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Process Evaluation of Serial Screening Criteria to Identify Injured Patients That Benefit From Brief Intervention: Practical Implications

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Abstract

Background—The aim of the current study is to evaluate the effectiveness of serial screening methods for the identification of injured patients at risk for alcohol problems and are most likely to benefit from brief interventions. We hypothesize that blood alcohol concentration (BAC) alone is not sufficient to effectively identify at-risk drinkers in the trauma care setting.

Methods—During a 2-year period, patients admitted to an urban Level I trauma center for treatment of an injury were screened for alcohol problems. Screening consisted of four serial screening criteria: (1) clinical indication of acute intoxication including positive BAC; (2) self-reported drinking 6 hours before injury; (3) at-risk drinking as defined by National Institutes on Alcohol Abuse and Alcoholism or (4) by responding yes to one or more items on the CAGE within the last year.

Results—In all, 11,028 patients were seen. Fifty-eight percent were eligible for screening and 90% of eligible patients were screened. Of screened patients, 41% screened positive for an alcohol-related injury. Of patients that did not have a BAC drawn, 39% ($n = 935$) went on to screen positive using serial screening procedures. Additionally, 36% ($n = 339$) of patients with a negative BAC went on to screen positive using serial screening procedures.

Conclusions—This evaluation clearly suggests that BAC alone is not sufficient to identify patients who are most likely to benefit from brief alcohol interventions. Self-reported drinking in conjunction with BAC facilitates identification and intervention of injured patients with alcohol problems.

Keywords

Screening; Brief intervention; Alcohol problems

A number of studies have demonstrated the effectiveness of brief alcohol interventions in the trauma care setting. Gentilello¹ first demonstrated that admitted trauma patients who received a brief alcohol intervention not only reduced their drinking but also reduced their risk of future injury. Moreover, the provision of brief alcohol interventions results in significant cost savings.² More recently, Schermer³ demonstrated that trauma patients who received brief intervention were significantly less likely to be arrested for a driving under the influence (DUI) at 3 year

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follow-up. As a result of these and other studies, the American College of Surgeons—Committee on Trauma (ACS—COT) in 2006 made it a requirement that all level one and two trauma centers have a mechanism to screen trauma patients for alcohol problems.⁴ This study examines procedures for effectively identifying trauma patients at risk for alcohol problems.

There are a number of mechanisms available for identifying patients at risk for alcohol problems. The trauma care context may not be conducive to the application of the most sophisticated approaches for diagnosing alcohol abuse and dependence. Gold standard diagnostic assessments such as the Composite International Diagnostic Interview (CIDI) or Structured Clinical Interview fourth edition of the Diagnostic and Statistical Manual (DSM-IV) Disorders are too long to be practical in the trauma care setting.⁵ Moreover, because these approaches determine prior diagnosis of alcohol abuse and dependence, they are less likely to identify patients who are at risk of developing alcohol problems in the future and who may be most likely to respond to brief alcohol interventions. Perhaps the most efficient mechanism for potentially identifying at-risk drinkers in the trauma care setting is blood alcohol concentration (BAC). However, many trauma surgeons are hesitant to test for BAC because of insurance regulations that allow insurance companies to deny reimbursement for injuries that occur while a patient is under the influence of alcohol or illegal drugs.⁶ Another problem with relying on BAC is that it only captures patients who were drinking before their injury and does not detect patients with alcohol problems who were not drinking prior to their injury.⁷ Brief interventions in the trauma setting have been found to be effective for injured patients who are at-risk drinkers whether or not they were drinking at the time of their injury.⁸ Therefore, BAC is not sufficient to identify patients who are at risk of future alcohol-related injury and likely to benefit from brief alcohol interventions.

