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College Student Drinking and Ambulance Utilization

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Abstract

Objective—Alcohol misuse by college students places resource demands on colleges and universities, including the provision of medical services for intoxicated students. We harvested archival data to document the prevalence of alcohol-related ambulance utilization and to explore factors associated with ambulance use.

Method—We reviewed two years of university ambulance records, and determined which trips were alcohol-related and their demographic, descriptive, and medical correlates.

Results—Alcohol use was associated with 17% and 16% of all university-based ambulance trips in 2005 and 2006, respectively. When alcohol was involved, patients were more likely to be under 21 years of age, less alert, and more likely to receive advanced life support. Alcohol-related ambulance trips were more likely to occur on weekends, to involve transport from a residence hall, and to a hospital.

Conclusion—Alcohol misuse is associated with 1 out of every 6 campus-based ambulance runs, a hidden cost of student alcohol misuse.

Keywords

alcohol abuse; emergency medical services; student health services

High volume alcohol use peaks among young adults between the ages of 18–25;¹ nearly 42% have reported heavy (binge) drinking, defined as 5 or more drinks on an occasion in the last month. Alcohol use increases risk for unintentional injuries (including motor vehicle accidents), homicide and suicide, the three leading causes of death in the young adults.² A particularly high risk subgroup are young adults enrolled full-time in college; college students drink more heavily than their same-age peers not attending college.¹

Alcohol misuse by college students affects the drinkers themselves, their peers, and the environment.³ Approximately 44% of students report heavy drinking within the last 2 weeks, with attendant hangovers, blackouts, and academic difficulties.⁴ Even more concerning are the 500,000 unintentional injuries and the 1,700 deaths among student drinkers each year.⁵ Peers sharing the college environment with heavy drinkers report having studies or sleep interrupted,⁴ and an estimated 600,000 have been assaulted or injured by a drunken student.⁵ Excessive drinking is also associated with property damage as well as the need for additional security, judicial, and student affairs personnel.³

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Alcohol misuse by students also places a burden on health services. For example, 16% to 33% of student visits to university-based emergency departments (EDs) are alcohol-related;^{6–8} in contrast, only 3% of ED visits by adolescents and young adults in the general population are alcohol-related.⁹ A little-recognized cost of student drinking involves the use of campus ambulance services. Even though 14% of ED visits involves ambulance transport,¹⁰ few data document the extent to which university-based ambulance services are needed as a result of student drinking.

This study was conducted to fill this gap in the literature by examining the prevalence and correlates of alcohol-related ambulance runs on a university campus. Data from two years were analyzed to address two questions: (a) What percentage of ambulance runs is alcohol-related, and (b) how do alcohol-related runs differ from non-alcohol-related runs?

Methods

The setting is a private four-year residential university in the northeastern US, which maintains a University Ambulance service as part of its Student Health Service. The University Ambulance serves 13,651 undergraduates, 5,715 graduate students, and 5,195 faculty and staff.¹¹ The student body consists of 44% men and 56% women; Whites account for 79%, African-Americans for 6.6%, Asian for 7.4%, and 5% of full-time undergraduate students are foreign nationals.¹¹

The study protocol was reviewed and approved by the Institutional Review Board; informed consent was waived because data for this study were obtained from de-identified archival records held at a health services office in a university in upstate New York. At this facility, every request for a University Ambulance leads to a Prehospital Care Report (PCR), a uniform report completed by the Emergency Medical Technician (EMT) on the scene as mandated by the state Department of Health Bureau of Emergency Medical Services. Data from all PCRs for 2005 and 2006 were harvested to obtain these nine variables:

