

Substance Use Disorder in the Emergency Department: Approaches to Estimating Prevalence

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Abstract

Background: Understanding the prevalence of substance use disorder (SUD) in emergency department (ED) settings could facilitate prevention and treatment responses to the epidemic. However, little information is available on the true prevalence of SUD in the ED population. We characterized 1) methods for determining the prevalence of substance use and SUDs within an ED, and 2) the degree to which prevalence differs between geographically proximate EDs.

Methods: This cross-sectional, multi-hospital study analyzed data from prior studies and electronic health records (EHR). Our data sources included 1) interviews of a population-based sample of ED patients, 2) chart review for a cohort of ED patients, and 3) ICD-9 codes from an urban, academic trauma center. In addition, ICD-9 codes were obtained for three geographically proximate hospitals of differing type. The sampling methods and ED settings were compared descriptively in terms of their population characteristics and estimated prevalence of SUDs.

Results: Prevalence of SUDs at the urban academic center was extremely high, particularly when measured by prospective survey, but also with chart review. Use over the prior year (binge drinking, illicit drug use, or treatment for alcohol or drug use) as determined by self-report and chart review respectively was: 41.9% and 15.2% for alcohol, 36.2% and 21.6% for drugs, and 59.2% and 30.4% for either. Estimates using ICD-9 codes indicated a far lower prevalence of substance use and suggest differences between EDs.

Conclusions: SUDs are highly prevalent in ED populations, though significant variability between EDs is likely. SUDs are infrequently coded, suggesting that clinicians may be unaware of SUDs, or that discharge coding is insufficient to understand and respond to SUDs. Feasible and efficacious methods of identification and documentation of SUDs is an urgent priority to aid efforts to facilitate health services planning and quality improvement, and enable pragmatic clinical trials.

Background

Psychoactive substance use, substance use disorders (SUDs), and complications of SUD are highly frequent in emergency departments (EDs).^{1–16} Those who use illicit substances and misuse legal substances are more likely to seek care in the ED than those who do not; and ED utilization increases with disorder severity and mental health comorbidity.^{10,12,17–22} The impact of SUDs in relation to morbidity, mortality, and cost, is high,^{17,18,21,23–44} yet the costs are presumably underestimated due to the array of adverse outcomes stemming from substance use and the extent to which SUDs may go unrecognized or undocumented.

Researchers and emergency care providers have begun to respond to this epidemic through advocacy, pioneering research, and by serving as champions of local practice change.^{3–16,18–29,31,32,39,40,45} As a result, EDs are increasingly recognized as an important venue for SUD assessment and intervention.⁴⁵ Efforts to date, while admirable, are dwarfed by the severity of the problem.

There is a fundamental need for a broad and sustained program of research to create, evaluate, disseminate, and implement ED-based interventions to address the epidemic of SUDs. However, an important initial step is to better understand the basic epidemiology of SUDs in EDs. Previous reports of substance use in EDs have often been affected by selection bias or included data that was limited in scope. There are few, if any, highly rigorous population-based estimates of substance use prevalence in *individual* EDs. National or statewide estimates have not yet clarified how the epidemiology of SUDs varies between EDs of differing type (e.g. urban, suburban, academic, and community).

In this study, we conducted two complementary analyses using data sources from prior studies and the hospital electronic health record (EHR) to better understand the prevalence of SUDs in ED settings. First, to explore various methods for obtaining relevant data, we explored the prevalence of substance use and substance use disorders in a single urban, academic, ED using: 1) interview of a prospectively identified, population-based, sample of ED patients, 2) chart review of consecutive ED patients with discarded blood remnants available in the hospital laboratory, and 3) discharge diagnosis codes from hospital EHR data. Second, to characterize how different types of EDs may vary, we compared four different EDs within a single metropolitan area using discharge diagnosis codes.

Methods

Study Design

This cross-sectional study is a secondary analysis of extracted data from three existing datasets involving four different hospitals. Throughout the manuscript, we have often employed the term “substance use” as a general term given our data lacks specificity about disorder severity, though much of the use we report is consistent with substance use disorder. The use of these data for this study was approved by the Institutional Review Board.

Setting

Three of the study site EDs were located within teaching hospitals (urban academic, urban community, and suburban community) and one was not (suburban community). All were located within 19 miles of each other. Patients were predominantly adult as younger patients tend to access nearby pediatric hospitals and treatment facilities. All EDs were staffed by the same emergency physician group, although the hospitals were separately owned and served different patient populations with different missions. The hospitals were open to all patients, with no regional payor exclusions and no structured referral system. Because of changes in the local hospital affiliations, EHR data were not readily available for all years; the last calendar year for which data were available from each hospital was included. Setting descriptions provided are specific to the time period from which the data was collected.

The urban academic center was a 665-bed tertiary care teaching hospital and the region's only adult Level I trauma center. The hospital operated in part on a county tax levy basis to treat the uninsured. The urban community teaching hospital was less than a mile from the academic center, had 550 beds, and was recognized as one of the region's premier centers for cardiac care. The suburban community teaching (200 beds) and non-teaching hospitals (146 beds) were located about 10 and 19 miles north, respectively, both amid wealthier suburbs and serving patients of higher socioeconomic status.

