



Original Contribution

Alcohol and drug screening of adolescent trauma alert patients at a level 1 pediatric trauma center☆



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ABSTRACT

Background: Adolescent trauma patients are reported to have increased incidence of alcohol and other drug (AOD) use, but previous studies have included inadequate screening of the intended populations. A Level 1 Pediatric Trauma Center achieved a 94% rate of AOD screening. We hypothesized that a positive AOD screening result is associated with males, increasing age, lower socioeconomic status, violent injury mechanism, higher Injury Severity Score (ISS), lower GCS, need for operation and increased hospital length of stay.

Methods: After achieving high rates of screening among admitted trauma alert patients 12–17 years old, we evaluated patients presenting during 2014–2015. Chi-square tests were used to compare the percentage of patients with positive test results across sociodemographic, injury severity measures and patient outcomes.

Results: Three hundred and one patients met criteria for AOD screening during the study period. Ninety-four percent of these patients received screening and 18% were positive. Males (21.4%) were more often positive than females (11.6%). Increasing age was directly correlated with AOD use. Race was associated with a positive screen. Black patients more often had positive screens (40.9%), as compared with White patients (13.8%) and other races (23.5%). Patients with commercial insurance (6.6%) were less likely to be positive than those with no insurance (19.0%) or Medicaid (30.9%). Lower median household income was associated with positive AOD screening. Patients with violent injury mechanisms were more likely to screen positive (36.2%) than those with non-violent mechanisms (18.0%). No statistical differences were found with injury severity scores, the need for operation, or hospital length of stay.

Conclusions: With near universal screening of adolescent trauma alert admissions, positive AOD results were more often found with males, increasing age, lower socioeconomic status, and violent injury mechanism.

Level of evidence: Level III, Retrospective comparative study without negative criteria.

Study Type: Prognostic.

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1. Background

Trauma continues to be the number one cause of death for children and young adults. Risk factors for injury or injury recidivism, if identified, may guide interventions that aim to reduce future injury. Adult trauma patients are known to have higher rates of alcohol and other drug (AOD) use when compared to other hospitalized patients [1–4]. Adolescent trauma patients have been shown to have higher risk of AOD use when compared to adolescents presenting with other medical conditions [5], and AOD use may be as high as 25% [6]. Because of these reports of increased risk, the American College of Surgeons requires verified trauma centers to perform alcohol screens and recommends

screening for drugs of abuse for injured patients [7]. Although alcohol screening is mandated and drug screening is recommended, best practices in screening methods and ages to screen are not well defined in the literature.

A study from 2009 reported wide variability in screening policies and practices across hospitals in the United States [8]. A report from the Pediatric Trauma Society, as a result of a literature review, recommended universal alcohol screening of injured adolescents, age 12 years and above, using both biochemical tests and questionnaires [9]. Barriers to implementing AOD screening in a pediatric trauma center may include concerns over confidentiality, health insurance liability, increased health care costs, and healthcare providers' perceptions [10]. When alcohol and drug screening is not applied with a universal policy and standardized procedures, previous studies have described both racial and gender bias. Black and Hispanic adult trauma patients were screened more often than white adults [11]. In the adolescent population, Hispanic males, African-American females, and males in general were more often screened [12]. While this is an area of growing concern, multiple studies looking to evaluate the adolescent trauma population have reported screening only 28–52% of the intended population [13–18].

Our Level 1 Pediatric Trauma Center developed and implemented a universal AOD screening policy in 2009 for all trauma alert admissions age 12 and older. The screening policy was tracked after implementation, and it was found that only 63% of intended patients were being screened. A quality improvement initiative was implemented, and the center was able to achieve a 94% compliance rate by 2014. The purpose of this study is to report AOD positive screening rates after achieving near universal screening of a large population of hospitalized pediatric trauma patients.