- a. *alcohol-related or not* (coded 1 or 0); a call was alcohol-related if alcohol intoxication was mentioned in any of these fields: dispatch information, chief complaint as reported by patient, primary or secondary presenting problem as determined by an Emergency Medical Technician (EMT), and the observation and comments sections completed by EMTs.
- b. *day of the week*.
- c. *call location* (i.e., residence hall, Greek housing, main campus, off-campus locations).
- d. *patient gender*.
- e. *patient status* (i.e., student, visitor, faculty, staff).
- f. *patient alertness* was determined by the 4-item AVPU scale;¹² where “alert” = patient is oriented to person, place, and day; “voice” = patient responds to vocal commands but at least some responses to orientation questions are confused or incorrect; “pain” = patient responds to painful stimuli but is not oriented to person, place or day; and “unresponsive” = patient does not respond to voice or pain. Estimates of the interrater reliability of the AVPU fall in the moderate to substantial range when used in emergency departments ($k = .41$),¹³ and trauma centers ($k = .80$).¹⁴
- g. *neurological status* was determined by the Glasgow Coma Scale (GCS), an observational assessment widely used in acute care settings to determine level of consciousness;¹⁵ the total score combines information from eye, verbal, and motor responses and ranges from 3 = deep coma or death to 15 = fully awake and alert. Psychometric data for the GCS have been mixed, but generally adequate when applied

by trained users;¹⁶ weighted kappa was .85 in a sample of drug intoxicated patients in an emergency department.¹⁷

- h. *Treatment* was coded as either basic life support (BLS, which consists of non-invasive stabilization of patients, including first aid, administering oxygen, and immobilization) or advanced life support (ALS, involving more invasive care such as insertion of endotracheal tubes or IV lines, medication administration, or cardiac defibrillation)¹⁸.
- i. *Disposition* was coded as treated by unit, transported to hospital, transported to the University Health Center, patient refused treatment, or no patient found.

Data were analyzed using Stata 10.0. Correlates of alcohol-related status were determined using χ^2 tests for categorical data and *t*-tests for continuous data.

Results

The ambulance service responded to 1003 requests in 2005, and 1011 requests in 2006. Across both years, 53% of calls were for females, 82% were for students, and 68% were for persons less than 21 years of age. Calls came most often from residence halls (43%), main campus (29%), off-campus (16%), health services (11%), and Greek housing (2%). Basic life support was provided during 58% of calls, and advanced life support provided during 17% of calls; for 25% of calls, treatment was refused. The disposition of calls included treated by hospital (59%) or by university health services (6%), or refused treatment (31%).

During 2005, 171 of 1003 (17%) calls were alcohol-related; during 2006, 164 of 1011 (16%) calls were alcohol-related. Thus, across both years combined, 335 of 2014, or approximately 17%, of all ambulance requests were alcohol-related. Because the patterns of findings distinguishing alcohol-related calls were identical in both years, they have been combined for analyses.

Table 1 summarizes the comparisons between alcohol-related and non-alcohol-related ambulance calls on descriptive variables. First, alcohol-related calls were more likely to occur on weekend nights (Fridays, Saturdays, or Sundays) whereas non-alcohol related calls were distributed equivalently across the week. Second, alcohol-related calls were more likely to request transport from residence halls (66%); in contrast, non-alcohol-related calls came from a wider range of campus locations. Third, alcohol-related calls were more likely to come from students (88%) than from employees (0%). Fourth, men were more likely to be transported if the call was alcohol-related (54%) than when it was not (45%). Finally, alcohol-related calls typically transported younger patients ($M = 19.76$ years, $SD = 4.43$) relative to non-alcohol-related calls ($M = 22.96$ years, $SD = 10.92$), $t(1255) = 8.85$, $p < .001$. A full 81% of alcohol-related transports were underage.

Table 2 summarizes the comparisons between alcohol-related and non-alcohol-related ambulance calls with respect to patient medical status. When calls were alcohol-related, the primary presenting problem determined by the EMTs was substance misuse itself (73%; e.g., self-reports of "I think I drank too much" "I am just very drunk"), followed by injury (12%) and unconsciousness (3%); whereas non-alcohol-related calls were most commonly associated with injury (35%), pain (21%), or illness (18%). During alcohol-related calls, EMTs judged patients to be less alert (69% vs. 97%), and more likely to respond only to voice or pain. When the call was alcohol-related, the neurological status (as determined by the Glasgow Coma Scale) of the transported patient was significantly lower and more variable. Advanced life support was required more often (29% vs. 14%), and basic life support less likely (47% vs. 61%) when runs were alcohol-related compared to when they were not. Alcohol-related runs were more likely to result in transport to a hospital (65%) and less likely to result in transport

to the University Health Center (0%) relative to non-alcohol-related runs (57% and 8%, respectively).

