# A rational response to Taser strikes


**By Steve Whitehead, NREMT-P**

Tasers are the fastest growing (and most controversial) addition to law enforcement's less-lethal arsenal. As the number of officers carrying Tasers skyrockets, paramedics are being called on more frequently to assess patients who have been "tased." Caught between the lack of quality information on what Tasers actually do and the whirlwind of bad publicity surrounding the device, EMTs and paramedics are forced to make tough decisions about treatment and transport with little reliable information to work with. Read on as we separate fact from fiction and address true medical concerns in Taser-deployment scenarios.

On July 18, 2004, *The New York Times* ran a front-page story with the ominous headline, "As Police Use of Tasers Rises, Questions Over Safety Increase."[1] The multi-page article went on to detail the last, unfortunate hours in the life of 32-year-old Kris Lieberman, a former landscaper who died in police custody after being tased. The article briefly mentioned Lieberman's prolonged state of excited delirium prior to his eventual confrontation with police officers. He was then tased multiple times and died in police custody. The implication was that the Taser had somehow played a critical role in Lieberman's demise.

In the weeks that followed, the Lieberman story would become another example of the sensationalized media frenzy that often surrounds in-custody fatalities. With little forensic evidence or understanding of the device, reporters rushed to blame the Taser and condemn the officers who had deployed it.

"It's frustrating," admits Rick Smith, CEO of Taser International, located in Scottsdale, Ariz., "To date, we've had 40 unexpected, unforeseen deaths. In every single case there are readily explainable causes. There are generally drugs involved or extreme levels of exertion. There are also people with psychological issues who may be off of their medications or there is a stress exacerbation of a pre-existing condition."[2]

*The New York Times* article failed to mention any of that. It also failed to mention the fact that many people die in police custody when no force is used at all (see sidebar, p. 60). Smith points out that the early stages of drug overdose often bring out behaviors that make a Taser deployment likely. *Another oft-ignored fact:* Many violent encounters that may have previously resulted in the use of deadly force are now mitigated by Taser use.

"Running around naked at three in the morning with a butcher knife threatening to kill people is an indicator that you might get hit with a Taser," Smith explains. "It's distressing to me that we have had 80,000 drug fatalities over the last four years and 40 people who have been hit with a Taser and died some time later, yet there is this focus on 'This has got to be the one. It must be the Taser in this case.'"[2]

The dangers of illicit drugs may be old news to the general public, but Tasers appear to pose a new threat. On the surface, the technology itself even seems wildly perilous—electricity administered at 50,000 volts from a handheld device that leaves people writhing on the ground—

# SHOCK

The Taser uses a continuous laser sighting to identify the probe impact region.

PHOTO KEVIN LINK

leading the public to ask: "How could such a thing possibly be safe?"

## What Tasers do

Understanding the proper treatment of the tased patient begins with an understanding of the device itself. The Taser delivers a controlled, pulsed dose of electrical current designed to temporarily incapacitate an individual. The electrical discharge is intended to end both physical and psychological resistance to an officer's commands.

The Taser can be used as a contact weapon, but don't mistake it for the handheld "stun guns" that you may have seen before. The Taser is primarily a projectile weapon that fires two probes up to 21 feet and delivers current through attached wires into a targeted individual.

When deployed, the Taser causes the muscle groups that lie between the two probes to contract uncontrollably. Taser technicians call this "jamming the T wave." Each electric pulse jams the muscles' ability to repolarize. Unlike previous stun devices that only caused pain, the Taser effectively shuts down the muscle group. This has proven far more effective than traditional stun weapons on larger individuals and those who have decreased pain sensation from drug and alcohol use.

The jolt that causes the muscle spasm is a mix of 50,000 volts and 0.38–1.2 amps, depending on the model. (The newer X-26 model uses less amperage than the larger M-26 version.) Although that sounds dramatic, consider that volts are quite benign; a simple static electricity charge can be as great as 20,000 volts. It's the additional amps that give the Taser charge its kick.

