Symptomatic Exposures Among California Inmates 2011–2013

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Abstract Prisoners have a high prevalence of substance misuse and abuse, but few studies have examined symptomatic exposures among incarcerated populations. We sought to further characterize the nature of these exposures among this population using the California Poison Control System data. Keyword searches identified inmate cases in 2011–2013 for patients 20+ years old exposed to a single substance and taken to hospital from jail, prison, or police custody. Comparisons were made with non-inmate cases during the same period, using similar limitations. Body stuffers and body packers were analyzed as a subgroup. Seven hundred four inmate cases were compared to 106,260 non-inmate cases. Inmates were more likely to be younger, male, and to have engaged in drug misuse or abuse. They most commonly ingested methamphetamine, heroin, acetaminophen, and anticonvulsants. Inmates were more likely to receive activated charcoal (OR 9.87, 8.20–11.88), whole bowel irrigation (OR 44.50, 33.83–58.54), undergo endotracheal intubation (OR 4.09, 2.91–5.73), and to experience a major clinical outcome or death (OR 1.41, 1.05–1.89). When body stuffers and packers were removed, clinical findings were similar, though the odds of a major outcome or death became statistically non-significant. Body stuffers and body packers primarily used methamphetamine and heroin, and compared with other inmates had

significantly higher odds of both adverse clinical effects and poor outcome. This large series provides a profile of symptomatic exposures among inmates, a little-studied population. The potential for high morbidity among body stuffers and packers suggests that a high index of suspicion of such ingestions be maintained when evaluating patients prior to incarceration.

Keywords Drug abuse · Prisoner · Body stuffer · Poison control

Introduction

The USA has a prison population of 2.2 million, yet little research has been conducted on drug overdose, poisonings, and other symptomatic exposures among these persons [1]. Nearly 50 % of state and federal prisoners report a history of drug abuse or dependence in the 12 months prior to incarceration, and 25 % were under the influence of drugs at the time they committed their offenses [2–4]. Scattered reports suggest that rather than being a “dry” environment, drug abuse, and misuse continue to occur during incarceration, often by inventive means [5–12]. Recent reports, for example, have documented outbreaks of botulism in prisons due to consumption of contaminated moonshine, or “pruno” [13, 14]. Prisoners may also become exposed to harmful substances by hastily ingesting drugs when confronted by law enforcement at the time of arrest (body stuffing) or swallowing large amounts of drugs for smuggling (body packing), either prior to or during imprisonment [15, 16].

In addition, prisons and jails house large numbers of persons with serious mental illnesses, and the suicide rate in these institutions is many times that of the general population [17, 18]. While self-poisoning is a relatively rare cause of

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completed suicide in prisoners, its role in suicide attempts and suicidal gestures has been less well described [19–21].

We used a statewide poison control database to learn more about types of symptomatic exposures, their clinical effects, and resource utilization among this group during a 3-year period (2011–2013). These findings, drawn from an incarcerated population of approximately 136,000 at the study's midpoint, were compared with those from the general population of California. We were particularly interested in the subgroups of body stuffers and body packers, given their potential for poor outcomes [22].

Materials and Methods

In this retrospective case series, we used clinical records stored in the California Poison Control System's (CPCS) electronic database for 3 years between January 1, 2011, and December 31, 2013. The CPCS possesses a statewide database containing records from over 300,000 telephone consultations performed each year by the CPCS's four regional call centers in Sacramento, San Francisco, Madera, and San Diego [23]. CPCS hotlines serve as a resource for toxic exposures to medical professionals, law enforcement, and the general community.

Cases were defined as persons within the state of California presenting to a health-care facility in California from jail, prison, or police custody (hereafter, "inmate") and were identified by a variety of free-text keyword searches of the CPCS electronic database (Dotlab) text notes. Search terms included the following: jail, prison, detention, correctional, institution, inmate, and prisoner. Inmate cases were compared to CPCS case records of non-inmates who presented to health-care facilities during the same time period. To aid comparison between cases and controls, additional inclusion criteria were a minimum age of 20 years and exposure to a single toxic agent. Cases were excluded if they were managed solely within the correctional system.