2. Methods

This study was approved by our institutional review board. A trauma database query was performed to identify patients 12–17 years old presenting as trauma alerts and hospitalized from January 1, 2014 to December 31, 2015. "Trauma alerts" include all patients triaged as "Level 1 trauma alert" (major resuscitation) and "Level 2 trauma alert" (minor resuscitation). Injured patients who did not receive trauma team activation were not universally screened and therefore not included in the study.

The policy for alcohol and drug screening during this study included screening all admitted trauma alert patients age 12 years and above. Ethanol and drugs of abuse were obtained by either urine or blood sample. The drugs of abuse screen included testing for amphetamines, barbiturates, benzodiazepines, cocaine metabolites, opiates and tetrahydrocannabinol (THC). If a prescription drug was positive, a chart review and patient/family interview was conducted to determine if the positive result could have been due to illicit drug use or due to prescription medication administered during the patient's trauma care. A CRAFFT questionnaire was performed on patients with negative lab results. The CRAFFT screen is a validated screening questionnaire for adolescents regarding their past year's alcohol and other drug use. It was developed at the Center for Adolescent Substance Abuse Research (CeASAR) at Boston Children's Hospital and its name is derived from key words in its assessment questions: Car, Relax, Alone, Forget, Friends, and Trouble. In our study, CRAFFT screening was deferred for any patient who had a positive lab result, since social work would provide a more thorough evaluation and referral to services as needed. If lab results or CRAFFT screen were positive, Social Work was consulted for brief intervention and/or referral to treatment.

Demographic data collected on all study subjects included age, gender, race, and zip code of primary residence. Injury data collected included mechanism of injury, Injury Severity Score (ISS), lowest Glasgow Coma Score (GCS), diagnoses, operative intervention and hospital length of stay. Mechanism of injury was then grouped into the

following categories: gunshot wound, hanging, motorized vehicle, assault/stabbing, fall, sports/recreations and other. Mechanism of injury was also categorized by violent (gunshot wound and assault/stabbing) and non-violent (hanging, motorized vehicle, fall, sports/recreations and other) mechanism.

Patient medical payer source was collected and designated as commercial, self-pay or Medicaid. In addition, median household income for the corresponding years of the study period was obtained from United States Census Bureau data and matched to the primary zip code to estimate economic status [19].

Chi-square tests were used to compare the percentage of patients with positive test results across sociodemographic and other patient factors.

3. Results

There were 301 trauma patients who met criteria for AOD screening in 2014–2015. Of those patients, 286 (93.7%) received at least one form of AOD screening. Testing performed included Ethanol (70.4%), Drugs of Abuse (85.4%) and/or CRAFFT screen (35.5%). The overall incidence of AOD use identified through this screening was 18.3%, with Ethanol positive in 8/212 (3.8%), Drugs of abuse positive in 41/257 (15.9%) and CRAFFT positive in 21/107 (19.6%). CRAFFT screen was positive in 7 cases in which lab testing was performed and results were negative.

The most frequently identified substance positive in laboratory AOD screening was THC ($n = 19$), followed by opiate ($n = 12$), alcohol ($n = 8$), benzodiazepine ($n = 6$) and amphetamine ($n = 1$) (Table 1). The CRAFFT screen was positive in 6 patients whose AOD labs were negative. Males (21.4%) were more often positive than females (11.6%, $p = 0.04$, Fig. 1). Increasing patient age was directly correlated with increasing positive AOD rates ($p = 0.0001$, Fig. 2). Black (40.9%) race was strongly associated with positive screening when compared to white race (13.8%) and other (23.5%, $p = 0.0008$).

Medicaid patients had the highest rates of positive AOD results (30.9%), followed by self-pay (19.0%) and privately insured patients (6.6%, $p < 0.0001$, Fig. 3). Socioeconomic status was evaluated by proxy using median household income by zip code of residence. The highest rate of positive AOD screens was seen in patients from zip codes in the lowest socioeconomic category (<\$30,000 median household income). Logistic regression was used to evaluate the influence of household income in a model with demographics. In the model, sex, age, and African American race all continued to be statistically associated with AOD use. The effect of household income on the AOD rate was not significant in the multivariable regression model.

