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## Methamphetamine Abuse & Its Health Care Impact in the Central Valley of California

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### Introduction

Methamphetamine abuse is a serious public health issue nationally, with a substantial impact on patient health and healthcare burden. According to data from the 2012 National Survey on Drug Use and Health, over 12 million people have tried methamphetamine at least once [1]. The RAND Corporation estimates the 2005 methamphetamine abuse cost to be in excess of \$23 billion dollars. 70% of costs were a result of intangible burdens associated with methamphetamine abuse and premature deaths [2].

Hospitalization discharge rates for drug abuse were the highest in the Northeast region of the United States and lowest in the West. However, amphetamine abuse diagnoses were the most prevalent in the West, despite the overall hospitalization rates for drug abuse being lower than the national average [3]. In California the incidence of drug abuse related hospital discharges increased 18-fold between 1983 and 2005, and in certain cities these rates increased by a factor of 3 or more per year [4]. The Central Valley California High Intensity Drug Trafficking Area Program (HIDTA) reports that, in comparison to other drugs of abuse, the production and abuse of methamphetamine poses the greatest threat in the Central Valley of California (CVC) [5].

The impact of methamphetamine abuse on health care utilization has not been studied. Additionally, large scale population-based analyses of acute and chronic medical consequences of methamphetamine abuse are lacking. The aim of the study is to document the health related consequences of methamphetamine abuse from a single tertiary care center serving a large and representative population in Central California.

### Methods

The study data was derived from the Stimulant Associated Disease Database (SADD), which is a retrospective observational registry study at Community Regional Medical Center (CRMC) in Fresno, California of patients with a positive urine drug screen for amphetamines ordered in the Emergency Department between January and December 2013. Due to the high prevalence of methamphetamine use in our patient population, all amphetamine positive urine drug of abuse screens were considered “methamphetamine” positive for study purposes. Fresno, California has a population of approximately 500,000 and the study institution is a large community based, University-affiliated Level 1 Trauma Center with over 700 inpatient beds and approximately 110,000 annual ED visits.

A sample of patient medical records from the registry were reviewed retrospectively and data was abstracted to include patient demographics, chief complaint, medical diagnosis, number of ED visits, number of inpatient admissions, potential complications and discharge disposition. Data was then descriptively analyzed. Additional data was also obtained from the EPIC electronic medical record and the hospital finance systems for additional demographics, inpatient costs and utilization data. The resulting data was then summarized by patient and for the overall study cohort.

### Results

#### Patient demographics

Of 4578 urine drug screens that were ordered in the ED over a one-year period, 1207 were positive for amphetamine (26%). Of those positive urine drug screens, the first 1011 patient medical records were reviewed (Figure 1). Although the number of positive amphetamine screens increased

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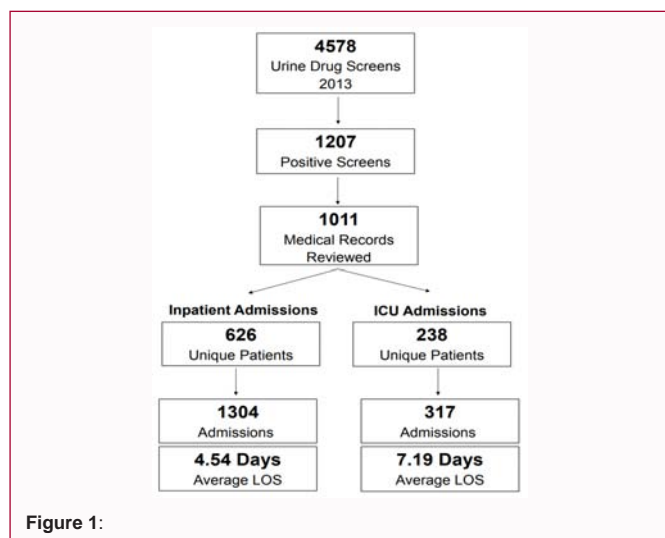


Figure 1:

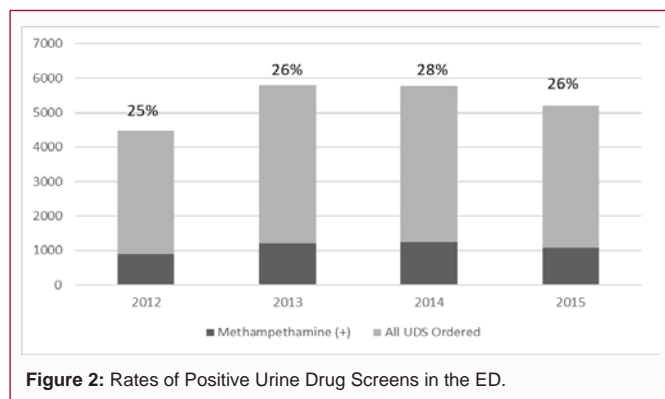


Figure 2: Rates of Positive Urine Drug Screens in the ED.

over the course of a four year period, the percentage of positive screens remained steady at around 25% (Figure 2).