Using a common form, three abstractors collected information on a number of demographic, clinical, and outcome-related variables from case records. The demographic variables were age, sex, and county. Clinical variables included pertinent information from the history and physical exam. Standard definitions were used to identify signs such as hypertension (SBP >140 mmHg or DBP >100 mmHg), tachycardia (heart rate >100 beats/min), hyperthermia (temperature >100.4 F or 38 C), tachypnea (respiratory rate >20 breaths/min). Other clinical data included exposure variables (route, location, reason for exposure, body stuffer, or body packer status), mental status variables (agitation, drowsiness, coma), clinical events (vomiting, seizure, ventricular dysrhythmia, cardiac arrest), and substance used (Table 2). The presence of these entities was noted if patient records provided direct

evidence (e.g., "BP is 180/90"=hypertension), was remarked upon (e.g., "patient is hypertensive") or could be reasonably inferred from the text (e.g., "patient became violent requiring restraints" = agitated). The term "abuse" was applied to describe use of a drug to get high, while "misuse" was defined as intentional improper or incorrect use for purposes other than a psychotropic effect, for example with the intention of smuggling the drug into prison for sale to other inmates.

Outcome variables included patient treatments and disposition (intubation, naloxone, activated charcoal, whole bowel irrigation, benzodiazepine use, other sedation, dialysis, intravenous fluids, admission to ICU) as well as an overall patient outcome as defined by the American Association of Poison Control Centers (0=unknown, 1=no effect, 2=mild effect, 3=moderate effect, 4=severe effect, 5=death) [24].

Agreement between abstractors was tested by calculating kappa coefficients (observed inter-rater agreement 81–100 %, kappa scores 0.69–1.0 [mean 0.86, median 0.85]). Clinical data for the comparison (non-inmate) group was obtained from coded variables that had been entered by poison control center staff at the time of the original case; a pilot set of the same 40 cases was used to test agreement between abstractors' analysis of the note fields and poison control center staff coding using kappa coefficients (inter-rater agreement 72–100 %, kappa scores 0.47–1.0 [mean 0.75, median 0.78]). All records were purged of personal identifiers prior to abstraction. Permission for the study was granted by the Committee on Human Research of the University of California, San Francisco, and the CPCS Research Committee.

Clinical data for the comparison (non-inmate) group was obtained from coded variables that had been entered by poison control center staff at the time of the original case. If information pertaining to a particular variable was not mentioned, it was treated as negative in the statistical analysis.

Data were analyzed using Stata version 12.0 statistical software (College Station, TX). Odds ratios with 95 % confidence intervals were calculated for most comparisons between inmates and non-inmates, and double-sided *t* tests were used to compare mean ages between groups [25]. Data from the calculation of odds ratios was rounded to the nearest tenth of a point and percentages were rounded to the nearest integer. Due to the possible differences between body stuffers and body packers compared with the general inmate population, a separate analysis was conducted that excluded these two groups. The subgroup of body stuffers and body packers was then compared with the remaining inmate case group.

Results

A total of 704 inmate cases were identified and compared with 106,260 non-inmate cases over the same time period

(Table 1). Of the 704 cases, there were 114 body stuffers and 14 body packers. The total number of adults held in California prisons and jails at the study midpoint (January 2012) was 136,146, of whom 7834 (6 %) were women [22]. The number of inmate cases per year was approximately steady over the study period (range 220–253). Compared with the general population, inmates were more likely to be younger (mean age 34 vs. 42, $p=0.000$) and male (84 vs. 44 %; odds ratio 6.25, 95 % confidence interval 5.11–7.64); these findings were not substantially different when body stuffers and body packers were excluded.

