physical force applied by the police officer during the encounter, and whether any type of nonlethal weapon was utilized (CED or OC spray; see Table 2). Departmental differences in policies authorizing specific conditions under which nonlethal technologies could be used was also controlled in analyses to determine if any of these factors confound the relationship between case characteristics and the likelihood that a force event will result in an injury to suspects or officers.

The analysis includes 24,380 police-citizen encounters involving all levels of force with information on suspect and officer injuries (see Table 2). Approximately 39% ($n = 9,529$) resulted in a reported injury to a suspect and approximately 14% ($n = 3,209$) involved an officer injury. Approximately 31% ($n = 7,475$) of all suspects were White and averaged 30 years of age. In 56% of the encounters officers used physical force to

Table 2. Descriptive Statistics of the Overall Sample of Use-Of-Force Cases in United States, 1998-2007

	Sample % (N)	Suspect injury (%)	Officer injury (%)
Injuries			
Suspect	39.4 (9,529)	100.0	0.0
Officer	13.8 (3,209)	0.0	100.0
White suspect	31.0 (7,475)	43.0*	13.0
Male suspect	87.7 (21,286)	41.0*	14.1
Use of force			
Physical	56.2 (13,668)	48.9*	21.2*
OC use	23.4 (5,723)	22.1*	14.0
CED use	22.3 (5,437)	25.1*	7.6*
Resistance	76.3 (14,331)	39.9*	16.7*
Defensive CED policy	65.5 (15,968)	35.2*	12.5*
Defensive OC policy	89.4 (21,818)	38.1*	13.7

Note: $N = 24,380$; CED = conductive energy devices; OC = oleoresin capsicum. The mean sample age was 30 years.

* $p < .001$, Pearson's χ^2 test.

control a suspect. In 76% of the encounters, suspects physically resisted. Officers used chemical spray (OC) in approximately 23% of these cases and used a CED in close to 22% of all encounters where force was used.

A comparison of the characteristics between injury and noninjury cases indicates a number of differences in the average suspect and situational characteristics between force events that resulted in an injury to suspects and officers compared to those that did not.⁶ A significantly higher proportion of injured suspects were White and slightly older compared to noninjured suspects. The distribution of suspect age by group (injury vs. noninjury) indicates a clear curvilinear pattern for both groups, which is consistent with the well-established age crime curve (Blumstein, Cohen, Roth, & Visher, 1986). On average, suspects were less likely to be injured if a chemical spray (OC) or a CED device was used against them than if they were controlled by some other means. Suspects were also more likely to be injured if they showed any physical resistance to the police. In addition, suspects were less likely to be injured if the department had a policy that restricted OC or CED usage to defensive resistance (involving an action) or greater, rather than against passively resistant suspects (refusing to comply or cooperate without an action).

In these force incidents, 21% resulted in injuries to officers who used physical force. In contrast, only 7.6% of the events where a CED was used resulted in an officer injury. Injuries when OC spray was used is intermediate at 14%. Officers were also less likely to be injured in events if the department had a defensive resistance (or greater) policy for CED devices.

After a comprehensive reanalysis using sophisticated statistical analyses, MacDonald et al. (2009) explained,

We examined the relationship between less-lethal weapons, situational features, and agency-level policies on injuries to suspects and officers in police use of force cases. Using administrative data from 12 local police departments representing more than 24,000 force cases, we found that the use of physical force by police increased the odds of injury to suspects and officers. Conversely, the use of less-lethal weapons (OC spray or CEDs) decreased the odds of injury to suspects. In the cross-sectional analysis, officers were unaffected by the use of CEDs, while the odds of officer injuries increased slightly when OC spray was used. The time series model of the change in injury incidence to suspects and officers associated with the introduction of CEDs in Austin, TX and Orlando, FL indicated that the incidence of injury declined substantially after this less lethal technology was deployed. Other studies examining cross sectional data from use of force events in the United States and the United Kingdom have found that CEDs were associated with lower injury risks compared to the use of chemical sprays or physical force (citations omitted). Given the findings from this study, as well as those from previously published research, law enforcement agencies should encourage the use of OC spray or CEDs in place of impact weapons and should consider authorizing their use as a replacement for hands-on force tactics against physically resistant suspects. (p. 2272)

While these data likely comprise the most comprehensive data set on police use of force and injuries, the general results mirror other published findings from single agencies. Regardless of the analytical scheme or data set, the evidence is consistent that the use of CEDs reduces the risk of injuries to both suspects and officers. In addition to the components already summarized, our research design also included qualitative data from officers and suspects to provide more detailed information on the context and process involved in the use-of-force encounters.

