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### Title

Restraint in police use of force events: Examining sudden in custody death for prone and not-prone positions

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Restraint in police use of force events: Examining sudden in custody death for prone and not-prone positions

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**Restraint in police use of force events: examining sudden in custody death for prone and not-prone positions.**

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**Abstract:** Despite continued cases of sudden in-custody death in subjects who are restrained, little is understood about the incidence of sudden death, its underlying pathophysiology, or its actual relationship to subject positioning. This paper reports data from 4828 consecutive use of force events (August 2006- March 2013) in 7 Canadian police agencies in 4 cities including Eastern and Western Canada. **Methods:** Human subjects committee approval was obtained in each city with approval for enrolment of subjects without consent. Consecutive subjects aged >18 years who were involved in a police use of force event were included regardless of the cause or outcome. Officers prospectively documented the final resting position of the subject, whether there was knowledge or suspicion that the subject was intoxicated with alcohol and/or drugs, suffering from emotional distress or any combination of those, the number and nature of a standardized list of features of excited delirium present, and the use of all force modalities alone or in combination. Our outcome of interest was sudden, unexpected in-custody death. Confidence intervals for differences were considered significant if the 95% confidence interval for the difference did not include zero. Assuming an alpha error of 5%, a beta error of 20%, a sample size of 1945 subjects per group gives our study 80% power to detect a difference of 0.5% in sudden death between the prone and not prone position. **Results:** During the study there were over 3.25 million consecutive police-public interactions; use of force occurred in 4,828 subjects (0.1% of police public interactions; 95% CI = 0.1%, 0.1%). 90% of subjects had complete information on positioning; none of the subjects without documentation of positioning died. Subjects were usually male (87.5%); median age 32 years. Subjects were abnormal with 81.5% of subjects documented to have one or more of alcohol and/or drug intoxication, and/or psychiatric/emotional distress at the scene. Significantly more subjects remained in a non-prone vs. prone position; yet over 2000 subjects remained prone. Although 5.3% more subjects with any assessed comorbidity were in the "not-prone" position, over 1500 with any assessed comorbidity were prone. Significantly more individuals with >3 features of excited delirium were not-prone while significantly more subjects with drug intoxication alone were in prone. There was no difference in CEW deployment in any mode between the positions. One individual died suddenly and unexpectedly; the individual was in the not prone position and exhibited all 10 features of excited delirium. No subject died in the prone position. In a worst case scenario our confidence intervals indicate, with a high degree of precision, that 99.8% of subjects would be expected to survive being in either the prone or not-prone position following police use of force. **Conclusions:** Prone positioning is common following police-public interactions. In this study no subject died among thousands who remained in the prone position after police use of force. From our data, in a worst-case scenario, 99.8% of subjects would be expected to survive any post restraint positioning in a law enforcement setting. Our epidemiologic data of real police public interactions support the human laboratory data that the prone position has no clinically significant effects on subject physiology.

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**Restraint in police use of force events: examining sudden in custody death for prone and not-prone positions.**

**Introduction**

A number of subjects succumb to unexpected sudden death following a police use of force event that includes some form of restraint. These sudden in-custody deaths are devastating for the families and communities as well as the police professionals and agencies involved, and they often command wide media attention. Regardless of media interest, sudden in-custody death represents an important medical issue. Yet, despite continued cases of sudden in-custody death and much postulation about mechanism, little is understood about the incidence of sudden death, its underlying pathophysiology, or its actual relationship to subject positioning.

The role of subject positioning following police use of force events in sudden in-custody death has remained under close scrutiny since the publication of three cases of sudden, unexpected deaths following prone positioning of subjects in the 1990's<sup>1</sup>. In these cases, and in subsequent cases<sup>2-6</sup>, when a clear cause of death is not evident, medical examiners have often reported that the sudden in-custody death was caused by positional asphyxia. Positional asphyxia is usually defined as compromise of ventilation because of sustained interference with the chest and/or diaphragm or occlusion of the upper airway due to sustained abnormal positioning of the body.<sup>7</sup> Because of this, prone positioning used during or after a police use of force event has been commonly implicated as the causal factor in the subject's death, irrespective of the duration of that positioning.<sup>3-5, 8-10</sup>