It's also important to remember that electricity follows the path of least resistance. An extensive study conducted by the Heart Center at the Alfred Hospital in Victoria, Australia, concluded that the Taser's current is well below the heart's fibrillation threshold, and it's doubtful that the current travels deep enough into the body to produce any noticeable effects on the heart.[3] Although difficult to measure, it's widely accepted that the electrical charge generated between the two probes travels no deeper than one-quarter inch into the body (see photo below).[4]

The Taser sends a controlled five-second cycle of energy, and the cycle can be interrupted by the user or repeated if necessary. A single pulse from the Taser lasts 11 microseconds. The device delivers 19 pulses per second for the first two seconds of operation and 15 pulses per second for the remaining three seconds of operation. *Assessment tip:* Emergency personnel should determine how many five-second cycles a patient has been subjected to.

It's also important to understand the functional role of the Taser in your local police department's use-of-force protocol. Some departments allow officers to deploy the Taser only as an alternative to deadly force; others allow officers to use the Taser after a subject has failed to comply with verbal commands. The difference may provide important insight into the status of the patient prior to Taser deployment.

## EMS response

Let's not beat around the bush about this. Most of the tased individuals you evaluate will need to be transported to the emergency department (ED). This isn't because of the Taser incident itself, but because of the potentially dangerous factors that led the patient to be tased in the first place and the potentially dangerous factors (e.g., a fall) that occurred immediately after the tasing.

The following is a rational, systematic, six-step approach to responding to and evaluating patients who have been tased. This approach was developed on the basis of a retrospective evaluation of 218 patients with Taser injuries admitted to an ED in Los Angeles County over a five-year period and by reviewing the case reports and research analysis of the 40 patients who died in police custody after being tased.[5,6,7]

*1. Find out what happened before the patient got tased.* If the patient doesn't present with the need for immediate medical intervention, take the time to

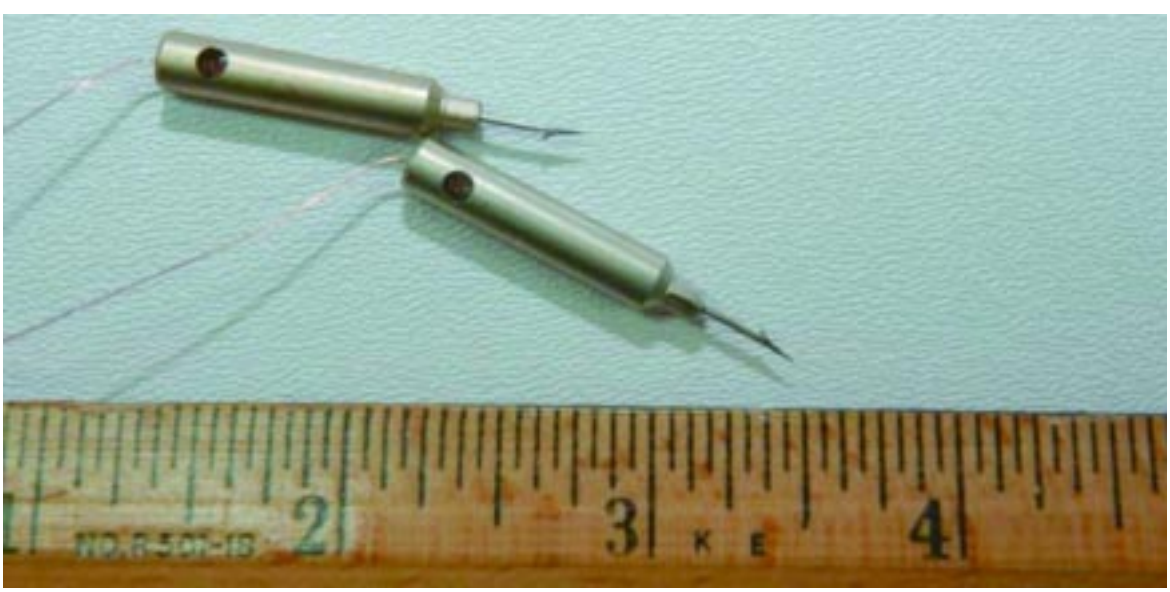


PHOTO JEFFREY FORSTER

The Taser barbs resemble a standard, Eagle Claw, #8 fishhook. The most conservative treatment is to consider the probe an impaled object that should be left in place and treated according to local protocol.

find out what was going on *prior to* the Taser deployment. This single step will provide you with a wealth of information regarding the patient's mental status and potential for future decompensation. Consider any report of extreme, irrational behavior prior to the tasing as significant, regardless of the patient's current presentation.