Patients with gunshot wounds and or evidence of hanging were found to have the highest rate of positive AOD results, but these were not statistically different when compared with rates seen in patients with other injury mechanisms (Fig. 4). When injury mechanism was divided into violent versus non-violent mechanisms, patients with violent injury mechanisms (36.8%) were more likely to be positive for AOD use than those with non-violent injury mechanisms 15.6%, ($p = 0.0015$).

Injury Severity Scores (ISS) was assigned after all injuries were diagnosed. ISS was divided into minor injury ($ISS \leq 15$) and major injury ($ISS > 15$). Positive AOD results were not statistically different in patients with major injury (23.8%) versus minor injury (17.2%) [$p =$

Table 1
AOD screen positive

	Frequency	%
THC	19	36.5
Opiates(OPI)	12	23.1
Alcohol	8	15.4
Benzodiazepine	6	11.5
CRAFFT	6	11.5
Amphetamines(AMP)	1	2.9
Total	52	100.0

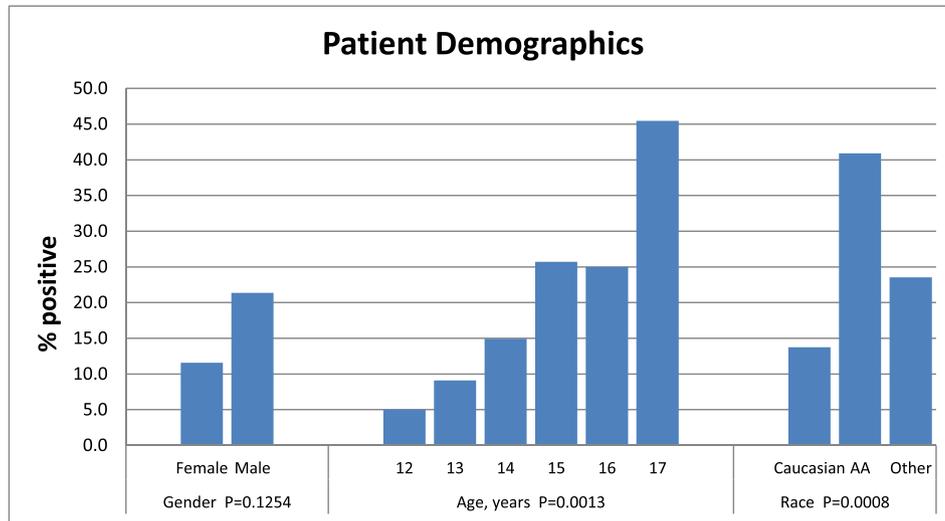


Fig. 1. Positive AOD screen by demographics.

0.23]. The majority of patients positive for AOD screening had a GCS of 15 (78.1%). Positive AOD results did not differ in patients with GCS = 15 and GCS < 15 [$p = 0.51$]. Hospital lengths of stay (LOS) tended to be longer in those with higher rates of AOD use, but in this sample, these differences were not significant ($p = 0.5191$). Also, no difference was seen in the need for operation.

4. Discussion

This study is a report of alcohol and drug use in the adolescent trauma population that presents data from near-universal screening of the intended population. Previously published studies have only achieved screening 28–52% of their intended population. This is important as screening bias and inadequate screening may impact data presented as representative for the adolescent trauma population.

This study shows that a significant proportion of moderate to severely injured pediatric trauma patients screened positively for alcohol and drugs of abuse. The 2015 National Survey on Drug Use and Health, performed by SAMHSA, found that adolescents age 12–17 years self-reported illicit drug use at 8.8% prevalence and alcohol use at 9.6% prevalence [20]. Our study results indicate that adolescents admitted

following trauma alert are more than twice as likely than the general population to be positive for illicit drug use, but rates of alcohol use are less than the general population.

The most commonly used substance identified was THC, followed by opiates and alcohol. The highest rates of positive screens in our study were in males and patients with older age, African American race, lower socioeconomic status and violent injury mechanisms. The direct correlation of increasing age and AOD use is also consistent with national youth surveys [21]. The low rate of AOD use (5%) identified in 12 year old patients reinforces using that age as a threshold for screening.