Conclusions

This study provides the first published evidence of the prevalence and correlates of alcohol-related ambulance use on a university campus. Using data from two consecutive years, we found that alcohol-related events triggered 1 in 6 requests for a campus-based ambulance service. Thus, a significant minority of university ambulance runs result from student misuse of alcohol. At approximately \$600 per call,¹⁰ the 335 calls in our two-year study period would generate an annual expense of approximately \$100,000. Each ambulance run is staffed by at least one EMT who serves as a crew chief, and up to three other crewmembers. Thus, use of ambulances, equipment, and staff for this purpose would also remove them from service for other emergencies and services.

The characteristics of alcohol-related calls can provide information to help reduce these incidents. Overall, alcohol-related ambulance calls were strongly associated with patients being underage (i.e., < 21 years) students, consistent with previous findings that freshmen (who are generally underage) constitute a disproportionate number of alcohol-related ED visits.^{6,8} Evidence suggests that at least half of first-year students who required emergency medical transport admitted to drinking more than they usually drink,¹⁹ and that associations between blood alcohol concentrations (BACs) and negative consequences is stronger for lighter drinkers.²⁰ Taken together, it appears that inexperienced drinkers who exceed their usual consumption levels are at greatest risk for ambulance transport. Alcohol abuse prevention efforts should include lighter drinkers as well as heavier drinkers; programming might include methods of monitoring BACs to avoid overconsumption requiring emergency intervention.

Alcohol-related calls were also associated with lower patient alertness and higher levels of treatment provided. Lower levels of alertness is consistent with alcohol overdose and/or greater levels of alcohol-induced injury. The signs and risks associated with alcohol poisoning should be core elements of alcohol prevention programs, because overdose on a psychomotor depressant such as alcohol can result in inability to communicate health-care needs and can itself be a primary cause of death.²¹ Alcohol-related status also leads to greater likelihood of hospital-based treatment, with resultant additional costs in time and expense.

We acknowledge the study's limitations. First, we relied on archival data, so that alcohol-related status was determined post-hoc with the data available on the PCR; this may have resulted in underestimates of alcohol involvement. Use of existing data also limits the range of possible predictors and prevents direct evaluation of the reliability of EMT ratings on the AVPU and GCS. Second, conclusions were based only on two successive years of data. The fact that proportions of alcohol-related runs remained stable across two years (as did their demographic and clinical correlates) increases confidence that our data reflect generalizable and not transient patterns of ambulance use. However, these findings await replication at other institutions.

Longitudinal studies document that many heavy drinking students reduce their consumption after graduating from college.^{22,23} Thus, the heavy episodic drinking that leads to high blood alcohol concentrations and resulting health risks has been construed as a developmentally limited phenomenon. Despite the fact that most young adults who drink to excess will not continue on this trajectory post-graduation, their behavior places them and others at risk in the present.

The present data help to document the acute impact of individual's alcohol use on the university community. As noted by Perkins,³ estimates of institutional costs related to alcohol misuse are not readily available. Health economists acknowledge that economic evaluations of prevention

programs are underdeveloped in relation to treatment programs, in part because losses and gains of preventing future health problems are hard to quantify.²⁴ These data provide a proxy measure of immediate cost to the institution of student alcohol misuse, and a potential metric for evaluating the effectiveness of prevention programming. Better cost estimates for property damage and the demands on personnel in health, security, and judicial services could shape discussions about alcohol abuse prevention policies.

Campuses vary on the relative balance of environmentally-based supply-reduction strategies and individually-focused demand-reduction strategies.²⁵ For example, our institution employs a combination of universal, population-based prevention (an on-line education program is required of all new students; published policies restrict access to alcohol on campus), selective prevention for at-risk students (e.g., educational programs required of members of Greek organizations), and indicated prevention for those students who fail to abide by campus alcohol policies.²⁶ Notably absent are conversations about the specific costs to the campus community of individual decisions to misuse alcohol. The campus community and society at large can make more informed decisions about resource management if they know how the alcohol use of undergraduate students affects the campus as a whole.