Recently, advanced physiologic monitoring has been used in experiments to determine the effects of the prone position on pulmonary function, cardiovascular function and sympathetic nervous system parameters<sup>11-16</sup>. These studies have looked at effects of position, obesity, restraints, and weight placed on the back of a prone subject. Though small differences in physiologic values can be found, there is little evidence of any clinical significance. There are issues with the translation of laboratory studies, which are primarily conducted on healthy volunteers, to the community setting where subjects' physiology is often complicated by the presence of alcohol, stimulants or acute psychiatric distress, including the state of extreme psychomotor agitation and altered consciousness known as excited delirium.<sup>17-21</sup>

There remains a deficiency in the systematic collection of high-quality data on the relationship between subject positioning and occurrence of sudden in-custody death under real- world conditions. While several case series exist that document outcomes in proned subjects, the true effect of positioning cannot be examined for its role in sudden in-custody death if only prone positioning is evaluated.<sup>1-3, 5, 6, 22</sup> To date, ours is the only epidemiologic study to prospectively document the number of individuals who remain prone or not-prone at the conclusion of a police interaction, and to describe the outcome for either position after police use of force. In previous work, we found that no subject had died when in the prone position following a use of force event in 1169 consecutive subjects.<sup>23</sup> The only death in that series of subjects occurred in an individual clearly documented to be in a not-prone position.

The purpose of this paper is to update and expand on our prospective, consecutive data set to include nearly 5000 consecutive use of force events from the police services in four urban centers in North America, to describe: (1) the nature of the subject and the use of force events; (2) the characteristics and proportion of individuals who remained in either the prone or not- prone position following a police use of force event; (3) the proportion of subjects who died suddenly overall in either the prone or not-prone position; and (4) whether there was a difference in the number of unexpected subject deaths in the prone vs the not-prone position.

## Methods

### *Study Design*

This prospective, observational epidemiological study was undertaken as part of a larger,

multicenter, epidemiologic study surrounding police use of force. Human subjects' committee approval was obtained at the relevant University and Health Authority Institutional Review Boards with approval for enrolment of subjects without consent, including extensive safeguards for subject privacy and the protection of personal information. (Part of the safeguard for subject privacy precludes the identification of the involved police agencies and cities in this report.)

### *Study Setting and Population*

This paper reports on data collected from August 2006 until March 2013, representing 4828 consecutive use of force events in seven Canadian police agencies in four cities including Eastern and Western Canada. In the seven agencies, during the enrollment period there were over 3.25 million police public interactions where a police officer and a member of the public were in the same physical space at the same time (i.e simple calls without officer attendance are not included).

At each police agency, general duty officers are trained in, and have individual and immediate access to use of all force modalities, including: use of physical strikes, use of oleoresin capsicum (OC) spray ("pepper spray") (i.e. Sabre RED Crossfire – 1.33% major capsaicinoids/10% oleoresin capsicum; Security Equipment Corporation, Fenton, MO), use of handheld baton (i.e. Autolock 21" baton, MONADNOCK, Monadnock Fitzwilliam, NH), application of a vascular neck restraint, (i.e. Lateral Vascular Neck Restraint©, National Law Enforcement Training Centre, Enforcement Training Center, Kansas City, MO), the deployment of a Taser X26©(Taser International, Scottsdale Arizona) conducted energy weapon ("CEW"), and use of firearms. Activities of special teams such as SWAT/Emergency Response Teams, canine officers, bomb squads or dive teams were excluded in this study of general police duty activities.

### *Inclusion criteria*

Subjects aged 18 years or greater who were involved in a use of force event with police were included regardless of the cause or outcome of that interaction. At all agencies, a use of force event was recorded if any action above the application of a simple joint lock (e.g., a bent wrist or straightened elbow) to gain compliance occurred. Officers were agency mandated to record all use of force modalities specific to that use of force event as a matter of policy and our database was compared to agency records to ensure that 100% compliance occurred.

### *Study Protocol*

Study data were collected by all general duty police officers during the course of their interactions with subjects either via electronic study forms embedded in the police service's standard electronic use of force report forms, or through paper forms completed in the duty room at the end of shift. Only one form per use of force event was recorded, regardless of the number of officers involved in the incident. Completion of all data points on the computerized forms was electronically mandated prior to submission, including indication of "unknown" information. Paper forms were audited regularly by the use of force coordinator at the involved agencies to ensure compliance. Unknown/missing data was investigated, and was not inferred to be a negative response; if the missing data could not be ascertained, it was indicated as "unknown".