Interviews With Officers and Suspects

This research component included interviews with officers and suspects involved in use-of-force situations and was conducted to add context to the quantitative components of the study. Deputies from the Richland County (SC) Sheriff's Department (RCSD) and suspects who were involved in use-of-force encounters between January and July, 2007 were interviewed to capture their perceptions of the use of force and suspect resistance (Rojek et al., 2009). Finally, interviews were conducted with trainers during five use-of-force and CED training sessions in Seattle and Miami-Dade police departments during 2005-2006. These discussions have been very helpful in providing context and interpretation of the findings from the various components of the study.

Interviews were conducted with 219 officers who responded to 105 incidents, with an average of two officers per incident. Five deputies refused to participate in the study but each interaction is represented. Twenty-three interviews were conducted with suspects at the Richland County Jail that corresponded with interviews of the officers who had arrested them. Unfortunately, most of the suspects were not available as they had

already been released from jail when we attempted to interview them and were not followed into the community. Ten jailed suspects refused to participate in the study.

The analysis of the data provided by the interviews, observations, and documents was accomplished through an open-coding strategy (Strauss & Corbin, 1990). According to the RCSD officers, the suspects' first behaviors included 34 cases of aggressive actions, including fighting, 29 cases of running away, 21 cases of defensive resistance (pushing/pulling against an officer), 13 cases of walking away, 7 cases of suspects with weapons, and 1 attempted suicide. The officers' first responses included 24 cases of verbal commands, 23 uses of a CED, 14 displays of weapons, 13 come-along holds or forceful handcuffing, 12 uses of hands and feet to gain control, and 11 foot pursuits. The suspects' second behaviors turned mostly to aggressive behavior (70%), running away (14%), and defensive or passive resistance (11%). Once resistance was encountered, officers usually used a CED (38%) or began fighting with hands and feet (24%). In those cases where suspects exhibited a third resistant behavior, most involved fighting (60%) or running away (35%). Officers who used a third tactic relied heavily on the CED (50%) or the display or use of a firearm (20%). Twenty officers (9%) reported being injured and the officers noted that 26 suspects (12%) were injured. The officer's reported that most injuries to them and the suspects were minor, but the suspect's reported being injured at a much higher rate than officers reported. Suspects also characterized their injuries as being more serious than reported by the officers.

Several trends from these data are important to discuss. First, most of the reported injuries to officers and suspects were minor, with only a few serious ones to suspects, including a dog bite and a gunshot wound. Second, there were nine incidents in which officers reported that the CED did not work properly or did not have its desired effect. It is unclear if the problems reported with the Taser were from darts not attaching properly, a cartridge malfunction, or some other problem. Third, there were reports of multiple CED hits on a suspect and multiple uses of the CED in drive stun mode to control suspects (or according to suspect's reports—to punish them). While these data cannot determine whether the uses of the CED were or were not appropriate, they suggest that multiple uses or activations of the CED are not uncommon.

Many of the suspects reported that the officers used excessive or unnecessary force to subdue them and that they were treated unreasonably. Interestingly, there were a number of claims that officers used CEDs very quickly in the interaction and several suspects claimed that the officers enjoyed watching them endure the pain. A number of suspects claimed that officers would knee them in the back and kick or punch them after they were in handcuffs. There were also claims that officers used CEDs on suspects after they were handcuffed.