Selection of Participants and Data Collection

Sample 1: Self-Reported Substance Use Based on Interview

The self-report estimate of prevalence included participants in a cluster-randomized trial designed to estimate disease prevalence at the urban, academic center ED.⁴⁶ Clusters were defined to represent days, times, and treatment areas of the ED. Research staffing was sufficient such that all patients present within a cluster could be approached consecutively.

The component of that investigation used for this study enrolled subjects from January 2008 through December 2009. Every patient between the ages of 18 and 64 present within the allocated cluster was invited to participate in a "study of diseases of public health importance." Patients were informed their data would be stripped of all identifiers before any analysis, and they were offered \$10 reimbursement for providing a blood sample and \$5 for completing an administered health history questionnaire. The health questionnaires included questions specific to alcohol and substance use in addition to social and medical history. While patients could be included in the dataset more than once, only the first enrollment was included in data extracted for this study.

Sample 2: Substance Use Based on Chart Review

Prevalence of SUD was estimated in a second sample of ED patients based on chart review of participants in a study of disease prevalence in which enrollment was based on availability of remnant blood samples discarded by the hospital laboratory at the urban, academic center.⁴⁶ All available samples were collected for 17 separate 24-hour periods. Periods were purposively sampled to provide data for one or two days each month for the calendar year 2010, and to include all days of the week. Informed consent requirements were waived by the IRB.

The health system's electronic records system was used to identify all encounters between included patients and the health system for the year prior to study enrollment. This included ED, office, and hospital encounters. For each visit, the full medical record was reviewed including physician notes, triage assessments, and social work evaluations. Charts were singly abstracted by one of three trained research assistants using pre-defined data definitions and a case report form. Training involved abstraction with real-time oversight by an investigator until charts were successfully abstracted without questions, omissions, or discrepancies; about 10 charts were required for each abstractor to be trained. Each completed case report form was reviewed by an independent researcher to identify seemingly spurious or omitted data. Approximately 10% of the case report forms were flagged by this method for further review and were re-abstracted. Subjects could be enrolled multiple times; only the first enrollment was included for this study.

Sample 3: Substance Use Comparing ED Type and Discharge Diagnostic Codes (ICD-9)

Each year, a standardized data extract that includes information for every patient visit to three EDs is obtained for research purposes. Data include: 1) ED registration information including identifiers, demographics, insurance status, and date and time of registration, and 2) up to 26 ICD-9 codes for each encounter. Although all patients in this data set are identified by virtue of being an ED patient, ICD-9 codes for that ED encounter could include information from their subsequent hospitalization in cases where patients were hospitalized.

Outcomes:

Primary outcomes are the proportion of patients with indication of ethanol use, other substance use, or both, for each of the three datasets. Secondary outcomes include the proportions using individual substances, proportions with indication of a substance use disorder, differences in prevalence of substance use when estimated using different methods, and differences in prevalence of substance use between the different study sites.

Outcomes primarily approximated use over the prior year. For self-report (interview), data pertained to use in the last year. For chart review and ICD–9 data, visits over a one-year period were combined, and charting is more likely to include recent than remote use, particularly in the case of ED encounters. Life-time use was also available from self-report.

Analysis:

We conducted descriptive analysis to describe the populations in terms of basic demographics and socioeconomic measures, tobacco use, and mental health co-morbidity; and to quantify the prevalence of substance use (alcohol and other drugs). Primary outcomes are given as proportions.

We used individual patients, rather than ED encounters by those patients, as the primary unit of analysis. This measure best approximates population prevalence. For patient-level analysis, information from all visits by each patient at a given hospital was combined. We also conducted a secondary analysis in which each encounter was considered separately. Each hospital was considered independently; patients with encounters at more than one hospital were counted as unique for each hospital.

Results

Characteristics of the Study Subjects:

ED populations for each of the four hospitals are characterized in Table 1, with stratification by sampling method and by facility. The hospitals generally differed in ED patient socio-demographic characteristics, as expected, given their geographic locations. There were more minorities and lower health insurance status at the more urban centers, and similar, though less pronounced differences between the urban academic and urban community hospitals.

Details of study flow and enrollment for the survey portion of the study has been reported elsewhere.⁴⁶ Briefly, initial patient approach was attempted but could not be completed for 334 (17.3%), 112 (5.8%) were missed, 454 (23.5%) declined, and 37(3.3%) would have been duplicate enrollments.

Main Results:

Primary outcomes are shown in Table 2, with stratification by hospital and, for the urban academic hospital, by sampling method. Prevalence of substance use at the urban academic center was high, particularly when assessed by prospective survey, but also as assessed by chart review. The prevalence of substance use at the urban academic ED was much lower when estimated using ICD–9 codes. Differences between hospital sites were small in absolute terms, but in relative terms seem to reflect the different populations served by each center.

Table 3 provides more detailed data about substance use that was available from subjects who underwent health interview. In this group, substance use was frequently reported. Lifetime use (i.e. use prior to the current 12-month period), in particular, was remarkably high: 74.2% for alcohol, 74.2% for drugs, and 87.4% for either. Table 4 shows that chart review did not provide as much detail on frequency of usage or differences between current and lifetime usage, and generally provided lower estimates of substance use compared with health interview estimates.