Oral ingestion was the predominant route of exposure among inmates and occurred more commonly compared to non-inmates (93 vs. 81 %; OR 3.18, 2.37–4.26), while inhalation was less common (2 vs. 7 %; OR 0.21, 0.12–0.38); there was no significant difference in the parenteral use of drugs between the groups (2 vs. 2 %; OR 0.80, 0.45–1.41). Presentation for other routes of exposure, including ocular, dermal, rectal, or miscellaneous, was less common among inmates compared to non-inmates (2 vs. 9 %; OR 0.18, 0.11–0.31). Seventeen percent ($n=117$) of inmate exposures were identified prior to incarceration, 81 % were identified after incarceration ($n=569$), and in 3 % of cases, the place of exposure was unknown ($n=18$). Predictably, when body stuffers and body packers were excluded, the number of pre-incarceration exposures fell ($n=39$, 7 %).

Self-harm (intentional suicidal ingestion) was the predominant reason for drug exposure among inmates and non-inmates alike (52 vs. 50 %). While the difference between the two groups was not statistically significant (OR 1.09 0.94–1.26), it became significant after body stuffers and body packers were excluded (63 vs. 50 %; OR 1.76, 1.48–2.08). Both drug abuse (16 vs. 7 %; OR 2.34, 1.90–2.87) and misuse (20 vs. 6 %; OR 3.31, 2.75–3.98) were much more common among inmates, while accidental exposures were rare (6 vs. 30 %; OR 0.17, 0.12–0.23). Odds of misuse became insignificant when body stuffers and body packers were excluded from the analysis (OR 0.72, 0.48–1.08).

The drugs most commonly used by inmates were methamphetamines (14 %), anticonvulsants (11 %), cleaning products (10 %), and acetaminophen (8 %) (Table 2). Inmates were much more likely than non-inmates to use methamphetamines (OR 6.40, 5.14–7.98) and heroin (OR 9.66, 6.82–13.68), as well as cocaine (OR 1.74, 1.01–3.00) and cleaning products (OR 2.14, 1.67–2.74). On the other hand, inmates were less likely to use opioid combination medications (OR 0.34, 0.23–0.49), ethanol (OR 0.1, 0.05–0.20), or antidepressants (OR 0.25, 0.17–0.36). The major difference noted when body stuffers and body packers were excluded was a dramatic reduction in the number of methamphetamine cases ($n=95$ vs. 17).

Table 1 General comparisons

	General population ^a	Inmates (all)	OR (95 % CI) ^b	Inmates (excluding body stuffers and packers)	OR (95 % CI) ^c
Number	106,260	704	N/a	573	N/a
Age, mean (range)	42 (20–99)	34 (20–70)	$p=0.000$	34 (20–70)	$p=0.000$
Sex=male	46,992 (44 %) ^d	590 (84 %)	6.25 (5.11–7.64)	482 (84 %)	6.34 (5.07–7.93)
Reason					
Abuse	7728 (7 %)	109 (16 %)	2.34 (1.90–2.87)	97 (17 %)	2.60 (2.09–3.23)
Intentional misuse	6320 (6 %)	139 (20 %)	3.31 (2.75–3.98)	25 (4 %)	0.72 (0.48–1.08)
Self Harm/Suicide	52,671 (50 %)	363 (52 %)	1.09 (0.94–1.26)	363 (63 %)	1.76 (1.48–2.08)
Accidental	31,163 (30 %)	46 (6 %)	0.17 (0.12–0.23)	42 (7 %)	0.19 (0.14–0.26)
Unknown	1406 (1 %)	46 (6 %)	5.22 (3.86–7.06)	42 (7 %)	5.90 (4.30–8.10)
Route of exposure					
Oral	86,155 (81 %)	654 (93 %)	3.18 (2.37–4.26)	528 (92 %)	2.87 (2.10–3.91)
Inhalation	7431 (7 %)	11 (2 %)	0.21 (0.12–0.38)	11 (2 %)	0.26 (0.14–0.47)
Parenteral	2259 (2 %)	12 (2 %)	0.80 (0.45–1.41)	10 (2 %)	0.82 (0.44–1.52)
Other ^e	9937 (9 %)	13 (2 %)	0.18 (0.11–0.31)	11 (2 %)	0.19 (0.10–0.34)
Unknown	478 (<1 %)	12 (2 %)	3.85 (2.18–6.80)	11 (2 %)	4.35 (2.40–7.88)