### *Measurements*

Positioning Officers prospectively documented the final resting position of the subject, once physical control had been achieved and while awaiting disposition at the end of the police-public interaction. The final position of the subject could be indicated as any one of the following: face down, face up, side lying, sitting, kneeling or standing. For analysis, these data were subsequently categorized in a binary fashion as either prone (face down) or not-prone (face up, side-lying, sitting, kneeling or standing).

Officer Assessment of Intoxication or Psychiatric Distress As part of the police assessment of the subject and scene, officers were asked to specifically record their perception of relevant biopsychic abnormalities in subjects by describing whether there was knowledge or suspicion that the subject was intoxicated with alcohol, intoxicated with drugs, suffering from psychiatric distress, any combination, or none at all.

Conducted Energy Weapon Use As part of the standard use of force reports, officers were required to document every use of a conducted energy weapon (CEW). The CEW used by all participating agencies was the Taser®. Data collected involving a CEW included whether the laser sight was displayed, the number of deployments, the mode of weapon (drive/contact/push stun, probe or a combination) and the number of trigger pulls.

Excited Delirium Features The clinical features that are often present when an individual is in a state of excited delirium have been previously described.<sup>18-21</sup> Officers prospectively documented the number of standardized subject features of excited delirium present at the time of the interaction on the standardized use of force report form, whether those features were present alone or in combination. These possible clinical features included: inappropriate clothing for the situation/environment (naked or

partially clothed), attraction to glass (destruction of glass, mirrors, glass or lights on vehicles), failure to respond to police presence, constant or near constant physical activity, does not appear to tire despite heavy physical exertion, unexpected/unusual strength, apparently unaffected by pain, very rapid breathing, excessive heat/hot to touch, and excessive sweating/diaphoresis.

Outcome Measures Our outcome of interest was sudden, unexpected in-custody death. Deaths with a clear cause (i.e. suicidal hanging, gunshot wound) were excluded from analysis of a relationship between death and positioning.

*Data Analysis* Use of force report forms were stripped of all subject and officer identifiers and then entered by trained transcriptionists into a custom database (Access® 2007, Microsoft, Redmond, WA). Twenty percent of data were double entered and cross-checked for accuracy with no significant errors detected. Tab delimited data were then exported to the statistical engine (SPSS © Version 18, IBM, Armonk, NY) for statistical evaluation. Descriptive analysis was performed and observed proportions were determined with standard methods; confidence intervals were calculated (SPSS © Version 18, IBM, Armonk, NY). Proportions and their differences are defined with 95% confidence intervals for non zero values with Yates' correction for small numbers where relevant. Zero proportions are defined

further through one-sided 97.5% confidence intervals. Confidence intervals for differences were considered to have statistical significance if the confidence interval for the difference did not include zero.

### **Sample size calculation:**

For a factor to be causal in a relationship, removal of that factor should eliminate the outcome of interest - in this case sudden in custody death. Thus, assuming that no person should die in a not-prone position, assuming an alpha error of 5%, and a beta error of 20%, with a sample size of at least 1945 subjects per group, our study has 80% power to detect a difference of 0.5% in the proportion of subjects who die in the prone vs not-prone position. In other words, if an additional 1 in 200 or more subjects die in the prone vs not-prone position, we have 80% power to detect that difference statistically.

### **Results**

During the study interval, across the agencies involved, there were over 3.25 million total police-public interactions, a use of force event occurred during that interaction in a total of 4,828 subjects (Use of force occurred in 0.1% of police public interactions; 95% CI = 0.1%, 0.1%). We excluded 455 subjects from analysis because the subject fled or the position was not recorded ("position unknown"). Thus, complete information on positioning was available for 4373 (90%) of the 4828 subjects who underwent police use of force. None of the subjects without documentation of positioning died. The characteristics of our study sample are documented in Table 1. In our sample, 4056/4373 were handcuffed (93%). The majority of subjects were male (87.5%) and the median age was 32 years (Table 1.) The majority of subjects were assessed by police officers at the scene as experiencing one or more comorbidity of alcohol intoxication, drug intoxication, and/or psychiatric/emotional distress (Table 1). There was no

significant difference in the characteristics of our study sample between police agencies or between years of data collection.

Table 2 indicates the final position of the 4373 subjects in whom final position was known. The majority of subjects remained in a non-prone position at the conclusion of the police-public interaction, and this difference was statistically significant. However, over 2000 subjects in our study remained in a prone position.