Table 5 shows selected ICD–9 codes for each hospital using both patients and encounters as a unit of analysis. Table 5A illustrates diagnoses related to specific substances, whereas table 5B includes diagnosis of substance use disorders. As was the case for overall composite outcomes, use of these diagnosis codes was relatively infrequent, but did reveal some relative differences between the hospitals.

LIMITATIONS:

We used complementary approaches to patient selection and data collection in order to expand understanding of substance use across several EDs. Each method entails differing biases related to selection of participants, method of assessing substance use, and quality of data. Indeed, these biases are a primary subject of interest in this manuscript and are detailed in the discussion. In addition, the data included in this

manuscript were not generally capable of accurately classifying severity of substance use disorder, and it is likely that they generally underestimate severity. Our survey and chart review methods did not reliably capture or differentiate misuse of prescription drugs; it is now recognized that an epidemic of prescription opioid misuse was accelerating during the time of this study.^{47,48} The worst of this epidemic was not captured by the data in this report. It is possible that attention to SUD and the quality of diagnosis coding has improved in the years since these data were collected, but it is profoundly unlikely that any such improvements have been sufficient to alter the conclusions of this report. Our demonstration that EDs differ in their prevalence of SUDs is also highly likely to be a durable finding.

Generalization of our findings might be limited. However, our sites represent several different hospital types and the data reflect differences in substance use between different ED populations in non-rural areas. We note that less than 1% of encounters were for children under age 14; our findings may not be applicable to institutions that see a significant number of children. We did not explore overlap in patient populations between the four EDs in this study or the other EDs in the region. Frequent users of EDs may be more likely to suffer from substance use disorders; whether such individuals are more likely to seek care at more than one facility is unknown.

We used several different years for data collection at the different hospitals, relying on the most recent data available for each site. This raises the possibility that differences between sites were due to epidemiological changes over time. However, time periods were reasonably proximate, and we are not aware of major regional or local changes in health care systems or societal norms over the time period covered by this study, with the exception of the ever growing prevalence of opioid use disorders and overdose in our region as in others.^{47,48}

Discussion

An important initial step in addressing a health concern is to characterize the extent of the problem in a manner relevant to the planned intervention setting. This study rigorously estimated the self-reported prevalence of substance use, including alcohol and other drugs, for one hospital and placed this estimate in context with other estimation methods. Our results confirm that substance use is exceedingly common, at least in urban academic medical centers. We also found the diagnostic coding system, the only measure readily available in the absence of significant investigative resources, to be insufficient as implemented for estimating the absolute prevalence of substance use and substance use disorders. However, relative differences in diagnosis coding suggest the prevalence of substance use is not evenly distributed throughout the emergency care system.

Comparing Sampling Methods: We selected different methods of prevalence assessment for their complementary advantages. Sample 1 (*Self-Reported Substance Use Based on Interview*) provided prospective, structured, data collection for a consecutively approached sample, but did not include those who refused to participate; and responses were subject to social desirability bias. Sample 2 (*Substance Use Based on Chart Review*) did not require consent, and thus included patients who would have been unwilling or unable to participate in sample 1. Chart review also might include information that had at some point been recognized clinically, that might not have been self-reported in sample 1. However, only those who had blood drawn as part of their ED evaluation were eligible, and chart review is subject to well-known biases, particularly since highly detailed substance use histories are not typical in ED evaluation. Sample 3 (*Substance Use Based on ED and Hospital Discharge Diagnostic Codes*) was included as the most readily available method of assessing health conditions for populations receiving medical care. It also includes all patients, and enabled comparison of different EDs. However, ICD-9 coding, even in the best of circumstances, is only as reliable as the process of identifying conditions, choosing to code them, and assigning the correct code. EDs typically code only those factors that are most relevant to the patient's immediate presentation and may not identify or code specific substances or patterns of use.

Our prospective prevalence estimate is one of the most rigorous to date. However, the limitations of self-report may be considerable. The exact magnitude of underestimation that results from self-reporting is unknown as there is no gold standard for assessing substance use. Toxicologic testing offers advantages, but is inadequately sensitive for some substances and/or patterns of usage may be falsely positive for others, and does not differentiate between therapeutic and non-therapeutic use.^{49,50} Nonetheless, one study has examined substance use prevalence according to self-report and as corrected by toxicologic assay. The difference between these two measures varied by substance but was typically on the order of 2 to 5 fold greater when measured directly.⁹ This argues that the ED prevalence of substance use is even greater than the already alarming findings of this study.

Unit of Analysis:

We have previously demonstrated differences in ED population assessment when using individual patients or individual encounters as the unit of analysis.^{51,52} To date, there is little guidance from existing literature as to how these measures might differ when considering substance use or which might be most appropriate for any given circumstance. Differences between the two metrics may have broad implications. For example, the number of patients may be more useful when considering disease burden and need for intervention, whereas the number of encounters may be more appropriate when considering healthcare utilization and cost. We suggest that future studies involving

substance use should report the extent to which repeat enrollment was prohibited and otherwise consider patient and encounter level metrics to be distinct but complementary.