Our findings of increasing AOD results in males and increasing age correlate with established national drug and alcohol use statistics. The importance of education and screening based on this data is well established as school based programs target pre-teens and adolescents in an attempt to curb AOD use before it starts. When comparing rates of AOD use by gender and age, we found that there was a steady increase in positive AOD screens in male trauma patients as age increased, whereas the rate of AOD use in female trauma patients remained fairly low until age 17, at which age AOD use jumped to 50% and bypassed the rate of AOD use by 17 year old males (41.7%).

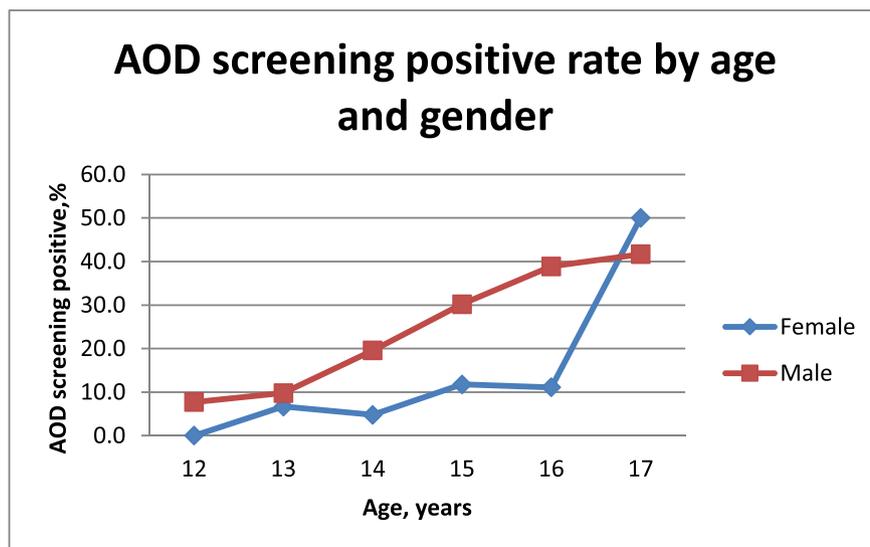


Fig. 2. Positive AOD screen by gender and age.

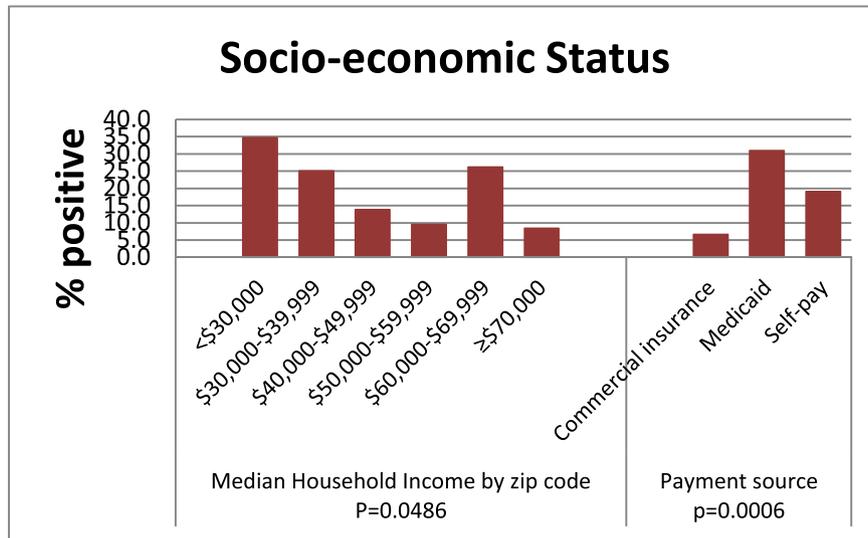


Fig. 3. Positive AOD screen by socio-economic status.