N/a not applicable, OR odds ratio, 95% CI 95% confidence interval

^a The general (non-inmate) population remains the same for Tables 1–4

^b Odds ratio comparing all inmates with the non-inmate control population (see “Materials and Methods”)

^c Odds ratio comparing inmates (after excluding body stuffers and body packers) with the non-inmate control population (see “Materials and Methods”)

^d All percentages rounded to the nearest integer

^e Includes dermal, ocular, and miscellaneous not otherwise specified routes of exposure

Table 2 Substances involved

	General population	Inmates (all)	OR (95% CI) ^a	Inmates (excluding body stuffers and packers)	OR (95 % CI) ^b
Stimulants—all types	4284 (4 %)	120 (18 %)	4.92 (4.03–6.00)	32 (5 %)	1.41 (1.00–2.01)
Methamphetamine	2539 (2 %)	95 (14 %)	6.40 (5.14–7.98)	17 (3 %)	1.25 (0.77–2.3)
Cocaine	1139 (1 %)	13 (2 %)	1.74 (1.01–3.00)	3 (<1 %)	0.49 (0.16–1.44)
Other stimulants ^c	606 (1 %)	12 (2 %)	3.04 (1.72–5.6)	12 (2 %)	3.74 (2.11–6.60)
Opioids—all types	11,920 (11 %)	62 (9 %)	0.77 (0.59–1.00)	32 (6 %)	0.47 (0.33–0.67)
Opioids—heroin	575 (1 %)	35 (5 %)	9.66 (6.82–13.68)	21 (4 %)	7.00 (4.51–10.88)
Opioids—other	11,345 (11 %)	27 (4 %)	0.34 (0.23–0.49)	11 (2 %)	0.16 (0.09–0.30)
Antidepressants	16,061 (15 %)	30 (4 %)	0.25 (0.17–0.36)	30 (5 %)	0.31 (0.22–0.45)
Antipsychotics	9084 (8 %)	33 (5 %)	0.53 (0.37–0.75)	33 (6 %)	0.65 (0.46–0.93)
Anticonvulsants	6881 (4 %)	79 (11 %)	1.83 (1.45–2.32)	79 (14 %)	2.31 (1.82–2.94)
Ethanol	11,095 (10 %)	8 (1 %)	0.10 (0.5–0.20)	8 (1 %)	0.12 (0.06–0.24)
Rubbing alcohol	838 (1 %)	2 (<1 %)	0.36 (0.00–1.32)	2 (<1 %)	0.44 (0.00–1.61)
Other alcohol	139 (<1 %)	1 (<1 %)	1.09 (0.00–6.22)	1 (<1 %)	1.34 (0.00–7.62)
Acetaminophen—all forms	14,606 (14 %)	58 (8 %)	0.57 (0.43–0.74)	57 (10 %)	0.69 (0.53–0.91)
Acetaminophen alone	4847 (5 %)	56 (8 %)	1.82 (1.38–2.39)	56 (10 %)	2.27 (1.72–2.99)
Acetaminophen with opioid	9759 (9 %)	2 (<1 %)	0.03 (0.00–0.10)	1 (<1 %)	0.02 (0.00–0.10)
Cleaning products	5247 (5 %)	70 (10 %)	2.14 (1.67–2.74)	75 (13 %)	2.90 (2.28–3.71)
Other substances	23,741 (22 %)	232 (33 %)	1.72 (1.47–2.01)	169 (29 %)	1.45 (1.22–1.74)
Unknown	2364 (2 %)	53 (8 %)	3.59 (2.71–4.76)	47 (8 %)	3.93 (2.91–5.31)