Underreporting of Substance Use Disorders and Disease Prevalence:

Given the known limitations of diagnosis coding, our finding that discharge diagnoses provide the greatest underestimate of disease prevalence is expected. Nonetheless, given the magnitude of underestimation, this finding is highly significant. First, it is emblematic of the basic deficit in our current practice paradigm, whereby an enormous health problem, with large effects on the emergency care system and ED patients is frequently unrecognized or undocumented. Second, it suggests there are no currently available surveillance means by which EDs can assess prevalence of substance use disorders, monitor changes over time, or categorize ED visits related to substance use for individual patients over time and for the ED population as a whole. This is a significant barrier to next steps in practice and research. As pressure mounts for healthcare systems to decrease utilization and improve health, data such as this should be motivating. It will remain difficult to address repeat healthcare utilization so long as substance use disorders remain unrecognized or unaddressed.^{53,54}

This report should be considered in context with others that indicate the magnitude and severity of the substance use problem in ED populations (Table 6). Taken together, these convincingly demonstrate the problem of substance use disorders to be among the greatest underlying threats to health and healthcare costs found in the specialty of emergency medicine. Emergency medicine has no shortage of urgent topics with which to contend, is faced with many unmet needs, and cannot solve all issues independently without assistance of the larger policy and healthcare community. Nonetheless, prevalence statistics such as we report should serve as a call to arms to pursue any possible progress, no matter how incremental, in research, policy, and practice.

Implications for Practice:

There are promising indications for screening, brief intervention, and referral to treatment (SBIRT).^{55–58} Much has been written about the importance of prescription drug monitoring programs,⁵⁹ and the need to consider the risk of iatrogenic addiction when managing acute and chronic pain has been recently emphasized.⁶⁰ Significant barriers remain to integrating these, and other as yet undeveloped, interventions into usual ED practice. However, there are reports of SBIRT being conducted by usual ED staff intervention and/or incorporating health promotion advocates into the financial structure of usual ED operations.^{5,6,56,62} Integration of simple screening questions into electronic health records has been shown to promote implementation.¹⁶

Conclusions

Substance use is remarkably prevalent in ED settings, although the burden is unlikely to be evenly distributed throughout the emergency care system. The high prevalence of this chronic disease and its significant consequences call for a rapid and dramatic expansion in attention from the emergency medicine community. A first step is to measure the problem, but cases of SUD are infrequently documented in any way that is easily retrievable and amenable to monitoring. Even when present, the accuracy of diagnosis coding could be questioned. Feasible and effective methods to detect and document SUDs are urgently needed to target interventions as they become available, facilitate health services planning and quality improvement, and enable pragmatic clinical trials.

Abbreviations

SUD: Substance Use Disorder

ED: Emergency Department

EHR: electronic health record

ICD: International Classification of Disease

IRB: Institutional Review Board

Declarations

Ethics approval and consent to participate: The study was approved by the University of Cincinnati Institutional Review Board. Informed consent requirements were waived by the IRB.

Consent for publication: N/A

Availability of data and materials: Datasets generated and/or analyzed during the current study are not publically available, but may be available from the corresponding author on reasonable request.

Competing Interests: The authors declare that they have no competing interests.

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Ethics approval: The study was approved by the Institutional Review Board

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Tables

Table 1: ED Population Characteristics by Assessment Method and by Facility

	UA* Self-report		UA* Chart review		UA* ICD9 codes		UCT ^{&} ICD9 codes		SCT [#] ICD9 codes		SC [%] ICD9 codes	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Age												
<18	–	–	–	–	564	(1.1)	371	(1.4)	1,455	(6.0)	1,291	(6.4)
18-29	282	(28.1)	230	(23.1)	16,074	(31.4)	6,051	(23.2)	4,664	(19.3)	4,298	(21.2)
30-39	185	(18.4)	197	(19.8)	9,965	(19.5)	4,207	(16.1)	3,432	(14.2)	3,573	(17.6)
40-49	241	(24.0)	231	(23.2)	9,506	(18.6)	4,504	(17.3)	3,585	(14.8)	3,558	(17.6)
50-64	289	(28.8)	339	(34.0)	10,937	(21.4)	5,439	(20.8)	4,844	(20.0)	3,874	(19.1)
65+	–	–	–	–	3,965	(7.8)	5,524	(21.2)	6,185	(25.6)	3,661	(18.1)
Not documented	6	(0.6)			115	(0.2)	0	(0.0)	0	(0.0)	6	(0.0)
Race												
Caucasian	410	(41.1)	438	(43.5)	23,955	(46.9)	14,056	(53.9)	16,626	(68.8)	16,918	(83.5)
African-American	549	(55.0)	483	(48.0)	22,935	(44.9)	11,017	(42.2)	6,859	(28.4)	2,019	(10.0)
Other/not documented	39	(3.9)	86	(8.5)	3,608	(7.1)	875	(3.4)	378	(1.6)	929	(4.6)
Asian	–	–	–	–	286	(0.6)	80	(0.3)	151	(0.6)	324	(1.6)
Hispanic	–	–	–	–	342	(0.7)	68	(0.3)	151	(0.6)	71	(0.4)
Sex												
Male	497	(49.8)	510	(50.9)	26,094	(51.0)	10,089	(38.7)	10,085	(41.7)	8,689	(42.9)
Admitted[@]	–	–	–	–	19,893	(18.4)	11,482	(27.6)	9,645	(26.4)	5,384	(17.9)
Payor												
Self-pay	–	–	–	–	21,614	(42.3)	3,446	(13.2)	2,758	(11.4)	2,497	(12.3)
Commercial	–	–	–	–	8,301	(16.2)	9,832	(37.7)	9,182	(38.0)	9,576	(47.3)
Medicare	–	–	–	–	7,489	(14.6)	6,812	(26.1)	6,912	(28.6)	4,054	(20.0)
Medicaid	–	–	–	–	10,773	(21.1)	3,708	(14.2)	2,789	(11.5)	2,237	(11.0)
Other	–	–	–	–	2,949	(5.8)	2,298	(8.8)	2,524	(10.4)	1,897	(9.4)
Smoking	589	(58.7)	464	(47.3)	20,991	(41.1)	3,616	(13.9)	6,716	(27.8)	3,777	(18.6)
Other												
Income < 10,000	443	(44.2)	–	–	–	–	–	–	–	–	–	–
Mental illness [^]	344	(34.4)	284	(28.6)	409	(0.8)	19	(0.1)	29	(0.1)	22	(0.1)
Homeless [^]	292	(29.1)	27	(2.7)	–	–	–	–	–	–	–	–
Prison/jail [^]	502	(50.0)	22	(0.1)	–	–	–	–	–	–	–	–