*2. Approach the patient with caution.* Keep in mind that the Taser can dramatically change a patient's outward presentation. Assume that any patient who has been tased was, at best, passively resistant and, at worst, violent and dangerous. Don't fall into the trap of believing that the Taser took all the fight out of a person. They're just as capable of resisting or injuring you now as they were before the incident. The only barrier to their resistance at this stage is a psychological one.

*3. Complete a thorough physical exam and history.* It should include a basic neurological exam, skin signs, pupil assessment, a complete set of vital signs and a close look for traumatic injuries. All tased patients are fall patients until proven otherwise. Individuals who are tased invariably fall to the ground without the ability to raise their arms or protect themselves. A 1987 retrospective study of reported injuries after tasing found a predominance of minor musculoskeletal injuries consistent with falls.[7]

Although, so far, no previous record exists of a significant neck injury resulting from a Taser-induced fall, minor head trauma is a frequent finding, and c-spine precautions should be considered.

It's not uncommon to find minor, first-degree burns located between the Taser probes. Anything that looks worse than a mild sunburn should be considered abnormal. Incontinence should be viewed as abnormal as well. Patients may report feeling dazed or have a transient, vertigo-type sensation. The patient may also have poor

## Sudden Unexpected Death Syndrome: Understanding the role of excited delirium

"People have been dying in custody for as long as police officers have been taking people into custody. This is not a new phenomenon," explains Chris Myers, a police officer with the Seattle Police Department, addressing a room full of his colleagues at the 2004 Taser International Tactical Conference.[10]

Myers goes on to explain how the Taser has become the latest in a long series of suggested causes for sudden, unexpected, in-custody deaths. Previous culprits include chokeholds, positional asphyxia and OC pepper spray [contains 10% oleoresin capsicum]. Although the theories have resulted in many changes in police officer use-of-force policy, one thing that hasn't changed significantly is the percentage of people who die suddenly and unexpectedly in police custody.

The numbers suggest that perhaps it's time to start thinking about in-custody death on a different level. In 1999, A.J. Ruttenber, MD, PhD, and his team at the University of Colorado School of Medicine were some of the first researchers to address the startling similarities between cocaine-induced rhabdomyolysis and the state of excited delirium that many police officers described in combative subjects prior to sudden, unexpected death. The researchers concluded that these were two stages of the same phenomenon.[11]

Several potential factors precipitate the deadly spiral of excited delirium, sometimes referred to as *acute exhaustive mania* or *sudden unexpected death syndrome*. The cycle can be induced by preexisting psychiatric disorders that precipitate an episode of psychosis or by noncompliance with essential psychiatric medications, such as lithium. More commonly, the cycle begins with the steady and prolonged use of such drugs as amphetamines (e.g., cocaine), PCP, LSD and ecstasy.[12]

Because the condition is difficult to diagnose postmortem and is often misunderstood, the medical field is only beginning to understand the progression of excited delirium. The disorder is theorized to progress something like this:[12,13]

*Stage 1: Euphoria*—The subject begins an episode of exertion, feeling euphoric from the early rush of adrenaline while experiencing a lack of discomfort that can accompany physical exercise. The subject may have feelings of invincibility and grandeur.

*Stage 2: Paranoia*—As body temperature rises, the brain triggers neurotransmitters that induce paranoia and fear responses. The subject may have paranoid delusions or feel nonspecific, generalized fear. Individuals often respond to these feelings with fight-or-flight type behavior. Individuals may also feel overwhelmingly hot and attempt to cool themselves by disrobing or seeking cool environments. Patients with excited delirium are frequently found naked or engaging in inappropriate behaviors, like climbing inside convenience store refrigerators.

*Stage 3: Rhabdomyolysis*—Insensitive to pain, individuals can push their muscles past their normal limits without feeling pain or exhaustion. Individuals may demonstrate unusual strength. The body now artificially moves past its exhaustion threshold. The muscles begin to cannibalize themselves for energy, and the resulting cellular breakdown releases intracellular toxins, enzymes and myoglobin into the blood stream, a phenomenon known as rhabdomyolysis.[14]

*Stage 4: Acidosis and death*—Prolonged anaerobic metabolism produces metabolic acidosis. The patient's core body temperature may reach critically hyperthermic levels above 105° F. Many individuals are reported to lapse into a phase of calm listlessness that emergency responders often mistake as compliance. Bloodborne toxins begin to clog the renal system and place the subject at risk for sudden, lethal arrhythmia, unconsciousness and death.