It is to be expected that suspects will tell a different story than the police officer who arrests them. In almost all the cases, the suspects reported that the level of force the officer used was excessive and that they, the suspects, were not resisting. The officers reported, for the most part, that they used minimal force to control the suspects and did not mention using force after a suspect was under control. Not surprisingly, the officers reported their force was necessary and reasonable.

A typical suspect response came from Case No. 0123061, who stated that he was unaware that there was a warrant out for his arrest, and when the police confronted him, he did not resist; rather, the officers “pushed me to the ground and put the cuffs on ... they didn’t have to do that to me.” This suspect said that he was not resisting and that the officers pushed him to the ground unnecessarily. He also said that all the officers had to do was tell him to “quit acting up.” His complaint was that the police officers should have told him to calm down and not shove him to the ground. The officers, on the other hand, said the suspect ran away when he was confronted with the warrant and the officers ran after him and tackled him on the ground. The theme of this and many other confrontations is procedural and that the suspect states that he did not resist and the officer used too much force on him, while the officers provide justification for the level of force used. In this case, when the suspect ran, the officers tackled him and each suffered a minor injury. Other cases followed a similar fact pattern where the participant fled but a CED was deployed, and often, no injuries were reported even when the suspect fell to the ground. The explanations from the suspect revolved around procedural justice issues and the officers’ were explaining the justification for their uses of force.

Most of the suspects reported severe pain when they were hit with a CED. When questioned about the level of pain, many suspects said that they would avoid another shock at almost any cost. In other words, the deterrent value of the CED appears quite high and it was reported by a majority of the suspects that if they saw a red dot on them and realized a CED hit was imminent they would give up to avoid the pain. Similarly, many of the suspects said they have informed their friends on the street about the pain from a CED and suggest they avoid being hit with one. These comments are similar to ones made by the trainers in Seattle and Miami-Dade who have anecdotal stories about suspect’s giving up when warned by an officer or seeing a red dot from the laser which indicated that they were about to be hit with a CED. It is clear that a past experiences with a CED provides a valuable lesson and a good deterrent to avoid another hit.

Instructor Interviews

The interviews with the use-of-force instructors from Miami-Dade and Seattle were informal but elicited important information on their experiences with officers, use of force, and CEDs. First-time and refresher training issues were discussed with the instructors who were all experienced and well versed in the use of CEDs. The interviews included questions about their perceptions of problems with CEDs, training issues, and confrontations with suspects. The instructors were candid and even reported concerns that several of the officers did not seem comfortable using CEDs. They also discussed having to retrain officers and work with some on clarifying the strengths and weaknesses of carrying a CED. All the instructors were concerned about how well the officer’s understand the policy and how the first time users would respond to their initial deployments. In the refresher courses, many of the officers asked a variety of questions concerning “what if’s” concerning multiple deployments, problems when the CED malfunctioned, and the ease with which suspects were controlled with a CED. They also

reported scenarios where suspects had heard about the power of the CED and responded well to officers who pointed the device at them. Most important, trainers stressed the importance of training officers in real-world and high-stress conditions.

Discussion: Policy and Training Recommendations

The findings from previous research as well as the present study show that most use-of-force encounters involve defensive efforts by suspects to resist physical control. A typical “resistance to control” scenario involves an initial refusal by a suspect to comply with police commands followed by the suspect pushing or pulling against an officer’s attempt to obtain physical control and apply handcuffs. According to the information gained from our interviews of officers and suspects, many of these “wrestling matches” end up with the suspect and officer on the ground and the officer trying to use the ground for leverage. The multivariate injury models clearly show the increased risk for injury that such physical struggles carry with them when compared to the use of a CED. Our policy and training recommendations, derived from the extant literature, are aimed at reducing these risks.

Addressing the Critical Questions: Placement of CEDs on a Force Continuum, Minimizing Injuries, and the Elimination of Abuse

The proliferation of CEDs in law enforcement agencies nationwide suggests that agencies see value in adopting this less lethal technology (see Adams & Jennison, 2007). Our data show that CEDs are used more frequently than other less lethal weapons and appear to be the “response of choice” to control suspects or respond to resistance. Although the injury findings suggest that the substitution of CEDs for physical control tactics may be beneficial in many cases, their ease of use and popularity among officers raise the specter of overuse and abuse (see Braidwood Commission, 2009).

