



Full length article

Differentials and trends in emergency department visits due to alcohol intoxication and co-occurring conditions among students in a U.S. public university



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ABSTRACT

Background: Few studies have explored the epidemiology of students presenting to the emergency department (ED) as a consequence of hazardous drinking. This study examined differentials and trends in ED visits following alcohol intoxication and co-occurring conditions among students presenting to a major U.S. university health system.

Methods: The ED electronic medical records from academic years 2010–2015 were queried for student visits and their records were linked to the university's student admission datasets. Student alcohol-related visits were identified based on ICD-9 codes. Student characteristics and trends in the rate of alcohol intoxication per 100 ED student visits were analyzed. A random sample of 600 student clinical records were reviewed to validate diagnostic codes.

Results: There were 9616 student ED visits (48% males) to the ED of which 1001 (10.4%) visits involved alcohol intoxication. Two thirds of ED visits with alcohol intoxication had a co-occurring diagnosis, with injuries (24%) being the most common condition. The rate of alcohol intoxication varied greatly by student demographics and campus-related factors. There was a linear increase in the rate of alcohol intoxication from 7.9% in 2009–10 to 12.3% in 2014–15 ($p < 0.01$). The increase was greater among female students, students below 20 years of age, Asian students, and student athletes. In the sample reviewed, only two thirds of ED visits with alcohol intoxication were recorded by diagnostic codes.

Conclusion: The rate of ED visits following alcohol intoxication varied by student demographic characteristics and campus-related factors with a rising trend over the study period.

1. Introduction

Numerous studies have identified that excessive alcohol use is a problem in the general college age population. Data from the Substance Abuse and Mental Health Services Administration (SAMHSA) from 2010 demonstrated an increase of 24.3% past-month alcohol users between 16 and 17 year olds and 18–20 year olds, and a 21.1% increase from 18 to 20 year olds to 21–25 year olds (SAMHSA, 2011). More specifically, 18–22 year olds enrolled full time in college had a higher prevalence of past month alcohol use (63.3% versus 52.4%), binge drinking (42.2% versus 35.6%), and heavy drinking (15.6% versus 11.9%) than those not enrolled in full time college. The most commonly presented direct and indirect outcomes of excessive alcohol

consumption that are seen in the emergency department (ED) include trauma, injuries, mental health issues, assault, and death.

Alcohol intoxication continues to present a great burden for ED personnel and consumes a significant amount of ED resources. The 2006–2010 national statistics on alcohol-related ED visits and comorbidities reported a rising trend in the rate of alcohol-related ED visits among young people 20–24 years of age from 97 to 120 per 100,000. A significant proportion of ED visits in this age group had co-occurring injuries (38%) or mental health concerns (35%) (NIAAA, 2013). Data from the Drug Abuse Warning Network (DAWN), which captured ED data for alcohol abuse among minors 18–20 years of age, estimated approximately 95,166 visits occurred for underage drinking (alcohol alone or in combination with drugs) in 2005. In 2010,

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however, underage drinking resulted in 114,722 ED visits, or 848.7 visits per 100,000 in 2010. This corresponds to approximately 21% increase since 2005, showing the increasing prevalence of alcohol-related medical emergencies among those 18–20 years of age (SAMHSA, 2011).

Students are a unique population whose alcohol use and drinking behavior are dependent on a range of personal, inter-personal, and campus-related factors. It is well-established that white students, first year students (Wechsler et al., 1995), and students enrolled in fraternities/sororities (Lo and Globetti, 1995; Presley et al., 2002) have higher rates of episodic heavy drinking than other students, while students who are engaged in athletics have lower rates of risky drinking. In addition, the type of residence and the college size also affect the level of binge drinking (National Institutes of Health, 2002).

While binge drinking is common among college students, most studies on college drinking behavior are self-report surveys, which are subject to reporting bias. Due to legal and social concerns, students tend not to provide honest responses to sensitive questions related to their hazardous drinking behavior, especially when it involves the use of emergency care (National Institutes of Health, 2002). Thus, EDs are in a unique position to provide objective clinical and epidemiological data enabling monitoring of hazardous drinking in college-age students. In addition, given the complex challenges in addressing dangerous alcohol use among college students, characterizing students presenting to the ED for treatment of intoxication is useful in developing adequate and targeted interventions and responses. A clearer understanding of the change over time of ED visits related to alcohol intoxication overall and within each demographic, organizational, and academic sub-group can provide important information to monitor the effectiveness of intervention efforts and determine which student sub-groups should be targeted.