* urban academic center

& urban community teaching hospital

suburban community teaching hospital

% suburban community non-teaching hospital

Ⓒ for admitted patients, N (%) refers to the number of ED encounters which resulted in hospitalization as a proportion of the total number of ED encounters for that site. The remainder of the table uses patients as the unit of analysis.

^ lifetime history

Table 2: Composite Prevalence of Substance Use over the Prior Year by Assessment Method and by Facility

	UA*		UA*		UA*		UCT&		SCT#		SC%	
	Self-report		Chart review		ICD9 codes		ICD9 codes		ICD9 codes		ICD9 codes	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Any alcohol use	420	(41.9)	153	(15.2)	4,395	(8.6)	640	(2.5)	424	(1.8)	351	(1.7)
Any drug use	363	(36.2)	218	(21.6)	7,808	(15.3)	930	(3.6)	1,041	(4.3)	430	(2.1)
Any drug or alcohol use	594	(59.2)	306	(30.4)	10,167	(19.9)	1,349	(5.2)	1,356	(5.6)	721	(3.6)

Calculations include differing variable definitions and do not necessarily denote substance use disorder (SUD) and do not quantify severity of SUD. Self-report data includes binge drinking, drug use, or treatment for alcohol or drug SUD in the past year. Chart review data includes mention in the medical record of alcohol intoxication, illicit drug use, or drug or alcohol treatment during visits over the prior year. ICD9 data includes any code (use, abuse, or disorder) documented during ED visits (or subsequent hospitalization) during the calendar year).

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Table 3. Frequency of Self-Reported Binge Drinking, Drug Use, and Treatment for Substance Use Disorders During Interview of Prospectively Identified Population-Based ED Sample

	Lifetime Use		Last used				How often in the past 12 months					
	N	(%)	0-3 months		4-12 months		> 12 months		1-2 times		>2 times	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Treatment for alcohol or drug use	263	(26.2)	52	(5.2)	23	(2.3)	188	(18.9)	33	(47.1)	37	(52.9)
Binge drinking*	744	(74.2)	336	(33.7)	84	(8.4)	324	(32.5)	92	(23.0)	308	(77.0)
Marijuana	721	(71.9)	266	(26.7)	63	(6.3)	392	(39.3)	44	(14.3)	263	(85.7)
Cocaine	296	(29.5)	53	(5.3)	27	(2.7)	216	(21.7)	10	(14.1)	61	(85.9)
Synthetic drugs	107	(10.7)	5	(0.5)	6	(0.6)	96	(9.7)	3	(30.0)	7	(70.0)
Injection drugs	82	(8.2)	11	(1.1)	4	(0.4)	67	(6.7)	0	(0.0)	13	(100.0)
Amphetamines	0	(0.0)	-	-	-	-	-	-	-	-	-	-
Heroin	12	(14.6)	-	-	-	-	-	-	-	-	-	-
Other drugs	3	(0.37)	-	-	-	-	-	-	-	-	-	-

* Defined as more than four drinks for females and five drinks for males in a two hour period

Table 4. Frequency of Binge Drinking, Drug Use, and Treatment Found During Chart Review of Current and Prior Healthcare Encounters Over One Year Period