While we found differences in policies concerning the placement of CEDs on the force continuum, there was no evidence that the size of the agency or its’ geographical location accounted for these differences. Differences in policy appear to be based on the philosophy and values of the agency command staff. As our data indicate, there has been a failure to reach the goal of creating a consensus as to where the CED should be placed on a use-of-force continuum. More research needs to be conducted to determine the impact of placing CEDs at different levels on the use-of-force continuum with the goal of accomplishing the desired level of success and officer satisfaction (see White & Ready, 2007). Also, when determining where to place a CED on a force continuum, it is necessary to consider both the amount and type of force with the justification for that force.

If injury reduction is the primary goal, then based on the findings of the national study, agencies should forbid the use of these less lethal weapons on passive resisters. Our policy recommendation is that both OC spray and CEDs should be authorized as possible response alternatives to active threats of resistance. Our data show that 20% of the agencies would have to modify their placement of CEDs in their force policies,

and 60% would have to institute policy and training concerning what officers can do when a suspect tenses and pulls away. This may be a difficult task for policy makers, but it would create an appropriate balance between the level of government intrusion by the use of a CED and the protection of a suspect's 4th Amendment interests (see *Bryan v. McPherson* No. 08-55622 [9th Cir. December 28, 2009]). Obviously, both tools have limitations and cannot be used in all situations and against all suspects. We agree with PERF's recommendation that after each deployment of a CED the officer must reconsider the circumstances of the encounter and determine if there is another method to gain control of the suspect without using the CED multiple times (see Police Executive Research Forum, 2005 and Cronin & Ederheimer, 2006).

The possible overuse of CEDs has several dimensions. First, CEDs can be used too often, that is, at inappropriately low levels of suspect resistance. In other words, a CED can be deployed at citizens who merely disobey or even misunderstand officer's orders, which would be an inappropriate use of such a high level of force. This problem can be managed with policies, training, monitoring and accountability systems that provide clear guidance (and consequences) to officers regarding when and under what conditions CEDs can be used and when they cannot be used. In addition to setting the resistance threshold appropriately (our recommendation is to set it at active resistance), comprehensive CED policies and training should require that officers evaluate the totality of the circumstances before using a CED, which would include the environment, age, size, gender, apparent physical capabilities, and health concerns (e.g., obviously pregnant women) of suspects. The present research, as well as prior studies, shows that CEDs are often used against vulnerable populations, which can result in problematic outcomes. Department trainers should focus on alternative methods to control suspects who are members of these at risk populations. In cases where it is determined that CEDs are ineffective or create an unacceptable health risk, multiple applications of a CED should be prohibited. In addition, CED policies and training should prohibit the use of CEDs in the presence of flammable liquids or in circumstances where falling would pose unreasonable risks to the suspect (elevated areas, into water, adjacent to traffic, riding a bicycle, etc.). Finally, policies and training should address the use of CEDs against persons who are restrained (e.g., handcuffed or otherwise controlled) and should either prohibit such uses outright or limit them to clearly defined, aggravated circumstances.⁷

In addition to being used too often, CEDs can be used too much. Reported deaths in association with CEDs often involve activations of multiple CEDs on an individual or multiple 5-s cycles from a single CED. Based on data collected from our national survey and medical studies, it is our recommendation that CED policies should require officers to assess continued resistance after each standard cycle and should limit the CED to no more than 3 standard cycles (15 s) of total activation time against the same person.⁸ In addition, it is common sense that if the shock of a CED has not worked after an application, and has failed to produce compliance, then it is not going to work after multiple deployments. While our knowledge of harm caused by multiple exposures to a CED or extended exposure is limited, it has been suggested that extended exposure to a CED is more likely to result in death than a single exposure or an exposure

of 15 s (Amnesty International, 2006). Following the deployment of a CED, the suspect should be carefully observed by officers for signs of distress and should be medically evaluated at the earliest opportunity. In fact, a model response has been created by Miami-Dade Fire Rescue that aggressively treats suspects with a high temperature, including those hit with a CED.⁹ Their policy includes the delivery of a sedative to calm the patient and allow for treatment to cool his or her body temperature.