Information on the presence of comorbidities was missing in a total of 40 subjects; 29 of those were prone and 11 of those were not-prone. Although 5.3% more subjects with any assessed comorbidity were in the "not-prone" position, over fifteen hundred individuals with any assessed comorbidity were left prone. (Table 3). While an equal number of subjects intoxicated with alcohol alone or who displayed signs of emotional disturbance alone were in each position, significantly more subjects with drug intoxication alone were in the prone position at the conclusion of the use of force event. (Table 3). Persons with all 3 comorbidities (alcohol and drug intoxication plus evidence of emotional distress) were equally distributed between the prone and not prone positions. (Table 3)

We also evaluated the final resting position for individuals in the cohort with and without 3 or more concomitant features of excited delirium. Overall, there 499 individuals in the entire cohort with 3 or more concomitant features of excited delirium at the time of the use of force event and within that group, 86 individuals had 6 or more concomitant features. (Table 4). Significantly more individuals with 3 or more concomitant features of excited delirium were placed in the not-prone position at the conclusion of the use of force event (Table 4).

We further evaluated the cohort to document the frequency and nature of CEW use between subjects in the prone and not-prone positions (Table 5). Overall, approximately 15% of subjects had documentation of any CEW use. There were 32 subjects undergoing CEW who

had no additional description of the nature of that deployment; 17 were in the prone position and 15 were in the not-prone position at the end of the encounter. In another 199 subjects, only laser light illumination was used during the CEW use; these subjects were also equally distributed between the prone and not-prone positions.

For the remaining subjects with a deployment of the CEW, approximately 10% of the subjects in each final position had undergone CEW deployment. There was no difference in the proportion of individuals undergoing CEW deployment in any mode between the prone and not-prone groups. (Table 5.)

One individual died suddenly and unexpectedly during the course of our study. None of the subjects without documentation of their final resting position died. For our entire study, the prevalence of sudden in custody death in all police use of force events was 1/4828 or 0.02% with a 95% confidence interval of (0.0005%, 0.1%). The incidence of sudden in-custody death for our consecutive use of force cohort in whom final position was known was 1/4373 or 0.02% with a 95% CI of (0.0005, 0.1%). The individual who died was documented to be in the side-lying position at the conclusion of the police-public interaction and remained so prior to his cardiopulmonary collapse (Table 6.). From our data, the 95% confidence intervals indicate that, in a worst case scenario, 99.8% of subjects would be expected to survive being in either the prone or not-prone position following a police use of force event. In our study, the only subject who died was in a not-prone position, thus we have detected a 0.04% difference in the proportion of subjects who have died. While this difference does not achieve statistical significance due to sample size, it is clinically extremely important since it indicates that death is not limited to persons in the prone position. The person who died exhibited all 10 features of excited delirium during the police use of force event including being partially clothed, destroying glass, failing to respond to police presence, demonstrating constant physical activity, failing to tire despite heavy physical activity, having unexpected strength, being unaffected by pain, rapidly breathing, being hot to the touch, and having excessive sweating.

## Discussion

### *Prone Positioning and Positional Asphyxia*

Positional asphyxia, as a medical definition, refers to a situation where there is sustained compromise of ventilation because of interference with the chest and/or diaphragm, preventing normal

respiratory excursion, or occlusion of the upper airway due to sustained abnormal positioning of the body.<sup>7</sup> Positional asphyxia has been described in the following contexts of prolonged entrapment: unusual body positions; under fallen vehicles; while heavily intoxicated with loss of reflexive airway protection; in combination with significant medical disorders such as multiple sclerosis or significant obesity; or in cases of SIDS.<sup>7, 24-26</sup> Extrapolation of these concepts to indicate an increased risk of sudden death due to simple prone positioning after a police use of force event has engendered vigorous discussion, and is based solely in case series of individuals who have prone positioning as one part of their use of force event. This discussion continues with vigor even in the absence of quality, systematic data collection to support it.