Clinical judgment has also been shown to be inaccurate for identifying patients who are likely to benefit from brief alcohol interventions.^{9,10} In one study, clinical suspicion alone missed 23% of patients who were acutely intoxicated.⁹ Furthermore, clinical evaluation fared worse than chance alone in identifying patients who screen positive on a typical screening instrument. More specifically, more than 50% of patients who screened positive on the Short Michigan Alcohol Screening Test were not identified by trauma care staff. In addition, 26% of patients were falsely identified as alcohol dependent. As a result, brief intervention resources that are limited might be misdirected if trauma centers rely on early administered methods of identification such as BAC or clinical judgment. To effectively attain the ACS requirement to implement screening for alcohol problems, trauma centers need more information regarding the most effective and efficient standardized screening procedures for routinely identifying acute intoxication and harmful drinking or alcohol abuse and dependence in the trauma care setting.

Beyond BAC and clinical detection, the sensitivity and specificity of various methods has been extensively evaluated.¹¹ Self-reported drinking can be used to differentiate patients who differ with regard to frequency and intensity of alcohol consumption.¹² In conjunction with a quantifiable estimate of blood alcohol concentration such as BAC, self-reported drinking is an appropriate method for ascertaining alcohol involvement in an injury.¹³ The National Institute on Alcohol Abuse and Alcoholism has also established drinking guidelines for identifying patients who might be at risk for the development of alcohol problems that can be used to identify at-risk injured patients in the trauma care setting.¹⁴ The CAGE is another widely used and accepted tool for identifying alcohol dependent patients in medical settings. It too, can be successfully used in the trauma care setting to identify injured patients with alcohol problems.¹⁵ Although each of these methods is consistent with the time and financial constraints of the trauma care setting, no one method is likely to identify injured patients who present for treatment in the trauma care setting and are most likely to benefit from brief alcohol intervention.

Serial screening methods would be particularly useful in the trauma care setting, where medical care necessarily takes precedence over immediate identification of problem drinking. Serial screening, in which subsequent criteria are only assessed if the patient screens negative on prior screening criteria, may be a more effective method of screening to identify patients who are most likely to benefit from brief interventions. However, despite their potential utility, their effectiveness has yet to be established.¹⁶ The aim of the current study is to evaluate the effectiveness of serial screening methods for the identification of injured patients at risk for alcohol problems who are most likely to benefit from brief alcohol interventions. Examination of the effectiveness of screening criteria may help to further define efficient and effective methods of identification of problem drinkers in the trauma care setting and improve understanding and compliance with the recent ACS requirement.

METHODS

Participants

During a 2-year period, patients admitted to the Emergency Department and Trauma Center of an urban Level I trauma center for treatment of an injury were screened for alcohol problems. Of those, 1,493 consented to participate in a randomized clinical trial and completed a baseline assessment of drinking.

Screening Procedures

Screening consisted of four screening criteria: (1) clinical indication of acute intoxication including positive BAC; (2) self reported drinking six hours prior to injury; (3) at-risk drinking as defined by National Institutes on Alcohol Abuse and Alcoholism (NIAAA; see below) or (4) by responding yes to one or more items on the CAGE within the last year. The CAGE consist of four items including 1) Have you ever felt that you should *cut down* on your drinking? 2) Have people *annoyed* you by criticizing your drinking? 3) Have you ever felt bad or *guilty* about your drinking? 4) Have you ever had to drink first thing in the morning to steady your nerves or get rid of your hangover (*eye opener*)? These screening criteria were selected by a multidisciplinary team including an epidemiologist, psychologist, trauma surgeon, and trauma nurse clinician. Screening criteria were applied serially, i.e., subsequent criteria were only assessed if the patient screened negative on prior screening criteria. For example, if a patient was admitted with a positive BAC no other screening criteria were assessed before enrollment and assessment. These procedures were chosen to reduce staff and patient burden while effectively identifying patients who would most likely benefit from a brief alcohol intervention.

Once patients screened positive, the study clinician, in consultation with trauma care staff and a review of the medical record, assessed for current intoxication and cognitive impairment. Patients who were intoxicated or suffered from mild cognitive impairment were monitored for later inclusion in the study. Because the primary study evaluated the potential ethnic differences in the effectiveness of brief intervention among Black, White, and Hispanic adult trauma patients, patients under the age of 18 or of other racial or ethnic groups were ineligible to participate in the study and were not screened. In addition, prisoners, homicidal, suicidal, or actively psychotic patients were excluded from participating in the study and were not screened. When a positive, eligible patient was identified, study clinicians would approach the patient to obtain written informed consent. Before the assessment, patients consented to participate in a study involving assessment of their substance use and other high risk behaviors, be randomized to brief intervention or standard care and complete a 6 month and 12 month follow-up. Study procedures were approved by the University of Texas Health Science Center on the Committee for Protection of Human Subjects and the Institutional Review Board of the trauma center where the study was conducted.

