

# A Descriptive Comparison of Alcohol-Related Presentations at a Large Urban Hospital Center from 1902 to 2009

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**Abstract** Although alcohol use has long been a significant cause of hospital presentations, little is published regarding the long-term demographic changes that have occurred at a single hospital site. To address this deficit, we prospectively studied all acute alcohol-related presentations to Bellevue Hospital Center (New York, NY) and compared this contemporary data set with one from the same institution from 1902 to 1935. We prospectively identified all patients presenting to the emergency department because of acute alcohol use over an 8-week period in 2009. We described the basic attributes of patients presenting currently because of alcohol and compared these data to those previously described between 1902 and 1935. We also compared our census data with contemporaneous data from all patients presenting to this hospital site. During the study period, 560 patients presented because of acute alcohol use which extrapolated to an estimated 3,800 patients over the calendar year. This compares to 7,600 presentations recorded annually early in the twentieth century. Twelve percent of patients in 2009 were female as compared to 18 % of patients between 1934 and 1935. Patients with alcohol-related presentations in

2009 were more likely to be admitted than contemporaneous patients without an alcohol-related presentation (30 vs. 19 % admitted;  $p < 0.001$ ). Since first measured 110 years ago at one large New York City hospital, alcohol-related presentations remain common representing 5 % of all emergency department visits. This demonstrates alcoholism's continuing toll on society's limited medical resources and on public health as a whole.

**Keywords** Alcohol · Demographics · Emergency department · Emergency medicine · Urban

## Introduction

Alcohol use has been a significant cause of hospital visits for centuries [1]. These presentations are not limited to simple alcohol intoxication, but rather encompass addiction, withdrawal, and trauma and neurological, nutritional, hepatic, gastrointestinal, and psychiatric disease [2–5]. Numerous studies have described the impact of alcohol on hospital and emergency department (ED) censuses, although these have typically focused on a single point in time [5–7].

One of the longest-running single hospital surveys of alcohol-related presentations was conducted at Bellevue Hospital Center over the first half of the twentieth century. Published by neurologist Norman Jolliffe in *Science* in 1936 [8], the research group documented 256,755 patient presentations to Bellevue between 1902 and 1935. Jolliffe showed how prohibition and its 1933 repeal, as well as the preceding temperance movement, correlated to each year's total number of

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per capita alcohol presentations. Demographic and clinical details about these presentations were limited to patient gender and age, but the sheer volume of presentations recorded makes this study an important resource in understanding the role of alcohol in public health over the study time period.

To appreciate how the nature of alcohol-related presentations has changed at a single urban hospital site over the previous century, we prospectively conducted a census of all alcohol-related presentations to Bellevue Hospital Center and compared this 2009 data set with the previous data published by Jolliffe. A secondary objective of this census was to describe in detail key demographic features of this current patient population and compare these to the general hospital population over this same period.

## Materials and Methods

### Study Design

Using 24-h-a-day trained research associates dedicated to this census, we prospectively identified all patients presenting to the ED because of acute alcohol use or withdrawal, as defined by their treating physician. Data for this survey were collected over a single 8-week period in 2009.

### Setting and Population

The study was conducted entirely through the Bellevue Hospital Center Emergency Department in New York, NY. Patients in the adult ED, pediatric/young adult ED, fast track/urgent care center, and ED intensive care unit (ICU) were eligible. No effort was made to survey patients in the outpatient clinic system, psychiatric ED, or those transferred from other hospitals directly to an inpatient service.

All nonpregnant patients, 18 years or older, were screened by research associates. Patients were included if their treating ED physician believed the patient “would have been unlikely to present to the ED without the acute use or withdrawal of alcohol.” The research associates used a 22-item structured survey instrument (Appendix 1) obtaining objective information, such as vital signs, from the medical chart and interviewing the treating emergency physician to obtain the remaining data. The research associates collected information from either attending emergency physicians or directly from

emergency medicine residents if these house staff had already discussed the case with the attending and the patient had already been physically evaluated by this attending physician. To ensure patient privacy and census completeness, no confidential patient identifiers were recorded. The institutional review board approved this study as well as an exemption to either inform or consent patients about their inclusion in the study; this allowed for a more comprehensive survey as we could include intoxicated and unconscious patients who are normally unable to give consent.

