

Safety and Epidemiology of Conducted Electrical Weapons (CEWs)

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Disclosures

- Research funding through US Dept. of Justice / National Institute of Justice
- No corporate funding from or financial interest in Taser International or other companies that manufacture / sell less lethal weapons

Conducted Electrical Weapons

- Commonly used
- Appear to decrease overall injuries (officers & suspects)
- Can cause injuries
 - Direct (sharp probes, muscle contraction, ignition)
 - Indirect (falls)
- Concern and controversy over
 - Potential cardiac effects
 - Role in unexpected deaths

Conducted Electrical Weapons

- Studies in healthy human volunteers are generally reassuring
- These results may not apply to population of interest
 - Medical and psychiatric conditions
 - Exertion / metabolic states
 - Medications / Drugs (prescribed, legal, and illegal)

What is the risk?

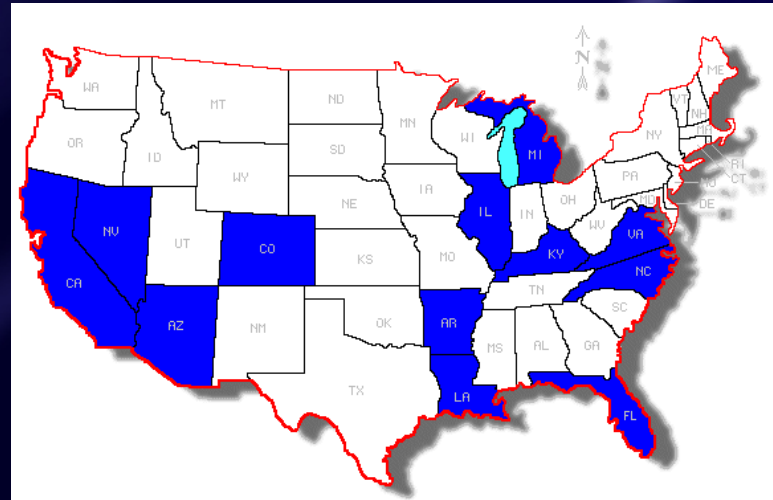
- Only epidemiology studies in population of interest can demonstrate safety or risks of CEWs in real world conditions
- Large, independent study needed

“Injuries Produced by Law Enforcement Use of Less Lethal Weapons: A Prospective Multicenter Trial”

The Less Lethal Weapons Study



LLW Study



- Prospective, multicenter, "real world" trial
- 6 LE agencies recruited across USA
 - Vary in size, location, population, policies (i.e. representative sample with good external validity)
 - All subjects receive medical screening exam
 - Tactical physician already integrated in agency

LLW Study

- CEW uses captured via mandatory Use of Force (UOF) review process
- Medical records retrieved by agency as part of UOF investigation
 - Federal HIPAA provision
- Physician review of 100% of cases
 - Police & medical records
 - CEW use details, injury classifications submitted via de-identified case report form

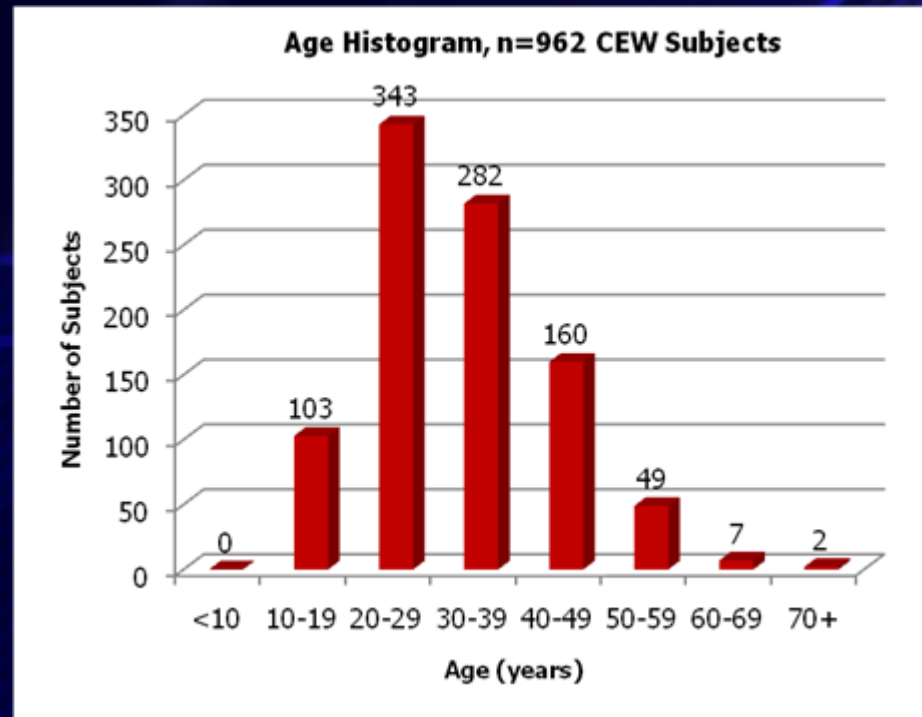
Injury Severity Definitions

Table 1: Injury Severity (*a priori* definitions)