Assessment

The following characteristics were measured in the baseline assessment following informed consent: self reported drinking before injury, at risk or heavy drinking, and alcohol abuse and dependence. After assessment, clinicians rated the patient's stage of change with regard to quitting drinking. Each of these assessment components is described below.

Drinking Before Injury—During the assessment, drinking before injury was assessed using the following item: “Before you were injured, did you drink any alcoholic beverage including malt liquor, regular beer, wine cooler, wine, fortified wine, or hard liquor even one drink?” A positive response confirmed drinking before injury. This item closely mirrors the screening item which asked patients whether they were drinking 6 hours before injury.

At Risk Drinking—During the assessment, at-risk drinking was assessed using the following gender-specific drinking guidelines from NIAAA. For women, at-risk drinking was defined as drinking more than seven drinks per week or more than three drinks per occasion. For men, at-risk drinking was defined as drinking more than 14 drinks per week or more than 4 per occasion. Drinking patterns were analyzed by two items. The first item asked about a typical drinking day: “On a typical day, how many drinks do you usually have?”, and at-risk drinking per occasion was analyzed by the following item: “Now think of all kinds of alcoholic beverages combined, that is, any combination of beer, wine, or liquor. During the past 12 months, what was the largest number of drinks that you had in a single day?” If a woman responded more than three or a man responded more than four, they were positive for at-risk drinking. Volume per week was calculated with quantity of drinks per day and frequency of drinking per week. If calculated volume per week was more than 7 for women or more than 14 for men, they were positive for at-risk drinking.

Alcohol Abuse and Dependence: The operational definition of alcohol abuse or harmful drinking and alcohol dependence was assessed at baseline using the CIDI. The alcohol abuse and dependence component of the CIDI is a comprehensive, fully structured diagnostic interview for the assessment of mental disorders which provides current diagnosis according to the *tenth edition of the International Statistical Classification of Diseases and Related Health Problems* and the *fourth edition of the Diagnostic and Statistical Manual*.^{17,18} The paper and pencil CIDI can be administered by trained lay interviewers and is widely used in epidemiologic investigations throughout the world. The CIDI maps the symptoms elicited during the interview onto *fourth edition of the Diagnostic and Statistical Manual* and *tenth edition of the International Statistical Classification of Diseases and Related Health Problems* diagnostic criteria and using a computerized algorithm, it analyzes whether the diagnostic criteria are satisfied. The inter-rater reliability of the CIDI has been demonstrated to be excellent, the test-retest reliability good, and the validity has been demonstrated to be good.¹⁹ In addition, the alcohol component of the CIDI has been used in the emergency room setting to evaluate the specificity and sensitivity of various screening instruments.²⁰

Stage of Change—After assessment, stage of change was assessed a trained interviewer along a 10 point continuum. A score of 1 or 2 indicated that the patient was not ready to change and in the Precontemplation stage, 3 to 5 indicated that the patient was unsure and in the contemplation stage, 6 to 8 indicated that the patient was ready to change or in the preparation stage and 9 or 10 indicated that the patient was already doing something about their drinking and in the action stage. The target behavior was defined as quitting drinking.

Statistics

The proportion of eligible trauma patients with drawn BACs was tracked throughout the study period. Patients who were ineligible to participate, including patients with a traumatic brain

injury who were unlikely to benefit from a brief alcohol intervention, are not included in this examination of percentage of blood alcohol draws. The data includes screening rates before and after educational efforts to increase BAC draws by trauma care staff including trauma surgeons and trauma nurse clinicians. In addition, a logistic regression comparing admission characteristics of patients who were screened and not screened was conducted. Subsequently, the bivariate distribution of screening criteria with pretreatment characteristics including drinking before injury, at-risk or heavy drinking, alcohol abuse or dependence, and stage of change were examined. Except for stage of change, the first three characteristics were examined in both screening and the initial assessment.