Our results indicate that although prone positioning was very common following police use of force with thousands of subjects' prone, none of the thousands of consecutive subjects in the prone position in our study died. This finding alone belies a strong causal association between prone positioning and sudden in custody death. One subject in our cohort died, who was clearly documented to not have been prone at any time during the of force event or prior to the cardiopulmonary arrest. Our 95% confidence intervals for death indicate that, in a worst- case scenario with a high degree of precision, 99.8% of subjects would be expected to survive being in the prone position following a police use of force event. Thus, our study of real world police-public interactions and their outcomes supports the experimental findings that prone position can create changes in physiologic measures under laboratory conditions without significant clinical effects.<sup>11-16</sup>

In our study, the individual who died was never restrained in the prone position and was not maintained in the prone position at any time prior to the cardiopulmonary arrest. Assessment of the death in the not-prone position finds that, in a worst case scenario, up to 4 in 10,000 subjects in the not-prone vs prone position could be anticipated to suddenly die in custody. This finding challenges the notion that prone positioning itself is a risk factor for sudden in-custody death.

#### *Intoxicants/Psychiatric Distress at the Scene*

Some have suggested that police restraint in a prone position may be acceptable in "normal" individuals but is more dangerous in individuals who have compromised physiological functioning due to intoxication and/or acute psychiatric distress.

In our consecutive cohort of subjects undergoing police use of force, more than 2000 individuals were placed in the prone position, the vast majority of whom (81.5%; 95% CI 80.3%, 82.6%) were perceived by officers at the scene as abnormal (i.e. any or all of alcohol/drug intoxication, or psychiatric distress), and none of them died. Significantly more of the hundreds of subjects who officers assessed as being under the influence of drugs at the scene were placed in the prone vs not-prone position.

None of them died. Overall, significantly more individuals with any comorbidity detected at the scene were placed in a not-prone position.

While some would suggest that this biases our study toward an increase in death in the not-prone group, we would find this compelling evidence that it is subject characteristics and not prone positioning that predicts sudden in custody death. We believe that the increase in numbers of subjects with comorbidities in the not-prone position is because of extensive instruction to law enforcement officers that utilization of this position is essential in protecting subjects from death. However, drug intoxicated persons can be extremely violent and those persons are operationally best controlled in the prone position by law enforcement officers as evidenced by their distribution in our study. Our data reveals that, in a worst-case scenario, 99.8% of use of force subjects would be expected to survive prone positioning. We find that policies that rely on that position to “prevent subject death” are not as risk avoidant as believed. Our data provide evidence that the nature of the subject being restrained, rather than specific positioning is more likely to predict sudden in custody death in the law enforcement environment.

### *Excited Delirium*

Sudden in-custody death of subjects exhibiting the signs of excited delirium is well documented through retrospective case studies.<sup>2, 3, 5, 9</sup> It has been suggested that subjects in a state of excited delirium are more susceptible to positional asphyxia due to a need to hyperventilate in order to compensate for an underlying acidosis. However, deaths in excited delirium cases have been described after hog-tie positioning, prone positioning, supine positioning and chemical restraint. In short, the effect of position following restraint in this population remains unclear.

We were interested in the outcomes for individuals in a state of excited delirium and prone positioning. 499 subjects in our study exhibited 3 or more concomitant signs of excited delirium (11% of use of force subjects) and significantly more of them were maintained in a not-prone position than were prone. The single death that occurred in our study was in an individual who had all 10 features of excited delirium documented prospectively at the time of his interaction with police; those features were: naked/partially clothed, destruction of glass, failure to respond to police presence, constant or near constant physical activity, does not appear to tire despite heavy physical exertion, unexpected/unusual strength, apparently unaffected by pain, very rapid breathing, hot to the touch and excessive sweating. He was documented to not be prone during the use of force event or prior to his cardiopulmonary arrest at the scene. The not-prone position was not protective in this case and we argue that the presence of excited delirium rather than the positioning should be the variable of interest in sudden in custody death.

### *Conducted Energy Weapon*

It has also been stated that the use of a CEW prior to the physical control of an individual could make subsequent prone positioning more dangerous through increased agitation, sympathetic drive and increased oxygen demands.<sup>27, 28</sup> We found that approximately 10% of the subjects in each position (over 200 subjects in each group) had undergone a CEW deployment as part of the police-public interaction. There was no difference in the nature of CEW deployments between the groups. The person who died in our study underwent CEW deployment in contact stun mode to the lower body and was positioned in a not-prone position during and after the use of force event.

### *Sudden In-Custody Death*

The subject that died in our cohort was an individual who was assessed by officers on the scene as displaying both drug intoxication and mental distress, had undergone a contact stun exposure with a CEW to the lower body, and who demonstrate all 10 features of excited delirium.<sup>18-21</sup> This subject was placed in the side lying position at the conclusion of the use of force event prior to the cardiopulmonary collapse and was documented to have never been maintained in a prone position during the use of force event.