A majority of our cohort were male (56.2%) and Hispanic (45.6%) with a mean age of 41 years (Table 1). Methamphetamine was the sole identified drug for a large percentage of the cohort, while cannabis was the top concurrently identified drug of abuse on urine drug screening. Ten percent of patients were alcohol and methamphetamine positive, while 3.2% of patients tested positive for cocaine and methamphetamine. Forty-two percent of patients admitted to methamphetamine abuse. When documented, inhalation was the preferred route of delivery (Table 2).

**Clinical presentation in the ED**

More than half of the patients presented to the ED via EMS (Table 1). Upon arrival in the ED, the most frequent clinical presentation was that of either suicidal/homicidal ideations (22.4%), followed by altered mental status/agitation (15.5%). The next most frequent presentations were trauma (12.0%) and chest pain (11%). Overall, 66% of patients had cardiac manifestations related to methamphetamine abuse and 26% had pulmonary manifestations (Figure 3).

Three hundred forty patients (33.6%) were hypertensive (systolic blood pressure > 140) at the time of presentation – 275 (81%) of this group had a systolic blood pressure between 140 and 179 and 65 patients (19%) had a systolic blood pressure exceeding 180. Thirty four patients (3.4%) in our cohort presented with a cerebrovascular event – 13 patients (38.2%) had a subarachnoid hemorrhage, nine had a subdural hematoma (26.5%), six (17.6%) had an ischemic stroke,

Table 1:

		n	%	
<b>Age</b>	41 ± 12.12	0-18	17	1.7
		19-35	361	35.7
		36-49	369	36.5
		50-64	242	23.9
		>65	20	2
		Unknown	2	0.2
<b>Gender</b>		n	%	
	Male	568	56.2	
	Female	441	43.6	
<b>Ethnicity</b>		n	%	
	Hispanic	463	45.8	
	White	403	39.9	
	AA	104	10.3	
	Asian	21	2.1	
	Other/Unknown	20	2	
<b>BMI</b>	27.64 ± 5.97			
<b>Mode of Transportation</b>		n	%	
	EMS	545	53.9	
	Self	298	29.5	
	Family	51	5	
	Not Documented	117	11.6	

Table 2:

	n	%	
<b>Drug of abuse</b>	Methamphetamine alone	667	66
	Methamphetamine + Cocaine	32	3.2
	Methamphetamine + Cannabis	293	29
	Methamphetamine + Cocaine + Cannabis	19	1.9
	Methamphetamine + Alcohol	10	10
<b>Admission of Use</b>		n	%
	Yes	432	42.7
	No	240	23.7
	Undocumented	339	33.5
<b>Mode of Delivery</b>		n	%
	Inhalation	64	6.3
	IV	49	4.8
	Snorting	10	1
	Ingestion	15	1.5
	Unknown	873	86.4

and six (17.6%) had an intracerebral hemorrhage (Table 3).

A total of 91 patients in our cohort were pregnant, and of those, 70 (76.9%) presented to the ED with pregnancy related complaints, including preterm labor (n=28; 40%) and vaginal bleeding (n=7; 10%) (Figure 3).

**Hospital disposition, health care utilization and associated costs**

Nearly half (51.6%) of the patients presenting to the ED had two or more visits to the ED during the course of one year with an average

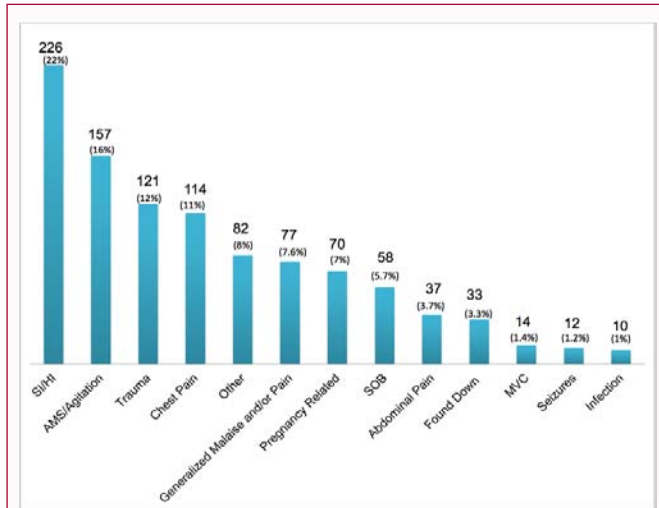


Figure 3: Clinical Presentation in ED (n=1011).

