Screening for At-Risk Drinking Behavior in Trauma Patients

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Context: A blood alcohol level above 0 g/dL is found in up to 50% of patients presenting with traumatic injuries. The presence of alcohol in the blood not only increases the risk of traumatic injury, but it is also associated with worse outcomes and trauma recidivism. In light of these risks, the American College of Surgeons Committee on Trauma advocates screening for at-risk drinking. Although many institutions use blood alcohol levels to determine at-risk drinking in trauma patients, the Alcohol Use Disorders Identification Test (AUDIT) offers a cheap and easy alternative. Few direct comparisons have been made between these 2 tests in trauma patients.

Objective: To compare the utility of blood alcohol level and AUDIT score as indicators of at-risk drinking in trauma patients.

Methods: Records for all trauma patients aged 18 years or older who were admitted to a level I trauma center from May 2013 through June 2014 were reviewed in this retrospective cohort study. Inclusion criteria required patients to have undergone both blood alcohol level testing and AUDIT on admission. A blood alcohol level greater than 0 g/dL and an AUDIT score equal to or above 8 were considered positive for at-risk drinking. Performance of both tests was indexed against the National Institute of Alcohol Abuse and Alcoholism (NIAAA) criteria for at-risk drinking.

Results: Of 750 patients admitted for trauma, 222 records (30%) contained data on both blood alcohol level and AUDIT score. The patients were predominantly male (178 [80%]) and had a mean (SD) age of 40.1 (16.7) years. Most patients (178 [80%]) had sustained blunt trauma. Ninety-seven patients (44%) had a positive blood alcohol level, 70 (35%) had a positive AUDIT score, and 54 (24%) met NIAAA criteria for at-risk drinking. The sensitivity and specificity of having a positive blood alcohol level identify at-risk drinking were 61% and 62%, respectively. The sensitivity and specificity of having a positive AUDIT score identify at-risk drinking were 83% and 81%, respectively.

Conclusion: As a stand-alone indicator of at-risk drinking behavior in trauma patients, the AUDIT score was shown to be superior to blood alcohol level. The utility of obtaining routine blood alcohol levels in trauma patients as a screening tool for at-risk drinking should be reexamined.

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Traumatic injury and alcohol consumption share a complicated relationship, with acute alcohol consumption being an independent risk factor for injury,[1-3] increased severity of injury,[4,5] and worse outcomes for most injuries.[5,6] Up to 50% of trauma patients have alcohol detected in their bloodstream at the time of admission, and 10% or more of these patients will present again to the same hospital with a new injury within a year.[7-10] Given the interactions between alcohol and trauma, screening and intervention for at-risk drinking behavior are important components of injury prevention and public health. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines at-risk drinking as that which may lead to alcohol abuse, liver disease, and other adverse consequences (>4 drinks per day for men and >3 drinks for women).[11]

Hospitalization of trauma patients provides a potential opportunity for psychosocial intervention.[12] The efficacy of brief substance abuse intervention programs has been demonstrated by several different trauma centers.[10,13-16] These studies have shown that nearly 80% of patients with a positive blood alcohol level are willing to participate in a brief intervention, and brief interventions are associated with a 50% reduction in hospital admission for traumatic injury during the subsequent year.[15,16] These effects can last for several years after the brief intervention.[10]

The low cost associated with screening and intervention[12,17] and the potential cost savings from reducing trauma recidivism[13,15,16] represent a large potential savings of health care dollars. A cost analysis by Gentilello et al[10] suggested that the savings could amount to more than $1.8 billion per year, making screening and intervention for at-risk drinking one of the single most cost-effective preventive health care measures.

Recognizing the importance of these brief interventions, the American College of Surgeons Committee on Trauma adopted screening for at-risk drinking and providing brief interventions as a critical component of level I and II trauma center care standards.[18] Furthermore, they developed a reference guide to aid with the implementation of these programs,[19] which offers multiple suggestions for screening modalities. However, most institutions rely on admission blood alcohol levels alone.[20,21] In the current study, we compared the use of scores on the Alcohol Use Disorders Identification Test (AUDIT) with blood alcohol levels to determine at-risk drinking in trauma patients.