	N	(%)
Alcohol		
Diagnosed abuse/addiction	100	(9.9)
Treatment for abuse/addiction	28	(2.8)
Alcohol level >80(0.8); Currently intoxicated; Drinks to intoxication	102	(10.1)
Drugs		
Diagnosed abuse/addiction	99	(9.8)
Treatment for drug abuse/addiction	38	(3.8)
Use Marijuana	132	(13.1)
Use non-injected powder cocaine or crack	55	(5.5)
Use synthetic drugs (Meth, Ecstasy, GHB, K, etc.)	7	(0.7)
Use injection drugs	50	(5.0)
Amphetamines	0	(0.0)
Heroin	27	(54.0)
Cocaine	17	(34.0)
Other/Unknown	11	(22.0)

Encounters and Patients with an ICD9 Code for Poisoning (Table 5a) and Dependent and Non-Dependent Use (Table 5b) by Facility

ICD9 code for poisoning		UA*		UCT&		SCT#		SC%	
		91,942		41,633		36,574		30,075	
		(Y=2011)		(Y=2007)		(Y=2009)		(Y=2011)	
Encounters		51,126		26,096		24,165		20,261	
		N	(%)	N	(%)	N	(%)	N	(%)
by analgesics, antipyretics, and antirheumatics (965)*		Encounters	629 (0.68)	30 (0.07)	77 (0.21)	52 (0.17)			
		Patients	575 (1.23)	28 (0.12)	73 (0.32)	51 (0.26)			
	Opium (alkaloids), unspecified (965.00)	Encounters	62 (0.07)	3 (0.01)	14 (0.04)	5 (0.02)			
		Patients	61 (0.12)	3 (0.01)	14 (0.06)	5 (0.03)			
	Heroin (965.01)	Encounters	264 (0.29)	1 (0.00)	17 (0.05)	16 (0.05)			
		Patients	240 (0.52)	1 (0.00)	17 (0.07)	16 (0.08)			
	Methadone (965.02)	Encounters	12 (0.01)	0 (0.00)	4 (0.01)	0 (0.00)			
		Patients	11 (0.02)	0 (0.00)	3 (0.02)	0 (0.00)			
Includes Codeine [methyldorphine], Meperidine [pethidine], Morphine)		Encounters	81 (0.09)	6 (0.01)	20 (0.06)	10 (0.03)			
		Patients	79 (0.16)	6 (0.02)	19 (0.08)	10 (0.05)			
by sedatives and hypnotics (967)*		Encounters	79 (0.09)	6 (0.01)	12 (0.03)	11 (0.03)			
		Patients	77 (0.16)	6 (0.02)	12 (0.05)	11 (0.05)			
	Barbiturates	Encounters	3 (0.00)	1 (0.00)	0 (0.00)	0 (0.00)			
		Patients	3 (0.01)	1 (0.00)	0 (0.00)	0 (0.00)			
	Unspecified sedative or hypnotic (Includes sleeping pills)	Encounters	16 (0.02)	1 (0.00)	4 (0.01)	3 (0.01)			
		Patients	16 (0.03)	1 (0.00)	4 (0.02)	3 (0.02)			
by other central nervous system depressants and anesthetic (968)*		Encounters	27 (0.03)	2 (0.01)	3 (0.01)	1 (0.00)			
		Patients	25 (0.05)	2 (0.01)	3 (0.01)	1 (0.01)			
	Intravenous anesthetics (Includes Ketamine, Methohexital, and Thiobarbiturates)	Encounters	1 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)			
		Patients	1 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)			
by psychotropic agents (969)*		Encounters	567 (0.62)	26 (0.06)	44 (0.12)	57 (0.19)			
		Patients	520 (1.11)	26 (0.10)	43 (0.18)	55 (0.28)			
	Benzodiazepine-based tranquilizers	Encounters	301 (0.33)	14 (0.03)	26 (0.07)	27 (0.09)			
		Patients	281 (0.59)	14 (0.05)	25 (0.11)	26 (0.13)			
	Hypnotics [hallucinogens] (Includes Cannabis derivatives, Lysergide, Mescaline, Psilocin, Psilocybin)	Encounters	19 (0.02)	0 (0.00)	1 (0.00)	10 (0.03)			
		Patients	19 (0.04)	0 (0.00)	1 (0.00)	10 (0.05)			
	Psychostimulants (Includes Amphetamine, Caffeine)	Encounters	1 (0.01)	0 (0.00)	0 (0.00)	1 (0.00)			
		Patients	1 (0.00)	0 (0.00)	0 (0.00)	1 (0.01)			
by central nervous system stimulants (970)		Encounters	67 (0.07)	8 (0.02)	6 (0.02)	3 (0.01)			
		Patients	64 (0.13)	8 (0.03)	6 (0.03)	3 (0.02)			
by use of alcohol (980)		Encounters	74 (0.08)	6 (0.01)	16 (0.04)	11 (0.04)			
		Patients	70 (0.15)	6 (0.02)	16 (0.07)	11 (0.05)			
by acute effect of other substances, chiefly non-medicinal as to source (989.0)		Encounters	115 (0.13)	64 (0.15)	100 (0.27)	36 (0.12)			
		Patients	114 (0.23)	64 (0.25)	99 (0.41)	34 (0.18)			