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References

1. Substance Abuse and Mental Health Services Administration. Office of Applied Studies, NSDUH Series H-34, DHHS Publication No. SMA 08-4343. Rockville, MD: 2008. Results from the 2007 National Survey on Drug Use and Health: National Findings.
2. Park MJ, Mulye TP, Adams SH, Brindis CD, Irwin CE. The health status of young adults in the United States. *J Adolesc Health* 2006;39:305–317. [PubMed: 16919791]
3. Perkins HW. Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *J Stud Alcohol Suppl* 2002;(suppl 14):91–100. [PubMed: 12022733]
4. Wechsler H, Lee JE, Kuo M, Seibring M, Nelson TF, Lee H. Trends in college binge drinking during a period of increased prevention efforts: Findings from 4 Harvard School of Public Health college alcohol study surveys: 1993–2001. *J Am Coll Health* 2002;50:203–217. [PubMed: 11990979]
5. Hingson R, Heeren T, Winter M, Wechsler. Magnitude of alcohol-related mortality and morbidity among US college students ages 18–24: Changes from 1998 to 2001. *Ann Rev Public Health* 2005;26:259–279. [PubMed: 15760289]
6. Meilman PW, Yanofsky NN, Gaylor MS, Turco JH. Visits to the college health service for alcohol-related injuries. *J Am Coll Health* 1989;37:205–210. [PubMed: 2784805]
7. Turner JC, Shu J. Serious health consequences associated with alcohol use among college students: Demographic and clinical characteristics of patients seen in an emergency department. *J Stud Alcohol* 2004;65:179–183. [PubMed: 15151347]
8. Wright SW, Norton VC, Dake AD, Pinkston JR, Slovis CM. Alcohol on campus: Alcohol-related emergencies in undergraduate college students. *South Med J* 1998;91:909–913. [PubMed: 9786284]
9. Elder RW, Shults RA, Swahn MH, Strife BJ, Ryan GW. Alcohol-related emergency department visits among people ages 13 to 25 years. *J Stud Alcohol* 2001;65:297–300. [PubMed: 15222585]
10. Larkin GL, Claassen CA, Pelletier AJ, Camargo CA Jr. National study of ambulance transports to United States emergency departments: Importance of mental health problems. *Prehosp Disaster Med* 2006;21:82–90. [PubMed: 16770997]
11. Syracuse University, Office of Development. Facts: Syracuse University 2008–2009 Web site. 2008 [Accessed February 23, 2009]. http://www.syr.edu/aboutsu/SU_FACTS_2008-09web.pdf