Much has been said about the danger of positional asphyxia in prehospital patient restraint. However, little has been reported about the dangers of prolonged agitation and combativeness in the restrained patient in any position. Researchers note that subjects who experience sudden unexpected death syndrome often present postmortem similarly to suffocation victims, even though no evidence of airway compromise is present. By the very nature of the patient's presentation, excited delirium and Taser deployments will continue to go hand-in-hand. *The lesson is clear:* Regardless of the method of restraint, patients who undergo a prolonged phase of agitation should be considered in danger of sudden death, even after the combativeness has resolved. ***—SW***

recollection of the Taser event. Chest pain, shortness of breath, vomiting and headaches should all be treated with a high index of suspicion.

Pay close attention to patients with a cardiac history, including coronary artery disease, myocardial infarction and congestive heart failure. Although the Taser current poses no direct threat to the conductivity of the heart, the strain of a prolonged physical conflict with police officers could precipitate a cardiac event.

*4. Consider the potential for sudden unexpected death syndrome.* The vast majority of patients who have died in police custody after being tased have shown signs of excited delirium. A basic understanding of the potentially fatal cycle of excited delirium should be a part of every EMT's and paramedic's knowledge base and a consideration on every Taser call. (See sidebar on excited delirium, p. 60.)

*5. Remove probes if indicated.* The barb of the Taser probe is essentially a standard, Eagle Claw, #8 fishhook. Recommendations differ on whether and how a Taser probe should be removed in the field. When in doubt, the most conservative treatment is to consider the probe an impaled object that should be left in place and treated according to local protocol. If the barbs have implanted in sensitive areas of the face, throat, eye, groin, breast, hands or feet, definitely leave them in place and pad and secure them as you would any other impaled object.

If you opt to remove the probe, grab it firmly and pull straight back in a quick fashion, using the other hand as a brace and counter-pressure area on the skin surface.[8] Keep in mind that the square body of the probe is marked with a grooved line to indicate the direction of the hook. If probes are resistant to removal with a single, sharp but gentle tug, leave them in place and transport the patient for probe removal at the ED.

The single-use wires connecting the dart to the gun can be broken between the thumbs and forefingers or cut with trauma shears. Probes should be treated as sharps and can be stored inside the Taser cartridge in the absence of a sharps container. Some police departments will request the probes after removal, especially if there was a malfunction or user error in the discharge of the device.

*6. Transport the big seven.* Always transport patients who have demonstrated one or more of the following:

- Evidence of excited delirium prior to being tased;
- Persistent, abnormal vital signs;
- History or physical findings consistent with amphetamine or hallucinogenic drug use;
- Cardiac history;
- Altered level of consciousness or aggressive, violent behavior including resistance to evaluation;
- Evidence of hyperthermia; and
- Abnormal, subjective complaints, including chest pain, shortness of breath, nausea or headaches.

## Treatment considerations

Patients who have been tased present a particular challenge to the prehospital care provider. With limited time, the provider is asked to consider all that has happened prior to Taser discharge, assess the patient's current condition and make accurate predictions about what might happen next.

Once the decision has been made to transport the patient to the hospital for treatment or continued observation, several elements need to be considered. As always, the bias of our treatment must be to maintain a safe environment for the providers and to protect the patient from harm.

Think about appropriate restraint early in the response. Remember that the single greatest predictor of future aggressive behavior is prior aggressive behavior. Even the calm, cooperative patient may descend, once again, into

# From Anecdotes to Scientific Evidence, Tasers Linked to Injury & Death

Although Taser International (TI) remains steadfast in its statements that Taser's less-lethal weapons are safe, there are dissenting opinions. In November 2004, Amnesty International released a report critical of Taser use that says over the past four years more than 70 people in the United States and Canada have died after being tased. On April 1, 2005, Amnesty International USA said that the number had risen to 103 between June 2001 and March 2005.

In July 2004, the *Arizona Republic* reviewed autopsy reports of people who died after being tased and also interviewed medical examiners. They concluded Tasers were linked to at least five deaths.