### Data Analysis

Trained research associates transferred all census surveys into an electronic database. A representative sample of the first week's data was checked by the investigators for accuracy and was found to be without discrepancy.

We used International Statistical Classification of Diseases (ICD9) diagnostic coding to control for potential seasonal variability in our data, as our survey was conducted entirely during the summer months. Four numbers from the ICD9 data were recorded: the total number of patients presenting to Bellevue for any reason over an entire current calendar year (2008); the total number of patients presenting to Bellevue in 2008 with an ICD9 diagnosis related to alcohol use or disease; the number of patients presenting for any reason over the study period (June 8–August 2); and the number of patients presenting over the study period (June 8–August 2) with an ICD9 diagnosis related to alcohol use or disease. Since the total ED census was slightly higher in the summer months (1.1 % more total ED patients per day during these summer dates) and patients with alcohol-related presentations were a slightly smaller fraction of total presentations in the summer months (5.2 % fewer of the summer patients had alcohol-related ICD9 codes), we used these data to extrapolate a seasonally adjusted estimate of alcohol-related presentations over the calendar year.

Statistical comparisons were made using Pearson's uncorrected chi-square test, the Student's *t* test, and *F* tests. Because of the large size of the study groups, all comparisons were found to be significant ( $p < 0.05$ ) using both *t* tests and *F* tests. As comparisons between the alcohol-related patient presentations and general ED presentations were not part of the primary hypothesis, we used a Bonferroni correction for these analyses and deemed any comparison with a *p* value of less than 0.001 ( $0.05 \times 20$  comparisons) to be significant. We

**Table 1** Comparison of acute alcohol-related presentations to the general ED census

	Presenting due to alcohol use (n=560)	All patients, 2008 (n=78,142)
<b>Age</b>		
18–30	23 % (125)	25 % (19,656)
31–40	23 % (122)	20 % (15,493)
41–50	24 % (127)	23 % (17,586)
51–60	20 % (108)	17 % (13,571)
61–70	8.6 % (46)	8.9 % (6,962)
71+	1.7 % (9)	6.2 % (4,874)
Unspecified age <sup>a</sup>	(23)	
<b>Gender</b>		
Female	12 % (64)	60 % (47,239)
Male	88 % (461)	40 % (30,903)
Unspecified gender <sup>a</sup>	(53)	
<b>Ethnicity</b>		
Asian	6.5 % (26)	9.2 % (6,759)
Black	31 % (125)	27 % (20,231)
Hispanic	23 % (93)	41 % (30,297)
White	39 % (155)	22 % (16,498)
Unspecified ethnicity <sup>a</sup>	(161)	(4,357)
<b>Expected disposition</b>		
Home	70 % (289)	81 % (63,569)
Admission	30 % (125)	19 % (14,573)
Withdrawal management	16 % (65)	1.9 % (1,538)
Medical (all beds)	6.5 % (27)	9.4 % (7,315)
Medical ICU	3.6 % (15)	0.3 % (270)
Psychiatric	3.6 % (15)	0.1 % (87)
Neurology	0.5 % (2)	0.5 % (372)
Unspecified service <sup>a</sup>	1.9 % (8)	0.2 % (150)
Unspecified disposition <sup>a</sup>	(146)	

Because of the large size of the study groups, all comparisons were found to be significant using both *t* tests and *F* tests

<sup>a</sup> Patients with unspecified data were excluded from percentage calculations

conducted our analysis using MedCalc 11.6, produced by MedCalc Software (Mariakerke, Belgium).