Methods

The Loyola University Medical Center (LUMC) Injury Prevention Program maintains a database of all patients admitted to the trauma service. Besides basic demographic information and injury information, the database contains the results of all drug and alcohol screenings performed at LUMC, including laboratory tests and AUDIT. On admission to the hospital, trauma patients are asked if they are willing to complete an AUDIT and, if they provide consent, the test is verbally administered by either a trained social worker or a nurse. The answers are then entered into the database. Generally, AUDIT is performed the day after admission to the hospital; however, the test is not administered to patients in the following instances: discharge occurs before AUDIT is offered, consent is not given, Glasgow Coma Scale score is less than 15, intubation is necessary, or the patient does not speak English.

After obtaining approval from the LUMC institutional review board, a retrospective cohort analysis was performed on all trauma patients aged 18 years or older admitted between May 1, 2013, and June 30, 2014. This analysis reflects the experience of a single Midwestern, urban, American College of Surgeons–verified level I trauma center. Patients were included in the study if their records documented both a blood alcohol level and an AUDIT score. Patients whose record documented only 1 of these test results were excluded from the analysis. Data collected included patient age, sex, mechanism of injury, blood alcohol level,

AUDIT score, and the self-reported presence or absence of at-risk drinking behavior according to the NIAAA criteria.

Blood Alcohol Level

According to institutional protocol for patients with severe traumatic injuries and all burn injuries, blood was drawn to screen for the presence of alcohol. Testing for blood alcohol level for minor traumas was ordered at the discretion of the admitting physician. For patients transferred from another facility, only patients with blood alcohol levels obtained at LUMC were included, because outside laboratory results were not recorded in the database. Any level above 0 g/dL was considered positive.

Alcohol Use Disorders Identification Test

The 10 questions that make up AUDIT assess the following: how often patients drink; the quantity of alcohol consumption per day; patients' ability to stop drinking; the extent, if any, to which drinking interferes with daily responsibilities; the need for a drink to start the day; feelings of guilt or remorse after drinking; any blackouts or injuries experienced as a result of drinking; and concern expressed by others.[21] A score of 8 or higher (possible score range, 0-40) was considered positive.[22] The test was also used to determine whether patients met the NIAAA case definition of at-risk drinking.[11]

Statistical Analysis

The test for blood alcohol level and AUDIT were benchmarked against the NIAAA criteria for determining the operational characteristics of each test. The NIAAA case definition was used to denote a true positive for at-risk drinking.

Data were analyzed using Microsoft Excel statistical software (Microsoft Corporation). Comparisons between the 2 screening modalities were made using a χ^2 test, and comparisons within each method were made using a χ^2 test of independence. A P value of less than .05 was considered statistically significant.

Results

A total of 750 patients were admitted to the trauma service during the 14-month study period. Of these patients, 222 (30%) had a blood alcohol level and an AUDIT score recorded, 382 (51%) had a blood alcohol level but no AUDIT score, 50 (7%) had an AUDIT score but no blood alcohol level, and neither test result was recorded for 96 (13%). Of the 222 patients included in the study, the majority were male (80%) with a mean (SD) age of 40.1 (16.7). The majority of patients sustained blunt trauma (80%), with motor vehicle crashes being the most common cause of injury. Patient demographics are presented in *Table 1*. Of the 222 patients in the study, 54 (24%) met NIAAA criteria for engaging in at-risk drinking.

Ninety-seven patients (44%) had a positive blood alcohol level and 125 (56%) had no detectable level of alcohol. For those patients with a detectable blood alcohol level, 25 had a level less than 0.080 g/dL and 72 had a level of 0.08 g/dL or higher (mean [SD], 1.70 [1.09] g/dL). Of the patients with a positive blood alcohol level, 33 (34%) met the NIAAA criteria for engaging in at-risk drinking (*Table 2*), giving a positive blood alcohol level a sensitivity of 61%, a specificity of 63%, a positive predictive value of 34%, and a negative predictive value of 82%.

Seventy patients (32%) had positive AUDIT scores (mean [SD] score, 15.0 [7.6]). Of the patients with a positive AUDIT score, 45 (64%) met the NIAAA criteria for engaging in at-risk drinking (*Table 2*), giving a positive AUDIT score a sensitivity of 83%, specificity of 81%, positive predictive value of 58%, and negative predictive value of 93%.