A *Police* magazine Web message board reports Taser injuries ranging from pulled muscles to a dislocated shoulder to a broken vertebra.

The abstract of an Air Force Research Laboratory study states the devices may be dangerous. They say there could be some uncommon, "unintended effects" from the shock.

The individual stories of people who died after being tased usually involve multiple shocks. Related news stories raise concerns that Tasers may be used too casually, based on the claims by TI that the shocks do no lasting harm. A recurring idea in articles critical of Tasers is that there simply isn't enough scientific research to back up TI's claims.

*Studies being conducted now:* The National Institute of Justice is funding the largest study, with Wake Forest University Baptist Medical Center as the lead site. The multicenter trial will record the number and severity of injuries from less-lethal weapons, including Tasers. Principal investigator William Bozeman, MD, says, "This injury-epidemiology study will document the injuries sustained by 750–900 patients around the country. [It] promises to give us the best information yet on these weapons and the injuries they cause."

The jury is still out, but it has begun deliberations.

***—Ann-Marie Lindstrom***

PHOTOS JEFFREY FORSTER

Primarily a projectile weapon that fires two probes and delivers current through attached wires into a targeted individual, the Taser can be used as a contact weapon with the barbs removed (far right). The newer Taser model X-26 (shown here) uses less amperage than the larger M-26.

resistance and violence when the police (and the Taser) are no longer present. Patients who have exhibited violent or aggressive behavior should be restrained in the face-up position on the stretcher.

Patients who continue to struggle against restraints may be of limited risk to the provider, but they still pose a risk to themselves and are difficult to evaluate and treat appropriately. Chemically restraining individuals who thrash and fight against physical restraints protects patients from harm and may make patient care more effective. As always, consider your local protocols and potential risks to the patient before applying chemical restraint.

Any patient being transported with one of the "big seven" criteria listed on page 62 should be monitored for arrhythmias and placed on supplemental oxygen. Persistent abnormal vital signs, atypical skin signs, altered mental status and evidence of hyperthermia are all indications for peripheral IV access. Subjective complaints should be addressed per local protocol.

Patients who present with signs of hyperthermia, such as inappropriate clothing for the environment, warm skin (dry or diaphoretic), dry mucosa, nausea or muscle cramping should be cooled en route to the hospital. Ice packs and the vehicle's air-conditioner can be used to facilitate the cooling process.

# Sorting Taser Truths from Taser Mythology

From electrocution to people bursting into flames, you've probably heard a few stories about what Tasers can do under certain circumstances. Sometimes it can be tough to sort through the tall tales and get the straight story on what kinds of real dangers the Taser can present. Here's how research and experience stack up against seven often-heard claims about the Taser.

**Claim:** *You can electrocute someone with a Taser if you tase them while they're standing in water or covered with water.*

**Status:** False—There are no issues with tasing an individual while they are wet or standing in water. A Taser is designed to deliver a controlled, low-energy pulse that does not change regardless of the conductive medium on the other end of the barb. Individuals have been tased while drenched and even while standing waist-deep in water without untoward outcomes.

**Claim:** *If a person has flammable liquid on their clothing or they've been sprayed with a flammable liquid, a Taser could set them on fire.*

**Status:** True—Although a Taser won't ignite flammable clothing materials, it will ignite a flammable vapor. If someone's clothes have been doused with a vaporizing flammable liquid, such as gasoline, the Taser will provide an ignition source that could set the individual on fire. Officers trained in the use of the Taser have been instructed to withhold its use in high-flammability environments such as meth labs or gas stations. To date, two individuals have received burns because flammable liquids on their clothing ignited while they were being tased.

**Claim:** *A bulletproof vest will protect the wearer against a Taser.*

**Status:** True and false—This really depends on the type and fit of the vest. With standard body armor, a Taser's energy will be transmitted to the wearer and effectively deliver an incapacitating charge about 50% of the time. The critical factor is not what the vest is made from, but how tightly the vest fits and how close to the body it is. The Taser will go through any vest on the market if there are less than two cumulative inches between the wearer and the Taser barb.