**Results**

In total, 560 patients were included in this 8-week survey. This number extrapolates to a seasonally corrected estimate of 3,800 patients over the calendar year 2009. Table 1

**Table 2** Detailed characteristics of all patients presenting because of alcohol use (N=560)

<b>Mode of arrival</b>	
Self/walk-in	27 % (115)
Ambulance	68 % (293)
Law enforcement custody	5.6 % (24)
Unspecified <sup>a</sup>	(128)
<b>Subjective presenting state</b>	
Intoxicated, verbal	75 % (316)
Intoxicated, nonverbal <sup>b</sup>	12 % (52)
Withdrawal	6.1 % (26)
Normal (not intoxicated)	7.1 % (30)
Unspecified <sup>a</sup>	(136)
<b>Trauma</b>	
Not present	82 % (377)
Present	18 % (84)
Assault	4.1 % (19)
Motor vehicle collision	0.2 % (1)
Pedestrian struck	0.9 % (4)
Fall	9.1 % (42)
Unspecified trauma	3.9 % (18)
Unspecified <sup>a</sup>	(99)
<b>Residence</b>	
Private residence	46 % (121)
Group home or nursing facility	2.6 % (7)
Homeless (undomiciled)	52 % (137)
<b>Slept last night</b>	
Street	11 % (29)
Shelter	5.7 % (15)
Home of friend/family	0.8 % (2)
Homeless, last night's sleeping site unspecified	34 % (91)
Other/unspecified <sup>a</sup>	(265)
<b>Known seizure history</b>	
No	80 % (231)
Yes, on anti-epileptics	6.6 % (19)
Yes, not on anti-epileptics	13 % (39)
Known seizure today	1.7 % (5)
Unspecified/unknown <sup>a</sup>	(289)
<b>Known psychiatric history</b>	
Depression	5.8 % (32)
Schizophrenia/schizoaffective disorder	2.4 % (13)
Bipolar disorder	2.2 % (15)
Other psychiatric history	2.8 % (21)
Recent suicide attempt/ideation (any diagnosis)	1 % (6)
No known diagnosis	87 % (479)
<b>Cigarette use</b>	
Current user	76 % (105)

**Table 2** (continued)

Former user	7.9 % (11)
Denies use	17 % (23)
Unspecified/unknown <sup>a</sup>	(421)
Head CT anticipated <sup>c</sup>	
Yes	19 % (72)
No	81 % (307)
Unspecified <sup>a</sup>	(181)

<sup>a</sup> Patients with unspecified data were excluded from percentage calculations

<sup>b</sup> Nonverbal intoxication refers to inebriated patients lacking a sufficient level of consciousness to speak

<sup>c</sup> “Head CT anticipated” connotes that the treating physician intended to obtain a computerized tomography study of the patient's head, although we did not follow this to ensure that the CT order was actually executed

compares the basic demographic data of patients presenting because of alcohol during the study period with these demographics from the larger ED population. Patients presenting because of alcohol use were significantly more likely to be both male and white than the general ED population. They were more likely to be admitted (30 vs. 19 %;  $p < 0.001$ ), and those admissions were more likely to be to ICU beds than the general ED patient population as a whole (12 vs. 1.9 %;  $p < 0.001$ ). A detailed demographic description of the patients presenting due to alcohol use is presented in Table 2.

This estimated 3,800 alcohol-related patient visits to Bellevue Hospital Center in 2009 compares to an annual average of 7,600 such patients between 1902 and 1935 (which ranged from a peak of 11,307 cases in 1910 to a low of 2,091 cases in 1920). Five percent (27 patients) from the current 2009 sample was older than 65, comparable to the 5 % of patients presenting to Bellevue in the earlier 1902–1935 study who were older than 65. Eighty-eight percent of alcohol-related patients from the 2009 sample were men, while 82 % of presenting patients were men in the final 2 years of the previous study between 1934 and 1935.