Similar to the individuals who died in O'Halloran's cohort of 11 individuals in 1993, and to individuals in other case series, the subject in our cohort who died displayed multiple features of excited delirium at the time of the interaction with police.<sup>4-6, 22</sup> Unlike other cohorts, no individual in our cohort had ankle and/or leg restraints connected in a hogtied fashion (also known as the position of maximal restraint).

The details of the single death in our cohort are strikingly similar to other in-custody death occurrences both in and out of the prone position and are similar to sudden in-custody death cases with and without CEW application.

This case and our study echo the earlier findings of Pollanen and other authors that sudden in-custody death has more to do with the features of the individual than the positioning of the subject.<sup>6</sup> Our study, powered to find significance at as little as a 0.5% difference in death between the groups, provides evidence that prone positioning is not equated with subject death including in individuals who are highly abnormal. We have added thousands of subjects to our cohort since our original publication on prone positioning and over two thousand of those were documented to be in a prone position; yet still the only death in our entire cohort was not prone. Our data do not support the notion that prone positioning is specifically dangerous either as "positional asphyxia" or its hybrid "restraint asphyxia". We

cannot comment on the effect of the position of maximal restraint since it was not employed by any agency during the course of our study.

#### *Limitations*

Investigators have demonstrated that the addition of weight force to the back/shoulders of a subject in the prone position does not significantly impact pulmonary/cardiopulmonary function in healthy volunteers.<sup>12-14, 16</sup> In our study, we had no ability to confirm the addition or omission of weight force application to the subject's back or shoulders. There is little doubt that weight force application does occur in a law enforcement setting and in a large scale epidemiologic study of consecutive use of force events such as ours, some of the subjects in

the prone group will have had weight force applied to them. With only one death in our study, in the not-prone group, we cannot control for the effect of this variable.

No subjects in our study were restrained via restraint chair, or other upright restraint devices or wraps. Hence, we could not determine the outcome for these methods of restraint in our study.

Our study did not include evaluation of the length of time any individual remained in either position (prone or not-prone) but it is anticipated that in such a large sample, there will be a similar distribution in length of time that subjects remained in the prone position as to not-prone position; that time is anticipated to be short.

### *Statistical and Clinical Significance*

Our study was conducted over five years and we evaluated data across a large number of contributing police officers and wide variety of police-public interactions, regardless of subject outcome. Study forms were buried within normal use of force reporting, minimizing the effect of systematic recording bias.

Our observational and consecutive cohort was powered to find statistical significance if a 0.5% or greater difference in death rate existed between the prone and not-prone groups, assuming that no subjects should die in a not-prone position. We have documented that there is not a 0.5% or greater difference between the groups and have documented that the only death was in a not-prone subject. While we found no statistical significance between the groups, we believe the clinical significance of the death in the not-prone position is important in that a non prone position is not specifically protective as it is purported to be.

Our study provides good evidence that, in direct contrast to ongoing suggestion that prone positioning is inherently dangerous and that not-prone positioning is protective, it is obvious to us that no specific position is a guarantee of safety. Police policies based on completely avoiding the prone position are not risk-avoidant for the agency or protective for the subject.

This study contradicts the notion that prone positioning is a specific risk factor for sudden in-custody death, emphasizing that there is a difference between the medical definition of positional asphyxia and the effects of prone positioning in law enforcement settings. There is no doubt that there is a difference between an individual who has become trapped in a head-down or a chest-compressed position without the opportunity for self-rescue vs. a person placed in a prone position in a law enforcement event.

We again caution police and other prehospital agencies that this study does not provide evidence that leaving restrained individuals in a prone position, unsupervised, for protracted lengths of time is safe.

### Conclusions

Prone positioning is common following police-public interactions and in this study no subject died among thousands who remained in the prone position after undergoing police use of force. From our data, in a worst-case scenario, 99.8% of subjects would be expected to survive any post restraint positioning in a law enforcement setting. Our epidemiologic data of real world police public interactions support the published human laboratory data that the prone position has no clinically significant effects on subject physiology.