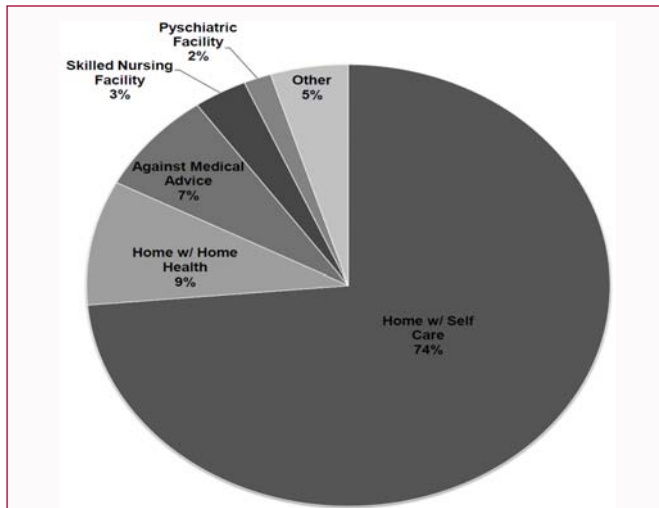


Figure 4: Discharge Disposition.

number of ED visits of 3.19. More than half (61.9%) of our patients required an inpatient admission. A total of 626 unique patients accounted for 1304 inpatient admissions with an average length of stay of 4.54 days ( $\pm$  6.34). 15% of this population had two or more inpatient admissions (Table 4).

In regards to ICU level of care, 238 unique patients accounted for 317 admissions to the ICU with an average LOS of 7.19 days ( $\pm$  0.79). Twenty-two percent of this population had two or more admissions to the ICU over the study time period (Table 4).

Our cohort had 1107 more inpatient admission per 1000 patients when compared to our institution’s benchmark of 182 inpatient admissions per 1000 patients.

**Discharge disposition**

Of the 1011 patients in our study population, nearly 75% of our cohort was able to return home after discharge from the hospital. An additional 9% was able to return home but required home health services for safety, physical therapy, occupational therapy or medication administration. Seven percent of patients signed out of the hospital against medical advice. A relatively small percentage (2%) of patients required an inpatient psychiatric admission after

Table 3:

Hypertensive	SBP $\geq$ 140	n	%			
		340	33.6	SBP 140-179	275	27.2
				SBP $\geq$ 180	65	6.4
Cerebrovascular Events	34	3.4	Subarachnoid Hemorrhage	n	%	
			Subdural Hematoma	13	1.3	
			Ischemic Stroke	9	<1	
			Intracerebral Hemorrhage	6	<1	
				6	<1	
Cardiomyopathy		41	4.1			
Pulmonary Hypertension		35	3.5			

Table 4: Hospital Disposition.

Hospital Disposition	Value
ED visits $\geq$ 2:522	
Average number of ED visits: 3.19 $\pm$ 5.86	
Inpatient Admission: 61.9%	
Admissions $\geq$ 2:15.1%	
Average admits/1000 patients: 1289	
ICU admission: 23.5%	
ICU admission $\geq$ 2: 21.8%	
Total Average ICU days: 7.19 $\pm$ 0.79	
Total Deceased: 2.5%	

being medically treated (Figure 4).

**Discussion**

Methamphetamine is a highly addictive stimulant with many names, including, but not limited to: blade, crystal, batu, ice, quartz, glass, crank, speed, and tweak. It is a stimulant that can be smoked, insufflated or injected and can produce prolonged euphoria, decreased appetite, and increased alertness [6].

Although amphetamine and methamphetamine are used interchangeably amongst the general population, it must be noted that they are two distinct compounds with unique molecular formulas and molecular weights [7,8]. Originally manufactured in 1887, methamphetamine has historically been used for a variety of purposes; it was widely used during World War II to keep troops awake and in the 1950’s as a dietary aid and antidepressant. Amphetamines have since gained widespread popularity as central nervous system stimulants or “uppers,” with common use among athletes, college students, and truck drivers. In 1970, the Controlled Substances Act made the substance illegal [9]. Globally, methamphetamine is the second most widely abused drug after cannabis, with an estimated prevalence of 14 million to 52.5 million users worldwide in 2010 and the highest prevalence of abuse in Oceania, North America and Central America [10].

The 2012 National Survey on Drug Use and Health estimated that more than 12 million people have tried methamphetamine at least once [11]. The RAND corporation estimated the 2005 methamphetamine abuse cost to be in excess of \$23 million dollars, with 70% of these costs being a results of intangible burdens or secondary deleterious health effects [12].