ICD9 code for dependent and non-dependent use

		UA*		UCT&		SCT#		SC%	
		N	(%)	N	(%)	N	(%)	N	(%)
Dependence syndrome (303)	Encounters	2,230	(2.43)	395	(0.95)	220	(0.60)	250	(0.83)
	Patients	1,602	(3.13)	316	(1.21)	171	(0.71)	186	(0.92)
Dependence (304)	Encounters	1,800	(1.96)	385	(0.92)	110	(0.30)	190	(0.63)
	Patients	1,399	(2.74)	288	(1.10)	100	(0.41)	163	(0.80)
Substance abuse of drugs (305)	Encounters	12,311	(13.4)	1,295	(3.1)	1,370	(3.7)	413	(1.4)
	Patients	8,642	(16.9)	952	(3.6)	1,094	(4.5)	381	(1.9)
Alcohol abuse (305.0)	Encounters	4,212	(4.58)	456	(1.10)	332	(0.91)	191	(0.64)
	Patients	3,312	(6.48)	394	(1.51)	286	(1.18)	182	(0.90)
Cannabis abuse (305.2)	Encounters	6,026	(6.6)	341	(0.8)	717	(2.0)	76	(0.3)
	Patients	4,535	(8.9)	302	(1.2)	591	(2.4)	73	(0.4)
Hallucinogen abuse (305.3)	Encounters	38	(0.04)	0	(0.00)	0	(0.00)	1	(0.00)
	Patients	38	(0.07)	0	(0.00)	0	(0.00)	1	(0.00)
Sedative, hypnotic or anxiolytic abuse (305.4)	Encounters	301	(0.33)	4	(0.01)	7	(0.02)	4	(0.01)
	Patients	277	(0.54)	4	(0.02)	7	(0.03)	4	(0.02)
Opioid abuse (305.5)	Encounters	1,342	(1.46)	94	(0.23)	105	(0.29)	40	(0.13)
	Patients	1,094	(2.14)	83	(0.32)	89	(0.37)	33	(0.16)
Cocaine abuse (305.6)	Encounters	2,375	(2.58)	383	(0.92)	162	(0.44)	28	(0.09)
	Patients	1,613	(3.15)	267	(1.02)	132	(0.55)	26	(0.13)
Stimulant or related acting sympathomimetic abuse (305.7)	Encounters	116	(0.13)	0	(0.00)	3	(0.01)	2	(0.01)
	Patients	112	(0.22)	0	(0.00)	3	(0.01)	2	(0.01)
Antidepressant type abuse (305.8)	Encounters	17	(0.02)	2	(0.00)	1	(0.00)	1	(0.00)
	Patients	17	(0.03)	2	(0.01)	1	(0.00)	1	(0.00)
Other, mixed, or unspecified drug abuse (305.9)	Encounters	1,092	(1.19)	316	(0.76)	198	(0.54)	122	(0.41)
	Patients	912	(1.78)	241	(0.92)	168	(0.70)	117	(0.58)

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Y= year

Table 6: Reports and Estimates of the Prevalence of Substance Use and Substance Use Disorders in the ED Based on Prior Publications

Year	Reference	Data Source/ Methods	Location	Metrics	EtOH Estimates	Substance Use Estimates	Combined EtOH & Drug Use Estimates	Notes
1997	Bernstein, <i>et al.</i> ³	SBIRT implementation	Boston Medical Center	Past year EtOH use disorder or drug use	Not reported	Not reported	EtOH or drug abuse problem (41%)	Selected sample emphasizing recognized disorders; unknown repeat enrollment
2003/2005/2006*	Rockett IR, <i>et al.</i> ⁷⁻⁹	Random, cross-sectional, two-stage probability sample	Seven Tennessee acute care, adult, civilian, non-psychiatric hospitals	Prevalence of self-reported EtOH and drug use, with concurrent toxicologic screening	<u>declared/corrected use</u> · EtOH (34%/35%)	<u>declared/corrected Use</u> · marijuana (8%/17%) · cocaine (0.8%/5%) · opioids (4%/13%) · pcp (0%/1%) · stimulants (2%/7%) · benzodiazepine (9%/17%) · barbiturates (6%/9%) · drug dependence (4%)	treatment need (29%) · in treatment (0.9%) · want treatment (2%) · DSM-IV dependent (4%) · past treatment/current use (6%) · past treatment/test positive (4%)	21% not completing interview; repeat enrollment unknown Unclear how testing excluded medical use; accuracy of toxicologic screen unknown and likely variable by substance ^{49,50}
2007	Academic ED SBIRT Research Collaborative ⁶	Quasi-experimental handout vs. BI delivered by ED staff	14 EDs nationwide	EtOH use above low-risk limits	· screen positive (26%) · past alcohol treatment (22%)	Not reported	Not reported	Selected sample emphasizing recognized disorders; unknown repeat enrollment
2008	Cherpitel CJ, <i>et al.</i> ¹⁰	2005 National Alcohol Survey (NAS)	National, U.S.	EtOH and drug for people reporting use of an ED	· risky drinking (24%) · problem drinking (8%) · dependence (3%)	· greater than monthly illicit drug use (7%)	Not reported	ED usage self-reported rather than data obtained/obtainable during ED visit
2010	Youmans, <i>et al.</i> ⁴	Random cross-sectional sample	Rhode Island Hospital	ASSIST score requiring brief intervention or intensive treatment; past 3 month use	· needing intervention (24%) · use in past 3 months (66%)	<u>Needing Intervention</u> · marijuana (24%) · cocaine (8%) · amphetamines (4%) · inhalants (2%) · sedatives (13%) · opioids (5%) · pain Killers (21%) <u>Use in past 3 months</u> · marijuana (28%) · cocaine (8%) · amphetamines (6%) · inhalants (1%) · sedatives (12%) · opioids (4%) · pain Killers (25%)	Not reported	50% of approached patients ineligible or refused
2010	D'Onofrio, G., <i>et al.</i> ^{5*}	SBIRT implementation	Yale New-Haven Hospital, Connecticut	> low-risk EtOH use; Illicit drug use in prior 12 months; number referred to drug and EtOH treatment	· use (46%) · at-risk (25%) · binge drinkers (9%) · dependent drinkers (14%) · referred to treatment (10%)	· use of 1 or more illicit drugs (16%) · cocaine (8%) · heroin (6%) · marijuana (6%) · referred to treatment (5%)	· referred to EtOH and Drug treatment (2%)	Selected sample emphasizing recognized and severe disorders; unknown repeat enrollment
2011	Booth, <i>et al.</i> ¹¹	Consecutive sample of adults age 18-60 years old	Hurley Medical Center, Michigan	Past month binge drinking; past year drug use; alcohol or	· past month binge drinking (21%) · past year disorder (12%)	<u>past month use</u> · cocaine (4%) · marijuana (20%) <u>past year disorder</u> · Cocaine (4%) · Marijuana (5%)	Not reported	Enrolled 9am-11pm; 64% of those present were enrolled; unknown repeat enrollment