(Authors' note: We have chosen the term 'subject' in this paper as the most appropriate available. The persons in the study have not voluntarily joined, so 'participant' is not appropriate. Though they are involved a police event, 'suspect' describes some but not all of the persons, and to use this term would be unfair to a number of the persons assessed in this study. Furthermore, the medical term 'patients' or 'clients' is not appropriate in the community setting, as only a minority of the persons in the study actually interacted with the medical system. Thus, we have used the parochial-sounding term 'subject' as the best fit.)

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**Tables and captions for Prone vs Not Prone Paper July 2014:**

Table1. Subject Demographics: 99% of the 4373 use of force events recorded demographic data.

Characteristic	n	Denominator with variable completed on UoF report	% of cohort	95% CI of the estimate
Male sex	3804	4348	87.5%	86.5%, 88.5%
Age	Mean 32 yrs	Median: 32 yrs	IQR 18,39	Youngest 18, oldest 79
Any comorbidity assessed by officer: alcohol, and/or drugs, and/or emotional disturbance	3530	4333	81.5%	80.3%, 82.6%
Alcohol only	1775	4333	41%	39.5%, 42.4%
Drugs only	338	4333	7.8%	7%, 8.6%
Emotional disturbance only	353	4333	8.2%	7.3%, 9%
All 3 comorbidities (alcohol, drugs, and emotional disturbance)	213	4333	4.9%	4.3%, 5.6%
3 or more Features of ExDS	499	4373	11.4%	10.5%, 12.4%
6 or more features of ExDS	86	4373	2%	1.6%, 2.4%

Table 2. Subject final position. N=4373

Position	N	% of cohort	Difference	95% CI for difference
Prone	2015	46.1%		
Not Prone	2358	53.9%	7.8%	(5.7%, 9.9%)

Table 3. Presence of comorbidities assessed by police officers at the time of use of force. Missing data for 29 prone subjects and 11 not prone subjects.

Comorbidity	Prone n = 1986	%	Not prone n = 2347	%	Difference	95% CI for the difference	Statistically Significant
Any comorbidity	1569	77.9%	1969	83.2%	5.3%	2.9%, 7.7%	Yes
All 3 comorbidities	89	4.5%	124	5.3%	0.8%	-0.5%, 2.1%	...
Alcohol only	1174	59.1%	1384	59.0%	0.1%	-2.8%, 3.1%	...
Drugs only	177	8.9%	161	6.9%	2.0%	0.4%, 3.7%	Yes
Emotional disturbance only	147	7.3%	206	8.7%	1.4%	-0.3%,3.0%	...

Table 4. Excited delirium features

ExDS features	Prone n = 2015	%	Not prone n = 2358	%	Difference	95% CI for the difference	Statistically Significant
3 or more features of ExDS	206	10.2%	293	12.4%	2.2%	0.3%, 4.1%	Yes
6 or more features of ExDS	33	1.6%	53	2.3%	0.7%	-0.2%, 1.4%	...

Table 5. CEW during use of force event

CEW detail	Prone n = 2015	% of prone subjects	Not prone n = 2347	% of not prone subjects	Difference	95% CI for the difference	Statistically Significant
Any CEW use recorded	315	15.6%	356	15.2%	0.4%	-1.7%,2.6%	...
CEW mode not recorded	17	0.8%	15	0.6%	0.2%	-0.3%, 0.8%	...
Light display only	94	4.7%	105	4.5%	0.2%	-1.1%, 1.5%	...
CEW deployed and mode known	205	10.2%	236	10.1%	0.1%	-1.7%, 1.9%	...
Contact stun only	52	2.6%	61	2.6%	0%	-0.9%, 1%	...
Probe mode only	129	6.4%	148	6.3%	0.1%	-1.3%,1.6%	...
Combination of probe and contact stun	24	1.2%	27	1.1%	0.1%	-0.6%,0.7%	...

Table 6. Death in prone and not prone subjects

	Prone n = 2015	% (97.5% CI)	Not prone n = 2358	% (95% CI)	Difference in death	95% CI for the difference	Statistically Significant
Sudden death in custody	0	0% (0%, 0.2%)	1	0.04% (0.001%, 0.2%)	0.04%	-0.2%, 0.3%	...

**Highlights**

Epidemiologic study of over 3.25 million consecutive police public interactions

More than 4500 use of force events, thousands in prone position

No subject died prone, one subject died not prone

99.8% of subjects expected to survive either position following police use of force

Study supports human physiologic experiments that prone does not impede physiology