RESULTS

Screening

During a 2-year period, 9,860 patients were injured and seen in the emergency department or trauma care center. In all, 65% were eligible for screening and 5,742 or 90% of eligible patients were screened by emergency room and trauma care personnel as part of standard medical protocol. Only 25 (<1%) patients refused to be screened. Of patients who were screened, 41% screened positive for an alcohol-related injury. Because study plans did not include 24/7 coverage for screening and enrollment during the project period, 9.8% (623/6365) of potentially eligible patients were not screened or were discharged before completing the screening process. A logistic regression analysis (Table 1) comparing patients who were screened versus those who were not screened in terms of age, gender, ethnicity, type of injury, ethnicity, and admission status analyzed that patients who were older (OR = 1.01, 95% CI = 1.003–1.02), in an MVC (OR = 1.87, 95% CI = 1.45–2.42) or fall (OR = 1.51, 95% CI = 1.12–2.03) were more likely to be screened and patients who were discharged from the Emergency Department were less likely to be screened (OR = 0.18, 95% CI = 0.15–0.22); ethnicity and gender were not significant predictors of screening status. Of the 1,493 enrolled patients, 588 (39%) patients screened positive as a result of a clinical indication or positive BAC. Positive BACs ranged from 0.11 to 0.54 with an overall average BAC of 0.17. Of patients who did not screen positive on the first criteria (n = 905), 365 (40%) screened positive because of self-reported drinking 6 hours before their injury. Of the patients who did not screen positive on the first or second criteria (n = 540), 475 (88%) screened positive as a result of at-risk drink as defined by NIAAA guidelines. All other patients (n = 63 or 42%) screened positive on the CAGE.

Observation of the proportion of eligible trauma patients across the study period indicates that the percentage of BAC drawn began at approximately 20% (Fig. 1). The denominator for these proportions is the number of potentially eligible trauma patients that could be screened and participate in a brief alcohol intervention (n = 4,273). That is, it excludes patients with traumatic brain injury and other patients who are unlikely to benefit or be able to actively participate in a brief intervention based on motivational interviewing. After educational efforts coordinated with trauma surgeons and trauma nurse clinicians, screening rates rose to approximately 40% to 60% (average of 45% throughout project period). However, approximately 40% to 60% of patients (average of 55% throughout project period) did not have a BAC drawn and, therefore their screening status would be indeterminable if BAC were the sole method of identifying patients who might benefit from a brief intervention. Of patients that did not have a BAC drawn, 37% (n = 869) went on to screen positive using serial screening procedures (Table 2). Additionally, 37% (n = 364) of patients with a negative BAC went on to screen positive using serial screening procedures. Overall, 37% (1233/3324) of patients who would potentially benefit from a brief intervention would not have been identified if screening was limited to BAC.

Screening Criteria and Drinking Before Injury

During the assessment, 58% (n = 871) of patients reported drinking before their injury (Table 3). Of those, only 59% (n = 515) were identified using clinical indication acute alcohol use including positive BAC. An additional 38% (n = 330) reported drinking before their injury during screening process. In contrast, only 2% (n = 21) of patients who reported drinking before injury in the assessment were identified using NIAAA guidelines and only 1% (n = 5) were identified using the CAGE. Interestingly, 12.5% (results shown) of patients who were identified using clinical indication alone (i.e., BAC was not drawn but there was clinical suspicion of acute intoxication) did not subsequently report drinking before their injury during the assessment. This may be an artifact of error associated with using clinical indicators of acute intoxication, self report bias or both.

Screening Criteria and Heavy Drinking

During the assessment, 91% (n = 1,358) of recruited patients reported heavy drinking (Table 4). Of those, only 40% (n = 536) had a clinical indication of acute alcohol use including positive BAC, 24% (n = 327) reported drinking before the injury during screening and 33% (n = 453) screened positive using NIAAA guidelines. Only 3% (n = 42) reported one or more items on the CAGE in the last year. A small minority of recruited patients (9%) did not report heavy drinking within the last year.