Limitations of National Study

It is important to mention the limitations of the national study, and especially the limitations of the data based on agency records. First, these data rely on officer accounts of the events and may have an officer bias. The minimal data collected on suspect accounts uncovered significant differences between officer and suspect versions of the events. Another limitation of these data is that many contextual variables known to be correlated with use-of-force consequences were unavailable (e.g., whether the suspect was under the influence of alcohol or drugs, what initiated the police/citizen encounter). As we collected the data electronically, we relied on the data available to us from each agency. Also, and as a result, it was often unknown to coders if minor injuries were simply caused by a CED barb or skin irritation as a result of exposure to OC spray. In cases where coders could determine these types of injury, they were coded as noninjuries to avoid confounding the injury analysis. Had we been able to determine and remove all such injuries from the analyses, reported reductions in injury rates would have been greater than reported. The final limitation is that we did not analyze rare cases, such as in-custody deaths. As a result, we cannot make a determination that CED use reduced in-custody deaths.

Recommendations for Future Research

We noted above that CEDs, as any tool, can be abused by officers. A critical research question focuses on the over-reliance of the CED. During our interviews with officers and trainers, we heard comments that implied a “lazy cop syndrome.” That is, some police officers may turn to a CED too early in an encounter and may rely on a CED rather than his or her skills in conflict resolution or even necessary hands-on applications. The general literature investigating the sequence of events during use of force situations, as well as findings from the national survey, illustrate that we need to examine how threats are perceived by officers who have CEDs compared to officers who do not have them and whether this influences an officer’s response to the threat (Mesloh, Henych, Thompson, & Wolf, 2008).

Another important CED-related investigation would be a case study of deaths in custody, when the use of a CED was involved, and a matched sample of deaths in custody, when a CED was not involved. Advocacy groups argue that CEDs can cause or contribute to suspect deaths. Although the medical research to date does not confirm such claims, the participants in CED experimental settings have all been healthy people in relatively good physical condition and who have not been under the influence of

drugs or alcohol. Obviously, there is no ethical way to expose overweight suspects who have been fighting and/or using drugs to the effects of a CED, so an examination of cases where similar participants lived and died might shed some light on the reasons for the deaths. The argument that is made by law enforcement is that most if not all of the participants who died when shocked by a CED would have died if the officers had controlled and arrested them in a more traditional hands-on fight, or used deadly force. At this point, the argument is rhetorical, and research is needed to understand the differences and/or similarities in cases where suspects lived and cases where suspects died in police custody, including deaths where a CED may or may not be involved.

Future research should address the problem that officer and suspect accounts have significant discrepancies and that simply using agency accounts may introduce an officer bias. Attempts should be made to verify officer accounts with suspect and witness accounts, and to develop a strategy to make decisions concerning the accuracy of divergent accounts.

As we learn more about the use of CEDs and the reduction of injuries to both officers and citizens, the specific areas of research may benefit by being refocused on how officers can be most effective with a CED. In other words, how can officers use its deterrent value to their best advantage and how agencies can eliminate officer abuse? Adding CEDs to early warning systems or making appropriate officer-to-officer comparisons may be a constructive beginning to determine patterns of use. Finally, suspect interviews can assist in our knowledge of the deterrent effect of a CED as can data collected on suspect's adherence to officer's orders when the red laser dot indicates an imminent shock.