Given the relatively low positive predictive value of both tests, we compared the ORs of at-risk drinking with various ranges in blood alcohol levels (*Figure 1*) and AUDIT scores (*Figure 2*). Increasing blood alcohol levels and AUDIT scores were associated with a significantly increased OR of engaging in at-risk drinking ($P<.01$). However, a more robust correlation was seen with the OR for increasing AUDIT scores compared with increasing blood alcohol levels.

Table 1.
Demographic Characteristics of Trauma Patients Who Underwent Blood Alcohol Level Testing and AUDIT to Determine At-Risk Drinking (N=222)

Characteristic	Patient Data[a]
Age, mean (SD), y	**40.1 (16.7)**
Sex	
Male	178 (80)
Female	44 (20)
Race	
White	107 (48)
Black	71 (32)
Latino/Hispanic	39 (18)
Asian	4 (2)
Other	1 (<1)
Mechanism of Injury	
Blunt	178 (80)
Motor vehicle accident	81 (36)
Pedestrian struck by motor vehicle	18 (8)
Assault	16 (7)
Fall	45 (20)
Other	18 (8)
Penetrating	44 (20)

[a] Data are given as No. (%) unless otherwise indicated.

Abbreviation: AUDIT, Alcohol Use Disorders Identification Test.

Table 2.
Comparison of Screening Methods for At-Risk Drinking in Trauma Patients (N=222)[a]

Screening Method	At-Risk Drinking	No At-Risk Drinking
Blood Alcohol Level[b]		
Positive	33	64
Negative	21	104
AUDIT Score[c]		
Positive	45	25
Negative	9	143

[a] Data are given as No. of patients.
[b] A blood alcohol level higher than 0 g/dL was considered positive for at-risk drinking.
[c] A score of 8 or greater (possible range, 0-40) on the Alcohol Use Disorders Identification Test (AUDIT) was considered positive for at-risk drinking.

Discussion

Screening for at-risk drinking is critical to the prevention of traumatic injury and death. Like any screening tool, the ideal characteristics are ease of use, low cost, and high positive and negative predictive value. The traditional method of screening for at-risk drinking in the trauma setting has been measurement of blood alcohol level, with validated questionnaire-type approaches being less common.[20,21,23] Although this common clinical practice is the generally accepted standard of care, laboratory testing alone may not be the best clinical practice. It only offers a snapshot of the patients' recent drinking behaviors. As such, it can be influenced by a variety of factors, such as volume of alcohol consumed, time since ingestion, individual capacity for enzymatic degradation of the ethanol, and consumption of a meal with the alcohol.[24] All of these factors can make it difficult to correlate acute blood alcohol levels with at-risk drinking.

Not surprisingly, numerous studies[25-28] have shown that the presence of a detectable blood alcohol level in the emergency department has a low sensitivity and specificity for determining at-risk drinking behavior. The reported sensitivity of blood alcohol levels has varied widely among studies, and the results of the current study fall within the middle range. In contrast to the variable sensitivity, the specificity of a negative blood alcohol level is generally 60% or greater. Although the results of the current study are in agreement with these findings, they are on the lower end. On the basis of these results, it is difficult to recommend using a blood alcohol level as a

Figure 1.
At-risk drinking relative to blood alcohol level among 222 trauma patients aged 18 years or older. A blood alcohol level greater than 0 g/dL was considered positive for at-risk drinking.