Screening Criteria and Alcohol Use Disorders

During the assessment, 44% (n = 588) of recruited patients met criteria for alcohol dependence (Table 5). Of these, about half or 49% (n = 289) had a clinical indication of acute alcohol use including positive BAC at the time of screening and 24% (n = 142) reported drinking before the injury during the screening process. In addition, 23% (n = 136) were identified during screening using NIAAA guidelines. Only 4% (n = 21) of alcohol dependent patients were identified through the addition of the CAGE to the screening process.

During the assessment, only 9% (n = 116) of recruited patients met criteria for alcohol abuse (Table 5). Of these, 40% (n = 46) were identified during screening using clinical indicators including positive BAC and 28% (n = 33) reported drinking before injury during the screening process. In addition, 30% (n = 35) reported at risk drinking using NIAAA guidelines. Only, 2% (n = 2) were identified during screening using the CAGE.

Screening and Stage of Change

During the assessment, 21% (n = 292) of patients were determined to be in the Precontemplation stage of change; 68% (n = 943) of patients were determined to be in the Contemplation stage of change; 9% (n = 124) of patients were determined to be in the Preparation stage of change; and 2% (n = 28) of patients were determined to be in the Action stage of change (Table 6). Of patients in the precontemplation stage, 37% (n = 107) had a clinical indication of acute alcohol use including positive BAC, 23% (n = 68) reported drinking before the injury, and 37% (n = 109) reported drinking beyond normal limits. Similarly, of patients in the contemplation stage, 40% (n = 377) had a clinical indication of acute alcohol use including positive BAC, 24% (n = 222) reported drinking before injury, and 33% (n = 311) reported drinking beyond normal limits. Of those in the preparation stage, 39% (n = 48) had a clinical indication of acute alcohol use including positive BAC, 33% (n = 41) reported drinking before injury, and 19% (n = 23) reported drinking beyond normal limits. In addition, 10% (n = 12) reported one or more items on the CAGE in the last year. Finally, of those in the action stage, 29% (n = 8) had a clinical indication of acute alcohol use including positive BAC, 36% (n = 10) reported drinking before injury, 25% (n = 7) reported drinking beyond normal limits,

and 11% (n = 3) reported one or more items on the CAGE in the last year. Overall 60% of patients who were considering quitting drinking would have been missed using BAC alone.

DISCUSSION

This evaluation of screening criteria used to identify patients for recruitment in an effectiveness trial of brief alcohol interventions in the trauma care setting has several practical implications for the implementation of screening procedures as required by the ACS for Level I and II trauma centers. First, it clearly suggests that BAC alone is not sufficient to identify patients who are most likely to benefit from brief alcohol interventions. Even with coordinated efforts with trauma care staff and ongoing education, only 45% of eligible patients had a BAC drawn. Although this is significantly more than the base rate (approximately 20%), 55% of patients would not be screened for potential alcohol problems and, thus, would not be provided brief alcohol intervention. In this study, a large percentage of patients who did not have BAC drawn or had a negative BAC subsequently screened positive using serial screening procedures. For example, 38% of injured patients with no clinical indication of acute intoxication including BAC draw reported drinking 6 hours before injury during the screening process. This also suggests that injured patients are willing to disclose drinking before their injury despite potential consequences. This disclosure is mirrored in data collected during the assessment regarding the patient's stage of change with regard to quitting drinking. A large majority of patients (79%) were thinking about quitting drinking. This confirms prior studies of readiness to change in injured patients using a convenience sample.²¹ Thus, a large percentage of patients who are likely to benefit from brief intervention were more effectively identified through the use of serial screening.