12. McNarry AF, Goldhill DR. Simple bedside assessment of level of consciousness: Comparison of two simple assessment scales with the Glasgow Coma scale. *Anaesthesia* 2004;59:34–37. [PubMed: 14687096]
13. Gill M, Martens K, Lynch EL, Salih A, Green SM. Interrater reliability of 3 simplified neurological scales applied to adults presenting to the emergency department with altered levels of consciousness. *Ann Emerg Med* 2007;49:403–407. [PubMed: 17141146]
14. Mullins RJ, Hedges JR, Rowland DJ, Arthur M, Mann NC, Price DD, Olson CJ, Jurkovich GJ. Survival of seriously injured patients first treated in rural hospitals. *J Trauma* 2002;52:1019–1029. [PubMed: 12045626]
15. Teasdale G, Jennett B. Assessment of coma and impaired consciousness: A practical scale. *Lancet* 1974;2:81–84. [PubMed: 4136544]
16. Prasad K. The Glasgos Coma Scale: A critical appraisal of its clinimetric properties. *J Clin Epidemiol* 1996;49:755–763. [PubMed: 8691225]
17. Heard K, Bebarta VS. Reliability of the Glasgow Coma Scale for the emergency department evaluation of poisoned patients. *Hum Exp Toxicol* 2004;23:197–200. [PubMed: 15171571]
18. Limmer, D.; Okeefe, MF.; Grant, HD.; Murray, RH.; Bergeron, JD. *Brady Emergency Care*. 9. Upper Saddle River, NJ: Prentice-Hall; 2001.
19. Reis J, Harned I, Riley W. Young adult's immediate reaction to a personal alcohol overdose. *J Drug Educ* 2004;34:235–254. [PubMed: 15648885]
20. Neal DJ, Carey KB. The association between alcohol intoxication and alcohol-related problems: An event-level analysis. *Psychol Addict Behav* 2007;21:194–204. [PubMed: 17563139]
21. Schuckit, MA. *Drug and Alcohol Abuse: A Clinical Guide to Diagnosis and Treatment*. 6. NY: Springer; 2006.
22. Schulenberg J, O'Malley PM, Bachman JG, Wadsworth KN, Johnston LD. Getting drunk and growing up: Trajectories of frequent binge drinking during the transition to young adulthood. *J Stud Alcohol* 1996;57:289–304. [PubMed: 8709588]
23. Sher KJ, Bartholow BD, Nanda S. Short- and long-term effects of fraternity and sorority membership on heavy drinking: A social norms perspective. *Psychol Addict Behav* 2001;15:42–51. [PubMed: 11255938]
24. French MT, Drummond M. A research agenda for economic evaluation of substance abuse services. *J Subst Abuse Treat* 2005;29:125–137. [PubMed: 16135341]
25. Wechsler H, Seibring M, Liu I, Ahl M. Colleges respond to student binge drinking: Reducing student demand or limiting access. *J Am Coll Health* 2004;52:159–168. [PubMed: 15018427]
26. Carey KB, Henson JM, Carey MP, Maisto SA. Computer versus in-person intervention for students violating campus alcohol policy. *J Consult Clin Psychol* 2009;77:74–87. [PubMed: 19170455]

Table 1

Descriptive Characteristics of Alcohol-Related Ambulance Runs

	2005–2006		Significance test	p value
	Alcohol-Related	Not Alcohol-Related		
	17%	83%		
Weekday			$\chi^2 (6) = 216.00$	<.001
Monday	4%	14%		
Tuesday	3%	15%		
Wednesday	4%	15%		
Thursday	5%	14%		
Friday	19%	16%		
Saturday	32%	13%		
Sunday	32%	13%		
Call Location			$\chi^2 (4) = 132.08$	<.001
residence halls	66%	38%		
Greek houses	4%	1%		
off-campus	17%	16%		
main campus	11%	32%		
Health Services	2%	12%		
Patient Status			$\chi^2 (2) = 23.61$	<.001
employee	0%	7%		
visitor	12%	14%		
student	88%	80%		
Gender			$\chi^2 (1) = 7.18$	<.01
female	46%	55%		
male	54%	45%		
Age			$\chi^2 (1) = 31.48$	<.001
< 21 years	81%	65%		
≥21 years	19%	35%		

Note. Percentages sum down subcategories within columns defined by alcohol-related and not alcohol-related. Totals may not sum to 100% due to rounding error.

Table 2**Medical Characteristics of Alcohol-Related Ambulance Runs**

	2005–2006		Significance test	<i>p</i> value
	Alcohol-Related	Not Alcohol-Related		
Consciousness			$\chi^2 (3) = 299.37$	<.001
Alert	69%	97%		
Voice	20%	2%		
Pain	10%	1%		
Unresponsive	1%	0%		
Treatment provided			$\chi^2 (2) = 35.12$	<.001
Advanced Life Support	29%	14%		
Basic Life Support	47%	61%		
Refused Treatment	25%	25%		
Disposition			$\chi^2 (4) = 33.03$	<.001
treated by unit	0%	2%		
treated by hospital	65%	57%		
treated by UHC	0%	8%		
refused/cancelled	33%	31%		
no patient found	1%	2%		
Neurological status	13.43 ± 2.72	14.85 ± .95	$t (315)^a = 8.92$	<.001

Note. UHC = University Health Center. Percentages sum down subcategories within columns defined by alcohol-related and not alcohol-related.

^a *t*-test degrees of freedom reflect Satterthwaite's method for unequal variances.