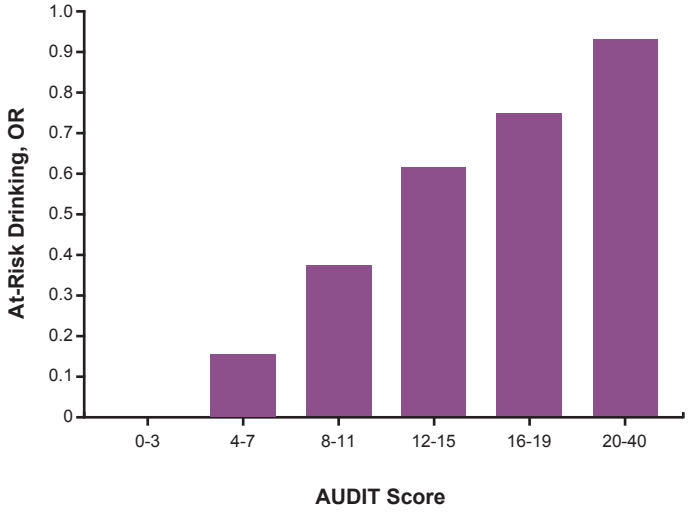

Figure 2.
At-risk drinking relative to Alcohol Use Disorders Identification Test (AUDIT) score among 222 trauma patients aged 18 years or older. An AUDIT score of 8 or higher (possible range, 0-40) was considered positive for at-risk drinking.

stand-alone determinant for at-risk drinking. In particular, if the goal is to prevent recidivism, acute alcohol consumption may be a poor indicator of at-risk drinking behavior or chronic alcohol abuse, which are better predictors of recidivism.[29]

The AUDIT tool was developed to specifically address the difficulties in identifying persons who engage in at-risk drinking behaviors.[22] Although originally intended for use in the primary care setting, its value in the emergency department and trauma unit has been validated by many studies.[26-28,30,31] The current study's findings of a greater than 80% sensitivity and specificity are in agreement with other studies. Few studies have offered direct comparisons between blood alcohol levels and AUDIT scores, but those that do further support the findings that AUDIT has a higher sensitivity for detecting at-risk drinking than the presence of a detectable level of alcohol on admission.[25-28] If only 1 test were to be performed, AUDIT is preferable to blood alcohol level screening for determining at-risk drinking. Furthermore, screening is a critical step in decreasing recidivism.

Conducting an AUDIT is relatively brief and easy, adding little time or cost to injured patients' care.[17] Testing can be conducted as an oral, written, or electronic questionnaire by a variety of trained professionals. One study[30] suggested that optimal results may be obtained electronically because of increased anonymity. Regardless of the method being used, the crucial step is assuring that patients with a positive test result undergo appropriate counseling. Our anecdotal experience parallels the work of Gentilello et al.[10] Patients were generally receptive to counseling. However, given the relatively recent end date of the current study, we are unable to comment on recidivism.

The application and generalization of the results of the current study should take into account the nature of the study and its limitations. The database we used was not originally designed with the intent of retrospective analysis and quantification of the operating characteristics of either of the tests. As a result, only 30% of poten-

tially eligible patients were included in the analysis, which risked introducing bias into the study population. Comparison of patients included and excluded from the study showed that similarities existed regarding age, sex, and mechanism of injury. However, the database does not include injury severity scores or other models for quantifying the degree of injury. Therefore, we were unable to definitively comment on whether or not this population was a representative one. The exclusion of patients with a Glasgow Coma Scale score less than 15 likely resulted in differences in the injury severity between these 2 populations. The potential clinical significance of this patient selection bias tempers generalizing these results to a larger patient population.

This study and its limitations suggest the need for a prospective multicenter study. Such a study might validate these findings as well as determine whether trauma recidivism is better predicted by identifying people who have engaged in at-risk drinking vs those who have consumed alcohol around the time of injury. Although a large degree of overlap exists between these populations, existing studies[7,8,10,11] on brief interventions focused on the latter group. A final consideration for future studies could be the use of collateral information as a proxy to complete AUDIT when patients are unable to complete it themselves,[32] potentially eliminating any bias toward less-injured patients.

Conclusion

The common practice of using blood alcohol level as a stand-alone indicator of at-risk drinking should be questioned. The current study confirmed previous findings that an admission AUDIT score is superior to blood alcohol level if the ultimate goal is to determine at-risk drinking, and a brief intervention to reduce trauma recidivism should be performed when indicated. Although routine testing for blood alcohol level may have a role in the management of trauma cases, this test should not be viewed as routine for determining at-risk drinking.

Author Contributions

Drs Plackett, Kovacs, and Esposito provided substantial contributions to conception and design; Dr Plackett, Ms Mueller, and Ms Grimley provided substantial contributions to acquisition of data analysis; Drs Plackett, Kovacs, and Esposito provided substantial contributions to interpretation of data; all authors drafted the article or revised it critically for important intellectual content; all authors gave final approval of the version of the article to be published; and Dr Plackett agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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