OR odds ratio, 95% CI 95% confidence interval

^a Odds ratio comparing all inmates with the non-inmate control population (see “Materials and Methods”)

^b Odds ratio comparing inmates (after excluding body stuffers and body packers) with the non-inmate control population (see “Materials and Methods”)

^c Predominantly synthetic cathinones (bath salts)

Clinically, the odds of experiencing common adverse effects such as vomiting, tachycardia, and hypertension were increased among inmates (Table 3). Additionally, less common but more serious problems such as seizures (OR 2.09, 1.32–3.30), ventricular dysrhythmias (OR 15.14, 7.96–

28.81), or cardiac arrest (OR 4.58, 2.19–9.58) occurred more frequently in the inmate population. Agitation was observed significantly more often among inmates than non-inmates (OR 2.89, 2.30–3.63), while central nervous system depression (drowsiness or coma) was observed slightly less often

Table 3 Clinical effects

	General population	Inmates (all)	OR (95 % CI) ^a	Inmates (excluding body stuffers and packers)	OR (95 % CI) ^b
Seizure	1391 (1 %)	19 (3 %)	2.09 (1.32–3.30)	13 (2 %)	1.75 (1.02, 3.02)
Vomiting	8178 (8 %)	67 (10 %)	1.26 (0.98–1.62)	58 (10 %)	1.35 (1.03–1.77)
Tachycardia	14,394 (14 %)	177 (25 %)	1.81 (1.53–2.14)	113 (20 %)	1.57 (1.28–1.93)
Hypertension	3182 (3 %)	118 (17 %)	6.52 (5.33–7.97)	76 (13 %)	4.95 (3.88–6.32)
Hypotension	4045 (4 %)	26 (4 %)	0.97 (0.66–1.43)	22 (4 %)	1.01 (0.66–1.54)
Ventricular dysrhythmia	101 (<1 %)	10 (1 %)	15.14 (7.96–28.81)	7 (1 %)	13.00 (6.12–27.60)
Cardiac arrest	233 (<1 %)	7 (1 %)	4.58 (2.19–9.58)	4 (<1 %)	3.23 (1.24, 8.39)
Hyperthermia	870 (1 %)	21 (3 %)	3.77 (2.44–5.83)	8 (1 %)	1.73 (0.87–3.45)
Agitation	4822 (4 %)	85 (12 %)	2.89 (2.30–3.63)	48 (8 %)	1.92 (1.43–2.58)
CNS depression (coma or drowsiness)	31,010 (29 %)	197 (28 %)	0.79 (0.67–0.93)	171 (30 %)	1.03 (0.86–1.23)

OR odds ratio, 95% CI 95% confidence interval

^a Odds ratio comparing all inmates with the non-inmate control population (see “Materials and Methods”)

^b Odds ratio comparing inmates (after excluding body stuffers and body packers) with the non-inmate control population (see “Materials and Methods”)

(OR 0.79, 0.67–0.93). These findings were attenuated but similar when body stuffers and body packers were excluded.

Inmates consistently required more interventions, including benzodiazepines (OR 10.13, 7.99–12.85) and other sedatives (OR 11.53, 8.60–15.46), activated charcoal (OR 9.87, 8.20–11.88), whole bowel irrigation (OR 44.50, 33.83–58.54), and endotracheal intubation (OR 4.09, 2.91–5.73) (Table 4). They also had a higher risk of a poor outcome (major health effect or death) compared to non-inmates (OR 1.41, 1.05–1.89). Findings were again similar but attenuated when body stuffers and packers were removed, with the exception that the odds of poor outcome became statistically non-significant (OR 0.97, 0.66–1.43). Four inmates died, all of them young male methamphetamine users, two of them body stuffers (Table 5).