Self-reported drinking in conjunction with BAC facilitates identification and intervention of injured patients with alcohol problems. In this study, we used self-reported drinking before injury, NIAAA guidelines and the CAGE. In this serial screening process, we found the CAGE provided limited yield in terms of identifying patients who are likely to benefit from brief intervention above and beyond the prior screening methods. That is, BAC, self-reported drinking before injury and NIAAA guidelines sufficiently identified a large majority of patients who might have subsequently screened positive on the CAGE. On the basis of these findings, BAC, self-reported drinking before injury and a self-report measure of typical drinking in combination will likely identify a majority of patients who would benefit from brief intervention. In this study, we used NIAAA guidelines which are similar to the Alcohol Use Disorders Identification Test (AUDIT-C), the first three items from the AUDIT.²² In the Quick Guide, ACS and COT recommend the AUDIT, which has 10 items, as a self-reported measure for screening injured patients.²³ The AUDIT takes approximately 2 minutes to 4 minutes to administer and can be self-administered. The AUDIT has the added advantage of providing information regarding the severity of alcohol problems that can guide intervention.^{22,24} Particularly, if a two stage screening process is employed in which all patients are screened by one person and intervention is provided by a second, the AUDIT can provide a platform for initiating brief intervention with patients. Another potential advantage of using self-reported measures that assess drinking beyond acute intoxication, is that it may minimize potential risk associated with the Uniform Accident and Sickness Policy Provision Law (UPPL), insurance regulations which permit insurance companies to deny coverage of an injury that occurs while a patient is under the influence of alcohol or illegal drugs.⁶ If screening is limited to BAC then the injury event can be attributed to alcohol which may place trauma centers at risk for denial of claims. This risk may be minimized if screening procedures also include identification of at-risk drinkers who were not necessarily drinking at the time of injury. To date, studies evaluating the effectiveness of brief intervention to reduce alcohol use and injury have used self-report measures in conjunction with BAC.^{1,3,8,25} As trauma care centers advance toward wide spread implementation of screening and brief intervention they should be encouraged to

employ similar screening methods to the extent that their resources allow. Serial screening methods such as those described herein may be both efficient and effective means to identify patients that may benefit from brief intervention.

With regard to the severity of alcohol problems, it should be noted that a large majority of patients either met criteria for alcohol dependence or did not meet criteria for either alcohol abuse or dependence. In contrast, far fewer patients met criteria for alcohol abuse. Saitz²⁶ similarly found that approximately 77% of medical inpatients met criteria for alcohol dependence. However, brief intervention alone may not be sufficient for these patients who are more likely to benefit from ongoing treatment or involvement in self help groups. Gentilello¹ found that patients who screened positive with less severe alcohol problems were more likely to reduce their subsequent drinking. In contrast, Schermer³ found that patients with an elevated AUDIT score were just as likely to have reduced rates of driving under the influence (DUI) arrest after brief intervention. The impact of severity of alcohol problems on intervention effectiveness has not been sufficiently explored in the trauma care setting. Because of the unique opportunity admission for treatment of an injury provides in terms of intervention for problem drinking, patients who are alcohol dependent may respond more favorably to intervention in the trauma care setting in comparison with other settings. However, brief intervention in the trauma care setting has not been thoroughly evaluated for the purpose of facilitating entry into treatment or subsequent involvement in Alcoholics Anonymous. Common screening procedures will not only identify patients at risk for developing alcohol problems but will also identify patients with severe alcohol dependence. As a result, efforts to implement brief intervention should include provisions for increasing treatment access and treatment usage in addition to brief intervention based on motivational interviewing. Further study is required to analyze the effectiveness of brief intervention on subsequent treatment usage across the spectrum of alcohol severity.

There are some limitations to the current study which warrant discussion. Most notably, these screening efforts were supported by funding from the NIAAA. Many trauma centers may lack the resources to put forth such a concerted effort to identify patients at risk for alcohol problems. In addition, this study focused on screening procedures for adult trauma patients. Similar studies of screening procedures for use in pediatric trauma centers need to be conducted. Finally, because a screening process was used, this study is unable to provide insight into the specificity and sensitivity of screening procedures beyond BAC. However, the sensitivity and specificity of various screening procedures is already well established. In addition, the primary aim of this study was to evaluate the utility of serial screening procedures after BAC draw in the trauma care setting. Thus, despite these limitations, this study suggests that serial screening can be an effective and efficient process for identifying patients who are most likely to benefit from brief alcohol interventions and is consistent with the time and financial constraints of trauma centers.