The impact of MA has been heavily felt in California, with the

incidence of drug abuse related hospital discharges increasing by 18 fold between 1983 and 2005 [13]. Abuse of the substance has been associated with most of the drug related violent crime and property crime in the area and is the primary substance of abuse for treatment admissions to publically funded facilities from 2004 to 2009 [14].

A variety of medical conditions have been associated with methamphetamine abuse, including acute overdose resulting in a sympathomimetic response of hypertension, tachycardia, agitation and seizures along with skin infections, trauma, intracranial hemorrhage and cerebrovascular accidents – all of these presentations were observed in our cohort.

Our study population had 7 times as many inpatient admissions compared to the general population, highlighting an increase in healthcare utilization in those who abuse methamphetamine. Based on the length of stay average, we estimate that each hospitalization in the methamphetamine positive patient population results in an average cost of approximately \$9090 per year, translating to an additional \$9 million/1000 methamphetamine users/year.

Previously reported rates of methamphetamine abuse in Los Angeles have been reported as increasing from 16.9% to 25.3% present from 2012 to 2015 [15]; we have shown similar rates with a steady rate of nearly 25% positive rate of methamphetamine urine drug screens in the ED.

Although a majority of our patients presented to the ED with psychiatric complaints (SI/HI or AMS/Agitation), only a small fraction of our cohort was discharged to a psychiatric facility, suggesting that transient psychiatric disturbances may be attributed to acute intoxication with methamphetamine [16-20].

## Limitations

Our study has several limitations, such as those associated with a retrospective analysis: all data was limited to what was documented in the electronic medical record and this was a single center study. There was no existing protocol for selection of patients for urine drug screen testing; there may be an underrepresentation of patients in that those who admitted to amphetamine abuse may not have been tested for the substance. Furthermore, patient medication lists were not cross referenced to ensure that no false positives were included in the study cohort; cross reactivity with other chemically similar stimulant agents such as pseudoephedrine or methylphenidate may result in a false positive for amphetamine in the urine drug screen.

Complicating this last point is that many users do resort to abusing over the counter, controlled substance or pharmaceutical stimulants to support a methamphetamine addiction when they are unable to access actual methamphetamine.

## Conclusions

Methamphetamine abuse is most predominant in males and those aged 19 to 49. More than half of the patients with a positive urine drug screen for methamphetamine required an inpatient admission

with 15% requiring two or more inpatient admissions; highlighting a substantial increase in healthcare utilization. We present a large-volume study of demographics, clinical presentation, complications, length of stay and healthcare utilization to better characterize the overall healthcare burden associated with methamphetamine abuse in our community.

## References

1. SAMHS. Administration, "Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings," 2012.
2. NPRKB. e. a. Nicoso, The Economic Cost of Methamphetamine Use in the United States 2005, Santa Monica, CA: RAND Corporation, 2009.
3. HCUP Statistical Briefs.
4. Pea. Gruenewald, "Assessing Correlates of the Growth and Extent of Methamphetamine Abuse and Dependence in California," Substance use & misuse, pp. 1948-1979, 2010.
5. Central California Valley High Intensity Drug Trafficking Area.
6. UNLoMN. National Center for Biotechnology Information, "Pub Chem Open Chemistry Database".
7. UNLoMN. National Center for Biotechnology Information, "Pub Chem Open Chemistry Database".
8. UNLoMN. National Center for Biotechnology Information, "Pub Chem Open Chemistry Databas,".
9. RL. Courtney KE, "Methamphetamine: An Update on Epidemiology, Pharmacology, Clinical Phenomenology and Treatment Literature," Drug and alcohol dependence. 2014; pp. 11-21.
10. "UNODC".
11. "SAMHSA".
12. "RAND Corporation".
13. ea. PJ Gruenewald, "Assessing Correlates of the Growth and Extent of Methamphetamine Abuse and Dependence in California. 2010; 45: 1948-1970".
14. "Central California HIDTA".
15. National Drug Early Warning System, "NDEWS Sentinel Community Site Advance Report 2016: Selected Findings for Heroin, Fentanyl, and Methamphetamine". 2017.
16. National Institute of Drug Abuse (NIDA)". 2013.
17. SSCSMea. Swanson, "The Scourge of Methamphetamine: Impact on a Level I Trauma Center," J Trauma. 2007; 63: 531-537.
18. KaRL. Courtney, "Methamphetamine: An Update on Epidemiology, Pharmacology, Clinical Phenomenology, and Treatment Literature," Drug and alcohol dependence. 2014.
19. "Frontline".
20. US Food and Drug.