The study has several limitations. This study is a single-center experience and may not be representative of other regions. The center is a large Level 1 pediatric trauma and burn center that serves approximately 2 million people and covers both urban and rural areas. The area has a considerable heroin and opioid use prevalence in the community. A large proportion of trauma alert patients receive some form of opiate prior to arrival at the trauma center to help alleviate their pain, and a smaller proportion receive benzodiazepine to alleviate muscle spasms if long bone fractures are present, or for seizure treatment in head injured patients. This may lead to missed identification of illicit drug use as positive screening results are attributed to medications given for trauma care. This may be of increased importance in regions where prescription opioids and heroin are commonly abused.

For socio-economic evaluation, we were limited to source of medical payment and median household income by zip code. Both factors have limitation in direct measurement of the patient’s socioeconomic status.

With the findings of racial and socioeconomic differences, community-based initiatives may also be beneficial to impact adolescent alcohol and drug use. By targeting prevention, screening and treatment in communities with higher risk for AOD use, these efforts may be more efficient and their impact may be increased. In addition, as violent

injury mechanism correlates with increased positive AOD results, prevention strategies may help reduce the incidence of violent injuries as well as AOD use. This information can be used by primary care providers, school systems, and community based programs such as sports organizations to screen and intervene on AOD use, violence and injury in at-risk adolescents.

This study and other research suggest that broader screening for AOD (for example, in the primary care or school setting) could identify pediatric patients at increased risk for injury and violence. Once identified, prevention strategies could be implemented in an attempt to reduce AOD use. In addition, communities at higher risk could be identified and community-based programs developed in an attempt to decrease AOD use.

This study addresses the first step in AOD treatment: Achieving universal screening and identifying at-risk populations. Further research is needed to evaluate the impact of brief intervention and referral to treatment once AOD screening is positive. Do current strategies reduce future AOD use and therefore decrease the rate of injury recidivism? Perhaps brief intervention is not enough and primary caregivers have a role to play in ongoing discussion and counseling. This could be achieved by routine follow-up care to reinforce the information

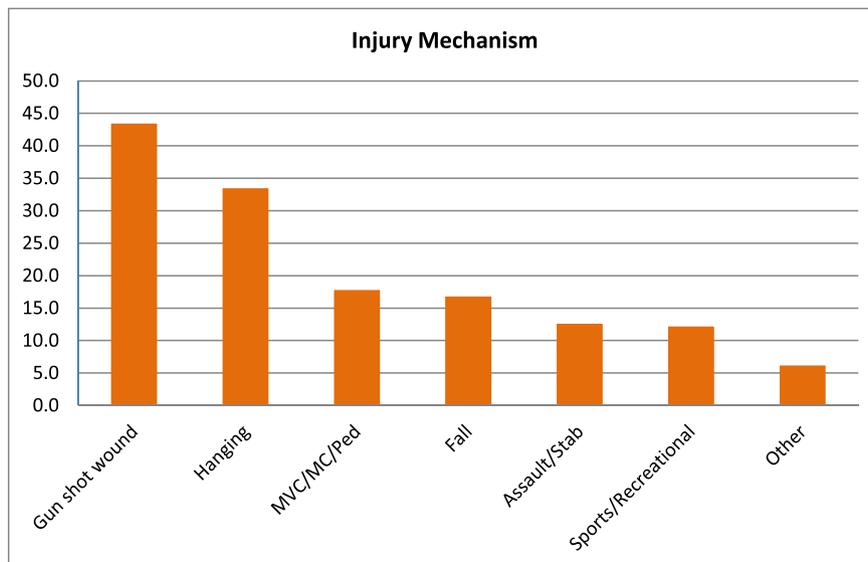


Fig. 4. Positive AOD screen by injury mechanism.

provided at the time of injury. Due to time constraints in a clinic or acute care setting, utilizing electronic devices for ongoing education and screening may not only save time, but may also be appealing to the technology-savvy adolescent population.

Conflict of interest

The authors have no conflicts of interest or funding sources to report.

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