We performed a subgroup analysis of the 114 body stuffers and 14 body packers identified during the study period, comparing them with the general inmate population (Table 6). Most concealed drugs orally, three concealed them rectally, and one inmate hid drugs both orally and rectally. Most body stuffers and packers were suspected of having ingested or concealed the drugs at the time they were apprehended (65 %); the number who obtained the drugs while in prison could not be determined. Body stuffers ingested drugs of abuse, primarily methamphetamines (61 %), heroin (20 %), and cocaine (7 %).

Of the 14 body packers, 13 were men, and ages ranged from 24 to 47 years. Two cases involved a pair of arrestees who were detained on suspicion of body packing. Two others admitted to packing drugs into jail for self use; in the other 10 cases, drug packing was identified among already incarcerated

individuals. Drugs were packed in the rectum in 3 cases (21 %); the rest were orally ingested. Similar to body stuffers, methamphetamines (57 %) and heroin (14 %) were the most commonly involved drugs; one case involved concealed packs of cigarettes. Eight patients received whole bowel irrigation and four received activated charcoal. Of the six patients (43 %) who were admitted to the ICU, four experienced a severe outcome, requiring intubation. None of body packers died.

Compared to other inmates, body stuffers and packers were more likely to experience agitation, tachycardia, hypertension, seizures, and hyperthermia; to require admission to the intensive care unit, undergo endotracheal intubation, and receive benzodiazepines and other sedatives; and to have a major medical outcome or death (Table 6).

Discussion

We performed a large retrospective case series of symptomatic exposures among California inmates over 3 years, 2011–2013. In several respects, drug exposures among inmates were notably different from general community exposures during the same period. Inmates were more likely to abuse drugs and make suicidal attempts or gestures and suffered more serious complications. Though women comprised only a small proportion of inmate cases (16 %), they were disproportionately represented compared to the makeup of the prison system as a whole, in which females accounted for only 6 % of all prisoners at the study's midpoint. These findings support prior reports suggesting that the prevalence of drug use or

Table 4 Medical treatments and outcomes

Outcome	General population	Inmates (All)	OR (95 % CI) ^a	Inmates (Excluding body stuffers and packers)	OR (95 % CI) ^b
Treated and released from ED	39,970 (38 %)	467 (66 %)	3.27 (2.79–3.82)	397 (69 %)	3.74 (3.13–4.47)
Admitted to critical care (ICU)	14,328 (14 %)	101 (14 %)	1.07 (0.87–1.33)	59 (10 %)	0.74 (0.56–0.96)
Endotracheal intubation	1383 (1 %)	36 (5 %)	4.09 (2.91–5.73)	19 (3 %)	2.60 (1.65–4.10)
Naloxone	1129 (1 %)	41 (6 %)	5.76 (4.18–7.93)	32 (6 %)	5.51 (3.84–7.89)
Activated charcoal	2790 (3 %)	148 (21 %)	9.87 (8.20–11.88)	93 (16 %)	7.18 (5.74–9.00)
Whole bowel irrigation	263 (<1 %)	70 (10 %)	44.50 (33.83–58.54)	7 (1 %)	4.98 (2.38–10.43)
Benzodiazepines	1346 (1 %)	81 (12 %)	10.13 (7.99–12.85)	43 (8 %)	6.32 (4.62–8.66)
Other sedative(s)	715 (1 %)	51 (7 %)	11.53 (8.60–15.46)	31 (5 %)	8.44 (5.85–12.19)
Hemodialysis	203 (<1 %)	6 (1 %)	4.53 (2.05–10.02)	6 (1 %)	5.53 (2.50–12.24)
IV fluids	5310 (5 %)	157 (22 %)	5.46 (4.56–6.53)	115 (20 %)	4.77 (3.88–5.86)
Major outcome or death	5149 (5 %)	47 (7 %)	1.41 (1.05–1.89)	27 (5 %)	0.97 (0.66–1.43)

OR odds ratio, 95% CI 95% confidence interval, ED emergency department, ICU intensive care unit, IV intravenous