Injury Severity	MILD	MODERATE	SEVERE
Description	Outpatient treatment - and - Mild or no long term disability expected	Inpatient treatment and / or Moderate long term disability expected	Inpatient treatment - and - Severe long term disability - or - threat to life
Examples	Abrasions, contusions, minor lacerations	Long bone fracture, Hemo-Pneumothorax, Hepatic / Splenic lac	Severe head injury Loss of limb or eye Ventricular Dysrhythmias

Results:

- n=962 CEW uses over 2 yrs
- Demographics
 - 94% Male
 - Mean:
 - Age: 32 yrs
(Range: 13 – 80 yrs)
 - Height: 5' 9"
(Range: 4' 6" – 6' 8")
 - Weight 184 lbs
(Range: 90 – 390 lbs)
 - Alcohol or drugs: 66%



CEW Use Patterns

- Deployment Mode
 - Probe n=640(67%)
 - Drive Stun n=249(26%)
- Mean number of discharges
 - Probe 1.6 cycles
 - Drive Stun 1.8 cycles

CEW Use Patterns

CEW Body Impact Areas			
(n= 1760) Includes probe and drive stun.			
	<u>n</u>	<u>(%)</u>	
Back	678	(38.5%)	Trunk 76%
Chest	360	(20.5%)	
Abdomen / Pelvis	294	(16.7%)	
Lower Extremities	243	(13.8%)	Extrem. 22%
Upper Extremities	146	(8.3%)	
Head / Face / Neck	33	(1.9%)	Sensitive 2.5%
Genitals	6	(0.6%)	

Results: Injuries

- None / Mild **99.7%** (95% CI: 99.1 – 99.9%)
- Mod / Severe **0.3%** (95% CI: .06 - .91%)

Injury Details...

Injuries	N	%	(95% CI)
None	743	77.2%	(74 - 80%)
Mild	216	22.5%	(20 - 25%)
Moderate	2	0.2%	(.03 - .75%)
Severe	1	0.1%	(.00 - .58%)

Mild Injuries (408 injuries in 216 subjects)		
Type	N	Percent
Puncture Wounds	204	78.8
Contusions	37	14.2
Lacerations	14	5.4
Other	2	0.6

Significant Injuries (Moderate + Severe)

Significant Injuries (3 injuries in 3 subjects)			
Type	N	Severity	Relationship to CEW
Head Injury (Epidural Hematoma)	1	Severe	Indirect - fall
Head Injury (Intracranial Contusion)	1	Mod	Indirect - fall
Rhabdomyolysis	1	Mod	Unknown

Two In-custody Deaths

- Violent, combative males in their 30s
 - History mental illness (1) drug use (1)
- CEWs ineffective, continued to struggle
- Taken into custody using physical force and pepper spray (1)
- Collapsed 5-20 minutes later
- Autopsy results:
 - Cocaine, dilated cardiomyopathy (1)
 - No specific COD (1)
 - CEW not listed by ME as causal or contributory in either

In Custody Death Rate

- No immediate in custody deaths (suggesting CEW effect) occurred

$$0 / 962 = 0\% \text{ observed rate}$$

- Allows calculation of likelihood of this event
95% confidence interval: 0.0 – 0.3%

If nothing goes wrong, is everything all right? Interpreting zero numerators.
JAMA. 1983 Apr 1;249(13):1743-5.

Summary – CEW Safety & Medical Effects

- First large independent study to show risks of CEW in real world use
- Bottom Line:
 - 99.7% suffer mild or no injuries
 - 0.2% – 0.3% may suffer significant injuries (falls)

Discussion

- Safety profile of CEWs in real world use appears to be excellent
 - Safer than alternative force options (impact weapons, hand-to-hand combat, pepper spray, canines)
- Significant injuries are rare but can occur
 - Law enforcement agencies should be prepared for this, provide appropriate medical screening and care
- Medical or psychiatric conditions may cause behavior that leads to police involvement & CEW use
 - Also require medical screening and care

Current Status

- Public release of initial results in Sept. 2007 (abstract, *Annals Emergency Medicine*)
- Manuscript completed, in submission to peer reviewed medical journal
- Largest dataset to date. Continued funding → ongoing incident monitoring and injury surveillance

Questions?