To date, only three US-based, published studies have examined alcohol use and related health consequences amongst college students presenting to hospital EDs (Turner and Shu, 2004; Wright et al., 1998; Wright and Slovis, 1996). These studies indicate that prevalence of ED visits involving alcohol use ranged from 13 to 16 per 100 ED visits, of which trauma was the most common co-occurring health consequence, accounting for 53% (Turner and Shu, 2004) or 69% (Wright et al., 1998) of the total visits. Younger students, freshmen, white, and undergraduate students were more likely than other students to visit ED for alcohol-related reasons. However, these studies had certain limitations, including a limited number of ED visits ($n \leq 1529$) and a short study period (i.e., 1–2 years). Therefore, these studies were unable to delineate the trends over time in the use of a hospital ED following alcohol intoxication amongst student populations. Furthermore, the use of a single data source (i.e., ED data) does not adequately capture other important students' characteristics such as academic programs, organizational affiliation, or extra-curricular activities.

The aim of this study was to examine demographic, organizational, and academic differentials and trends in alcohol intoxication and related health consequences that were identified from diagnostic codes documented in medical records among students who presented to an ED affiliated with a major public hospital in the U.S., through the combined use of the ED database and the University's Student Information System. This study also evaluated the validity and accuracy of diagnostic codes documented in the patient medical records.

2. Methods

2.1. Study population and data sources

The current study was based on a cohort of students from a US public university who visited the university hospital ED during six academic years from 2009 to 10 to 2014–15. Data were created by linking three student datasets: ED's Patient Registration System, University's Student Information System (SIS), and the ED's Clinical

Data Repository (CDR).

The ED's *Patient Registration System* is a reporting system of students visiting the university hospital ED. It generates a daily report of individuals who are flagged as students in the ED (those who identify as students have "Student Health" indicated as their Primary Care Provider at the time of registration). These reports are available 48 h after the ED visit date.

SIS is the university's student information database that contains information on student demographic characteristics (e.g., age, gender, ethnicity), extracurricular activities (e.g., athletic participation), fraternity/sorority affiliation, schools, academic level and academic program for each term that a student is enrolled. Every student has a unique student identification number. The 2013–2014 university student enrollment consisted of 21,238 students (45% male), of which 14,898 (70%) were undergraduates and 6340 (30%) were graduate students. Approximately 70% (62) of students were non-Hispanic white, 12% were Asian, 6% were African American, 6% were Hispanic, 4% were multi-racial, and less than 1% were American Indian/Alaskan Native or Native Hawaiian/Pacific Islanders (University of Virginia, 2014).

CDR is an electronic data repository of patient admissions and visits to all clinics and departments in the university health system. It contains ICD diagnostic codes for each ED visit, unstructured clinical notes, and other key clinical variables including laboratory test results (e.g., blood alcohol values, urine drug screen tests), admission characteristics (e.g., date/time of arrival and triage, disposition, acuity), medications and procedures administered during the visit, and post-visit recommendations and referrals (e.g., primary care provider, specialists).

2.2. Data linkage

A two-step process was used to link the three student databases. First, we extracted an initial subset of students who visit the ED from the patient registration system. We matched students identified from this system based on first and last names as well as date of birth with the SIS. Second, these data were de-identified and further linked to student ED clinical data for each student ED visit from the CDR, using student unique EMR number and the visit date. This process yielded an integrated dataset that contains a full record of students who experienced an ED visit in the university hospital.

Students with acute alcohol intoxication overwhelmingly seek care at the University Hospital ED, which is within a mile of campus student housing, and the majority of off-campus student housing. The nearest alternate ED is at a private hospital approximately five miles from the center of campus that is not conveniently accessible to students and rarely utilized, as confirmed by student health insurance data utilization.

2.3. Ascertainment of alcohol intoxication and co-occurring consequences

Student ED visits due to alcohol intoxication and co-occurring health consequences were identified from ICD-9 diagnostic codes documented in the patient EMR. ICD-9 codes indicating alcohol intoxication included 305.0 and 303.0 as defined by NIAAA (2013). The physician's diagnosis of this condition was primarily based on clinical presentation and/or the patient self-report of drinking before the ED visit. Co-occurring conditions examined included: (i) injury and trauma; (ii) mental health issues: depression, anxiety, suicidal behavior; (iii) other substance use, and (iv) sexual assault.

2.4. Chart review of the patient medical records

To evaluate the validity and accuracy of alcohol intoxication identified by diagnostic codes, 600 clinical records (100 records in each academic year) were randomly selected for chart review performed by two independent medical reviewers. When a discrepancy in assigning a specific alcohol-related diagnosis code was found, the two reviewers

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