^a Odds ratio comparing all inmates with the non-inmate control population (see “Materials and Methods”)

^b Odds ratio comparing inmates (after excluding body stuffers and body packers) with the non-inmate control population (see “Materials and Methods”)

Table 5 Profile of deceased inmates

Age/sex	Year	Substance used	Body stuffer or packer	Synopsis
23 M	2011	Methamphetamine	No	Seized in jail, became hypotensive. Expired 1 week later.
33 M	2012	Methamphetamine	No	Found obtunded in jail after meth use, expired 1 week later.
38 M	2011	Methamphetamine	Yes	Recently released from prison, “high” upon arrest, deteriorated shortly after booking. Two meth bags found in the stomach postmortem.
45 M	2011	Methamphetamine	Yes	Prisoner told clerk he had used meth prior to release from prison. Deteriorated after transfer to ED, one meth baggie found in rectum.

OR odds ratio, 95% CI 95% confidence interval, ED emergency department, M male

dependence among female inmates may exceed that of their male counterparts [26, 27].

Substances ingested by inmates reflect drugs and chemicals more likely to be available to this population. For example, heroin use was more common than other opioids, and ethanol intoxication was rare. Other products that were more common among inmates compared to the general population were plain acetaminophen (which can often be bought in prison commissaries) and household cleaning products.

Encouragingly, despite the prevalence of drug abuse among the incarcerated population generally and the increased odds of self-harm observed in this study, odds of poor outcome or ICU admission were not significantly different from the community population when body stuffers and body packers were excluded. This may be due to earlier identification of overdoses by staff in correctional institutions.

To our knowledge, the subgroup of 114 body stuffers represents the largest case series of these patients reported to date. In 30 % of our sample, body stuffing was identified after the inmate was in prison. This may mean that body stuffing was not revealed by the suspect or acted on by police until after booking; alternatively, it may reflect body stuffing by drug traders already established within a correctional facility. Body stuffers exhibited considerable differences in comparison with other inmates. Nearly 90 % of these patients ingested one of three drugs of abuse (methamphetamines, cocaine, and heroin), and nearly all of their clinical outcomes were worse than other inmates. There was a significant overlap in our study between methamphetamine users (60 % of body stuffers) and body packers (72 % of methamphetamine users).

Recent studies of both adult and adolescent offenders in California have found a high prevalence of methamphetamine

Table 6 Outcomes in body stuffers and body packers

	Body stuffers and packers (n=128)	Other inmates (n=577)	OR (95 % CI)
Ingestion suspected prior to incarceration	78 (61 %)	39 (7 %)	21.36 (13.22–34.52)
Major substances involved			
Methamphetamines	76 (60 %)	17 (3 %)	48.14 (26.60–87.09)
Cocaine	9 (7 %)	3 (<1 %)	14.47 (4.16–50.09)
Heroin	25 (20 %)	10 (2 %)	13.76 (6.51–29.07)
Clinical effects and treatment			
Seizure(s)	6 (5 %)	13 (2 %)	2.13 (0.82–5.54)
Tachycardia	62 (48 %)	113 (20 %)	3.86 (2.58–5.76)
Hypertension	41 (32 %)	76 (13 %)	3.08 (1.98–4.79)
Hyperthermia	13 (10 %)	8 (1 %)	8.18 (3.40–19.68)
Agitation	37 (29 %)	48 (8 %)	4.50 (2.78–7.28)
CNS depression	25 (20 %)	171 (30 %)	0.57 (0.36–0.92)
Admitted to critical care	41 (32 %)	59 (10 %)	4.10 (2.60–6.48)
Intubation	17 (13 %)	19 (3 %)	4.50 (2.29–8.84)
Activated charcoal	55 (43 %)	93 (16 %)	3.89 (2.57–5.88)
Whole bowel irrigation	63 (49 %)	7 (1 %)	67.5 (30.7–177.1)
Benzodiazepine	37 (29 %)	43 (8 %)	5.01 (3.07–8.18)
Other sedation	20 (16 %)	31 (5 %)	3.24 (1.79–5.86)
Major outcome or death	19 (15 %)	27 (5 %)	3.55 (1.92–6.57)

OR odds ratio, 95% CI 95% confidence interval, CNS central nervous system

use prior to incarceration; methamphetamine use is also highly associated with a history of prior arrest, jail, and recidivism [28–30]. More generally, methamphetamine abuse has been documented to be a significant source of emergency department-related visits and hospital costs [31].