**Claim:** *If you tase someone who is pregnant, you can injure the unborn fetus.*

**Status:** True and false—An unborn fetus is protected by a muscular, uterine shield, which greatly reduces the chance of the current ever reaching the fetus. A new U.K. study used computer modeling to show that the Taser current penetrates only a quarter-inch into the body, and the potential to harm a fetus with a Taser is thus highly unlikely.[15]

The issues with tasing a pregnant female are the secondary effects, such as the potential for the patient to fall and land prone. Although such an event has not been documented, it is reasonable to believe that a fall from a standing position could injure the fetus. Caregivers should always consider the potential for fetal trauma in a tased pregnant patient.

**Claim:** *The Taser could disrupt a patient's implanted pacemaker.*

**Status:** False—Pacemakers must comply with the Active Implantable Medical Device Requirement, which specifies that pacemakers must be individually tested to withstand very high shocks from external defibrillators. The Taser delivers 0.36–1.7 joules per pulse; whereas the pacemaker must be able to withstand 360 joules per pulse, a considerably higher load.

When asked about the possibility of a Taser affecting a pacemaker, Mark Kroll, PhD, the most prolific inventor of cardiac pacemakers in the world today, says, "If you were to plot the waveform of the Taser against that of a cardiac pacemaker, you wouldn't even see it. The [pacemaker's] waveform is much longer. Therefore, the theoretical possibility of the Taser affecting the ▶

heart is about the same as the chance of you getting a cell phone call on your AM radio."[16]

**Claim:** *The Taser may be safe for adults, but it poses an increased risk when used on children.*

**Status:** Undetermined–The claim that Tasers are not safe for use on children has been fuelled by two separate incidents in November 2004 in which Miami-Dade police used Tasers to incapacitate children. Taser International stands firm in its claim that the weapon is safe for use on children older than two years, citing research conducted by Underwriter Laboratories (UL) on the minimum safe limits of electrical shock for humans. However, UL disagrees. The company has come forward to say that its research was aimed at identifying safe levels for electrical cattle fences and is not applicable to the Taser discussion.[17]

Even Wayne McDaniel, an electrical engineer for the University of Missouri-Columbia who designed many of the Taser safety studies, disagrees with the company's safety claims regarding children. "The design of this device is for bad guys," explains McDaniel. "I don't think that I had ever envisioned the use of this thing on small children."[17]

Although more information is needed, caregivers should consider that due to their smaller size, children may be more susceptible to nerve or muscle damage from a Taser.

**Claim:** *The Taser can induce ventricular fibrillation in some people.*

**Status:** False–Quite a bit of speculation has circulated in the scientific community questioning whether a small subset of people could be hypersensitive to the effects of the Taser. Although this hypothesis is a valid consideration, multiple studies conducted on canines and pigs have demonstrated that the Taser's shock is far below the level necessary to cause a heart to fibrillate, even when applied directly to the myocardium. A recent study published in the *Journal of Pacing and Clinical Electrophysiology* estimated that the electricity needed to produce cardiac arrest in a small animal is 15 times greater than the stimulation of a Taser discharge.[18]

***–SW***

## The debate continues

On Aug. 20, 2004, as my research into the safety of the Taser drew to a close, I opened my front door to find a disturbing omen on the front page of my local newspaper. "Tasered Man Dies," the headline boldly asserted.[9] The front-page story reminded me that, although my research was ending, the debate over Taser safety is far from over.

The *Rocky Mountain News* article sounded eerily familiar. A middle-aged male acting agitated and uncontrollable, an extended fight with police officers and a sudden, unexpected death in the ED several hours later. With the official cause of death pending, all fingers were pointing, once again, at the Taser. (See sidebars on p. 62 and p. 64 for more anecdotal and scientific evidence on injuries linked to Tasers.)

With so much conflicting information about the safety of the Taser device being circulated, it's crucial for emergency providers to know how to appropriately evaluate the tased patient. Although we can't be expected to have definitive answers to questions about Taser safety, we can be expected to examine each patient thoroughly and use good judgment in our treatment and transport decisions. JEMS

*Steve Whitehead, NREMT-P, is a nationally registered paramedic with more than a decade of field experience. He is a full-time firefighter/paramedic for the Mountain View Fire Protection District, as well as a speaker, an author and a consultant on various EMS topics. Contact him via e-mail at swhitehead@mountainviewfire.org.*

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