## Discussion

Our data showed that 18 % of patients who presented because of alcohol had concomitant trauma. Methodological differences preclude direct comparisons to previous studies of

alcohol use and trauma; however, data from this current study dovetail previous literature investigating the proportion of trauma patients who had used alcohol. A multi-site 1989 study of ED patients with trauma, for example, showed 9 % to have detectable alcohol levels on breathalyzer testing [9]. A similar ED-based survey of urban trauma patients in 1991 demonstrated that 21 % of presenting trauma patients had evidence of acute alcohol use in serum testing [2]. A 1993 study measuring self-reported alcohol use among patients suffering trauma in the county/public ED setting vs. a private, managed care ED recorded 19 and 8 % alcohol use, respectively [4].

Previous studies of alcohol abuse among medical and surgical inpatients have shown remarkably high frequencies of alcohol dependence in these populations ranging from 7 to 25 % [10–13]. A unique strength of this current study is that it focuses not on chronic usage patterns, but rather how commonly alcohol is the acute cause for hospital presentations. Although we did not study chronic alcohol usage patterns in our current study, we believe it is likely that a substantially higher fraction of ED patients in this hospital setting suffered from alcohol dependence but had ED presentations that were unrelated to alcohol use.

Notably, 52 % of patients presenting because of alcohol were undomiciled in this current study. This is substantially more than the 20 % of the general ED population at this same hospital who were undomiciled [5]. Possibly contributing to both these figures is the one block proximity between the Bellevue ED and a 600-bed homeless shelter. Previous studies have estimated the frequency of alcoholism in undomiciled populations between 18 and 44 % [14, 15]. Similarly, a 1992 New York State survey showed that although undomiciled individuals were more likely to abstain completely from alcohol than the general population (39.8 vs. 26.4 %), the homeless were also more likely to be daily heavy drinkers (33.3 vs. 14.1 %) [16].

This current analysis is unique in that it focuses on the change of alcohol-related presentation at a single site over 107 years. The strength of comparison, however, also limits the applicability of these data to other sites. Bellevue Medical Center is unique because of its location in the urban center of New York City, large number of undomiciled patients, and ability to offer care to many patients without the ability to pay. These differences are likely reflected in the demographics of alcohol-related presentations to Bellevue. For instance, a similar urban hospital in Pachuca, Mexico reported 9.4 % of their

ED patients to have used alcohol within 6 h of presentation, compared with an estimated 4.9 % of Bellevue patients who presented because of alcohol [17]. A recent survey of Tennessee urban EDs found a similar 4.9 % of presenting patients to be acutely intoxicated with alcohol based on serum analysis [7]. A larger analysis data from the National Hospital Ambulatory Medical Care Survey estimated that 2.7 % of ED visits were related to alcohol abuse [18]. In sum, depending on the method of data collection and the area of study, the frequency of contemporary alcohol-related ED visits is widely variable.

### Limitations

We used a prospective, 24-h per day study design to ensure as high a degree of accuracy as possible. Still, it is likely that at least some patients were missed in the collection of these data. We believe that using the assessment of the treating emergency physician was the most accurate determination of the association between patients' presentations and the acute use or withdrawal from alcohol. Nevertheless, this strategy may have missed a small number of patients that would have been included if our study had relied on inclusion data such as ethanol concentrations and chief complaints. We did not attempt to validate the accuracy of our prospectively collected census with retrospective data.

Our comparison of the study population from 2009 ( $n=560$ ) with the ICD9-derived population from the same calendar time in 2008 ( $n=69$ ) demonstrates that ICD9 diagnoses would not have been a reliable means of capturing this patient population in our institution. A small number of patients had incomplete data sheets, due primarily to uncertainty about the data accuracy from the treating ED physician. Furthermore, our study was confined to the ED. No effort was made to include patients admitted directly to the hospital, although this practice is rare in the study hospital and we do not believe that their inclusion would have affected our data significantly. Any psychiatric patient who may have had an acute medical problem would have been evaluated first in the medical ED and thus would have been eligible for our study. As our research associates would be unable to physically conduct the survey in the psychiatric ED, we did not include patients treated solely in the psychiatric ED and cannot estimate

what fraction of these patient presentations were secondary to alcohol use or withdrawal.