2012	Wu, L, <i>et al.</i> ^{12*}	2007 to 2009 National Surveys on Drug Use and Health	National, U.S.	drug disorder ACASI& Self-reported substance use and substance use disorders among adults reporting use of an ED in prior 12 months	· EtOH use disorder (~9%)	<u>drug use</u> · any drug (17%) · marijuana (13%) · opioids (7%) <u>drug use disorders among subjects using drugs</u> · marijuana (17%) · cocaine (33%) · opioids (21%) · stimulants (19%) · sedatives (35%) · tranquilizers (12%)	· EtOH & drug use (15%) · EtOH or drug disorders (11%) · alcohol or drug disorders among ED patients using substances (16%)	ED usage self-reported rather than detected during ED visit; non-institutionalized adults
2013	Johnson, J. <i>et al.</i> , ¹⁶	Integration of screening questions in electronic medical record at triage	Level 1 trauma center, Georgia	Self-report past year excessive drinking or use of drugs (street or non-medical Rx)	Not reported	Not reported	· screen positive (22%)	Limited 3-question patient assessment; 96% screening rate though unknown quality/fidelity of screening
2013	Hankin, A. <i>et al.</i> ^{15*}	Cross-sectional screening	Large, public hospital, Southeastern U.S.	Self-report response to brief pre-screen and if positive ASSIST score	<u>among pre-screen positive</u> · low risk (44%) · moderate risk (36%) · high risk (10%)	<u>among pre-screen positive</u> · marijuana use (66%) · cocaine use (32%) · low risk (4%) · moderate risk (74%) · high risk (11%)	· pre-screen positive (28%)	Relationship between screened population and overall ED population unclear
2014	Sanjuan, <i>et al.</i> ¹³ ; Konstantopoulos <i>et al.</i> ⁶³	Secondary analysis drug abuse trial	Six urban hospitals	Self-reported past year use	· risky drinking (45%)	· drug use (30%) · moderate or severe drug problem (27%)	Not reported	Selected sample emphasizing recognized disorders
2014	Whiteside, <i>et al.</i> , ^{14*}	Secondary analysis EtOH trial; patients aged 14-20	University of Michigan	Past year EtOH misuse; non-medical Rx drug & marijuana use	· EtOH misuse (28%)	· non-medical Rx opioids (9%) · other non-medical Rx use (6%) · marijuana (33%)	Not reported	randomly selected shifts 8AM-2PM; selected sample with 54% of available patients screened; unknown repeat screening
2015*	Beaudoin, <i>et al.</i> , ⁶⁴	Secondary analysis of two clinical trials assessing substance misuse	Rhode Island Hospital	ASSIST score; past 3 month and lifetime use	· use in past 3 months (52%) · use in past 12 months (87%)	<u>Use in past 3 months</u> · all drugs (34%) · marijuana (27%) · cocaine (16%) · Rx opioids (6%) · opioids (2%) <u>Use in lifetime</u> · all drugs (39%) · marijuana (60%) · cocaine (24%) · Rx opioids (15%) · opioids (14%)	Not reported	Enrolled 8am-12am; 64% of those present were enrolled; unknown repeat enrollment

Table does not include estimates of proportion of ED utilization due to substance use disorders (alcohol or drugs); EtOH = alcohol, SBIRT = screening, brief intervention, and referral to treatment, BI = brief intervention

* Calculations performed by combining data from manuscripts or reformulation from included data/figures

& ACASI=audio computer-assisted self-interviewing