Methamphetamines are central nervous system stimulants that produce feelings of euphoria and a range of sympathomimetic effects that are reflected by our data—agitation, hypertension, tachycardia, seizures, hyperthermia, and the need for benzodiazepines and other sedative medications [32, 33]. Many of these patients had profound, life-threatening overdoses that resulted in ICU admission and endotracheal intubation, with a case-fatality rate of 4 % (4/95). The four deaths were all men with an average age of 35 years, similar in these respects to prior reports of methamphetamine-related fatalities [34, 35]. All four developed hypotension, a poor prognostic indicator in methamphetamine overdose that may be associated with massive ingestions.[36, 37] It is worth noting that among chronic methamphetamine users, accelerated cardiac pathology may predispose to risk of mortality even in the absence of major exposure.[38]

One of the four decedents, a body stuffer, was initially taken to jail despite being arrested for methamphetamine use; initially asymptomatic, he became unresponsive and coded shortly after booking. Of note, he had recently been released from a drug-related jail stay, putting him within the high-mortality window that has been described in recently released prisoners.[39] Relatedly, a second decedent had taken methamphetamine while in jail a few hours prior to when he was expected to be released.

Our body stuffers were similar to a group of 55 methamphetamine stuffers described in a recent article by West et al. [40] In that series, a higher proportion of patients experienced a severe outcome (29 %), but the case-fatality ratio was lower (2 %). The higher incidence of severe outcome in their series might be explained in part by a large percentage (25 %) of patients who had ingested unwrapped drugs. The outcomes in these two studies differ considerably from the three largest case-series of crack and cocaine body stuffers (total $n=250$), in which most patients had mild symptoms, and few required benzodiazepines or hospital admission, though many received whole bowel irrigation and two patients died.[41–43]. The generally mild clinical course experienced by most cocaine stuffers has led to initial efforts to develop validated emergency management guidelines, which are clearly needed for body stuffers more generally.

The limitations of this study in large part reflect the limitations of our dataset. The California Poison Control System depends on voluntary reporting of cases, cannot be assumed to be comprehensive, and may be subject to reporting bias. The dataset is inherently incomplete, limiting the ability to strongly associate exposures with symptoms or outcomes. It is possible that inmate cases—particularly the mild ones—may

have been underreported by emergency physicians or law enforcement. Other limitations include the inconsistent completeness of the case records, as cases are documented by CPSC staff primarily for clinical management and not research purposes. Our inclusion criteria excluded cases of polydrug exposures, but gained in the tradeoff was the ability to associate particular symptom complexes with specific agents and to make comparisons with the non-incarcerated population. However, we must acknowledge that cases categorized as single exposures did not always undergo thorough toxicology testing to rule out other unreported ingestants, and some of these cases may have involved additional substances. We also grouped together body stuffers and body packers for comparison to other inmates, although the drug wrapping techniques and amounts ingested by stuffers may differ from those of packers. However, we found no significant differences when body packers were removed from the analysis (data available upon request).

Conclusions

To our knowledge, we have presented the first large case series of symptomatic exposures among a high-risk demographic—persons under police custody—and as well as the largest case-series of drug body stuffers to date. Inmates had a substantially higher risk of drug abuse and suicide attempts and suffered more serious clinical side effects. The potential for high morbidity among body stuffers and packers suggests that a high index of suspicion of such ingestions be maintained when evaluating patients prior to incarceration.

Conflict of Interest The authors declare no conflicts of interest.

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