We collected data for only 8 weeks. We used ICD9-coding to estimate seasonal variance of both total ED population and the relative frequency of alcohol-related presentations. Both of these corrections were less than 6 %, so they only had minimal effects on our final estimate. Still, if there was a gross seasonal discrepancy in ICD9 accuracy (for example, patients with alcohol intoxication more likely to be given an accurate ICD9 diagnosis in the winter than in the summer), this would affect our estimate.

We did not address contextual changes to Bellevue Hospital Center and New York City over the previous century. Isolated gentrification to the surrounding neighborhood and increased accessibility of nearby hospitals may have altered the number of presentations to Bellevue Hospital without any absolute change in the prevalence of alcohol-related disease in New York City. Although our data show a moderate decline in alcohol cases, our data collection methods differed inherently from those used in the early 1936 study. Importantly, the 1936 paper by Jolliffe studied patients presenting to the psychiatric section of Bellevue Hospital, whereas our current study included those patients presenting through the medical ED. Thus, this relative decline is only an estimate of the true change in alcohol presentation frequency and one cannot make reliable deductions from this current data on how alcohol presentations have changed at this hospital site over the preceding 108 years.

### Conclusions

At one large New York City public hospital ED, presentations related to acute alcohol use and withdrawal have remained common since first studied 110 years ago. From the current data set, 4.9 % of presentations were related to acute alcohol use, representing a substantial proportion of hospital visits. Compared to improvements in areas of public health such as infectious disease and occupational injury, alcohol-related disease remains a major public health struggle [19, 20].

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## Appendix 1

### Alcohol Census Data Collection Instrument

Date and Time of presentation: \_\_\_/\_\_\_/09 \_\_\_:\_\_\_ (use 24-hour military time)

Age: \_\_\_\_\_ Gender: Male Female

Ethnicity: White Black Hispanic Asian Native American

Chief complaint: \_\_\_\_\_

Mode of arrival: Self  
EMS  
NYPD or DOC custody

Vital Signs (use earliest recorded values):

Heart Rate \_\_\_\_\_ beats/min Respiratory Rate \_\_\_\_\_ breaths/min Temperature \_\_\_\_ F Route:  
temporal/rectal (circle one)

Blood Pressure \_\_\_/\_\_\_ mm Hg Fingertstick glucose (if recorded) \_\_\_\_\_ mg / dL

Subjective Presenting State As Per Doctor/Nurse: Intoxicated, verbal  
Intoxicated, non-verbal  
Withdrawal  
Actively Seizing  
Postictal  
Normal (not intoxicated and at baseline mental status)  
Not known/other

Trauma: Yes No  
If Yes, Assault Motor vehicle occupant Pedestrian Struck Fall Other

Residence: Private Residence Group home or any treatment facility Incarcerated Homeless Other  
If homeless, place slept previous night: Home of Friend/Family Shelter Street Hospital  
Other

Insurance: Private Medicaid Medicare Uninsured Other (list: \_\_\_\_\_) Unknown

Known seizure history: No Yes, not on anti-epileptics Yes, on anti-epileptics Check if known to  
have seizure today

Known psychiatric disorder (check all that apply): None known depression  
recent suicide attempt/acute suicidal ideation  
schizophrenia/schizoaffective disorder bipolar disorder other (list:  
\_\_\_\_\_  
\_\_\_\_\_)

Known substance use: cocaine amphetamines marijuana opioids (i.e. heroin, methadone, oxycodone)  
benzodiazepines (i.e. Valium, Xanax, Klonopin) other (list all:  
\_\_\_\_\_  
\_\_\_\_\_)

Cigarette use: Current user Former user Never used Not known/unsure

Will a Head CT be taken today? Yes No Unsure

Expected Final ED Diagnosis(es):  
\_\_\_\_\_  
\_\_\_\_\_

Expected Disposition:

Home  
Admission  
Medical  
Regular bed  
Observation bed  
ICU bed  
Detox (withdrawal management)  
Psychiatric  
Neurology  
Other (specify: \_\_\_\_\_)

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