An editorial essay by Christine Hall, an emergency room physician and epidemiologist in Vancouver, British Columbia, places the use of a CED in its proper perspective and with the proper questions (2009) as follows:

Gaining control of a violent or disoriented individual is a challenging scenario in which the unpredictable risk is affected by numerous factors involving the individual, the environment and the intervention. Adverse outcomes, including death, are possible. In any dynamic, unstable scenario, the risk must be weighed against the need to gain physical control, prevent injury to others and limit the destruction of property. Even the risk of death can remain acceptable in the context of other immediate and measurable dangers. Considering this also requires knowledge of the risks of other modalities, including the use of batons, impact weapons and firearms, this raises the partially unanswered question, "what are the risks of CEW use by the police?" and the more important question, "Is it as safe as, or safer than the alternatives?" (p. 84)

Dr. Hall's comments are in response to the findings of the Braidwood Commission Report (2009), but make an important contribution to our understanding of police use of the CED. Her underlying theme is that its use may be the safest, most humane method of gaining control over an uncooperative suspect. However, she calls for more and better research on many of the issues we have discussed, including what constitutes an immediate or active threat to an officer. It appears that the more we learn about CEDs, the

more concerns become evident. For example, in October 2009, Taser International warned that chest shots increase the risk of cardiac arrest in some people and recommend lowering the preferred “point of aim” (Taser Training Bulletin, 15.0, October 15, 2009).

Based on the findings from the national study, and those from previous studies, the CED can reduce injuries to officers and suspects. Furthermore, while any use of force has its potential problems, this one seems to be reasonable when used against certain suspects in many situations. When left uncontrolled, any use of force can be dangerous, but when managed in a system that includes strong policy, training, supervision and accountability, the use of a CED can be a great asset to the police and the community by more effectively reaching the goal of using the least amount of force necessary to control unruly suspects, while minimizing injuries to officers and suspects.

Author's Note

The findings within this article are those of the authors and do not necessarily represent the official positions of the National Institute of Justice or the U.S. Justice Department.

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Notes

1. Taser International estimates that CEDs are in more than 12,750 law enforcement agencies.
2. Taser International maintains that no more than 1,200 volts enters into the body when a circuit is closed.
3. Fortunately, White and Ready (2009) have looked at media reports of fatal and non-fatal applications of CEDs and found that drug use, mental illness, and multiple deployments were associated with a reported death.
4. The other types of force listed were soft empty-hand tactics/control, hard empty-hand tactics/strikes/punches, and baton.
5. The geographic regions are identical to those used by the Law Enforcement Management and Administrative Statistics (LEMAS) and the Bureau of Justice Statistics.
6. The researchers applied the Kolmogorov-Smirnov test for equality of distribution functions between the two groups, rather than the conventional t-test for mean differences, because this test is less sensitive to extremes at the tails of each group's distribution.

7. See the PERF (2005) Conducted Energy Device Policy and Training Guidelines for guidance on this and other CED-related issues.
8. Rare situations can occur when a single officer is attempting to control a suspect who is highly combative and may need to use multiple activations of a CED especially to avoid the use of deadly force.
9. Miami Dade Fire Rescue Medical Operations Manual (2007, June) *Electronic control device*. Miami Dade Fire Rescue gives Versed via the needleless mucosal atomizer device, which removes risk of accidental needle stick. Once the participant is calm and accessible, an IV of 60°F normal saline is initiated and infused. A prophylactic 1 amp sodium bicarbonate is also given for acidosis that may result from a fight or physical exertion.

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Bios

Geoffrey Alpert is professor in the department of criminology and criminal justice at the University of South Carolina. He has been conducting research on high-risk police activities for 25 years, and has published more than 125 journal articles and 15 books. His most recent books are *Managing Accountability Systems for Police Conduct: Internal Affairs and External Oversight* (with J. Noble) and *Understanding Police Use of Force: Officers, Suspects, and Reciprocity* (with R. Dunham) published by Cambridge University press.

Roger G. Dunham is a professor of sociology at the University of Miami, Florida. His research focuses on policing strategies and officer decision-making. Specifically, he has conducted research on use of force, emergency driving, racial profiling, and attitudes toward the police. Recent books include (all coauthored with Geoffrey Alpert), *Understanding Police Use of Force: Officers, Suspects and Reciprocity* (2004); *Policing: Continuity and Change* (2006); and *Critical Issues in Policing*, 6th edition (2010).