In closing, many trauma centers may lack sufficient resources to implement screening procedures consistent with the current evidence base. Some trauma centers may find it necessary to balance effectiveness with efficiency by focusing their screening procedures toward targeted populations (i.e., admitted patients, acutely intoxicated patients, etc.). Although 90% of eligible patients were successfully screened in this study, 10% of potentially eligible patients were discharged before being screened. The primary predictor of being discharged before screening was admission status; patients discharged from the emergency department were less likely to be screened. As a result, given limited resources, trauma centers may want to consider focusing their screening and intervention efforts on admitted trauma patients. In addition, 14% of patients who screened positive were discharged before being approached for participation in the intervention. Consideration needs to be given to this fact when implementing brief interventions in trauma centers. Nevertheless, trauma centers may

benefit from systematic identification of all patients who are likely to benefit from brief alcohol interventions regardless of whether they initially have the staff resources to provide intervention. This program evaluation data will provide information for the determination of staffing needs to effectively implement screening and brief intervention. In general, clear guidelines need to be established for screening procedures and other process oriented outcomes to thoroughly evaluate their effective implementation in trauma care centers. Finally, the successful implementation of screening procedures requires multidisciplinary collaboration between trauma care staff and other key stake holders.

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Fig. 1.
Percent BAC drawn of total eligible patients.

Table 1

Logistic Regression Predicting Screening Status

	OR	95% CI	<i>p</i>
Age	1.01 [*]	(1.003–1.02) [*]	0.003
Gender	1.13	(0.93–1.38)	0.23
Type of injury			
MVC	1.87 [*]	(1.45–2.42) [*]	0.0001
Assault	0.93	(0.69–1.24)	0.61
Fall	1.51 [*]	(1.12–2.03) [*]	0.006
Ethnicity			
Hispanic	1.06	(0.86–1.31)	0.59
Black	1.14	(0.89–1.45)	0.3
Admission status (REF:A)	0.18 [*]	(0.15–0.22) [*]	0.0001

^{*}
 $p < 0.05$.

Table 2

Association Between BAC at Time of Admission and Screening Results using Serial Screening

Screening Results Using Serial Screening	No BAC Drawn, n = 2,344 (55)	BAC Negative, n = 980 (23)	BAC Positive, n = 949 (22)
Negative	1475 (63)	616 (63)	—
Positive	869 (37)	364 (37)	949 (100)

Values within the parentheses indicate percentage.

Table 3

Association Between Screening Criteria and Self-Reported Drinking Before Injury During Assessment

	Not Drinking Before Injury, n = 620	Drinking Before Injury, n = 871
Criteria 1 (BAC/RN)	73 (12)	515 (59)
Criteria 2 (Self-report)	35 (6)	330 (38)
Criteria 3 (NIAAA)	454 (73)	21 (2)
Criteria 4 (CAGE)	58 (9)	5 (1)
Total (%)	100	100

Values within the parentheses indicate percentage.

Table 4

Association Between Screening Criteria and Self-Reported Heavy Drinking During Assessment

	No Heavy Drinking, n = 134	Heavy Drinkers, n = 1,358
Criteria 1 (BAC/RN)	51 (38)	536 (40)
Criteria 2 (Self report)	38 (28)	327 (24)
Criteria 3 (NIAAA)	24 (18)	453 (33)
Criteria 4 (CAGE)	21 (16)	42 (3)
Total (%)	100	100

Values within the parentheses indicate percentage.

Table 5

Association between Screening Criteria and Diagnosis Alcohol Abuse and Dependence during Assessment

	Neither, n = 632 (51)	Abuse, n = 116 (9)	Dependence, n = 588 (48)
Criteria 1 (BAC/RN)	198 (31)	46 (40)	289 (49)
Criteria 2 (Self-report)	163 (26)	33 (28)	142 (24)
Criteria 3 (NIAAA)	236 (37)	35 (30)	136 (23)
Criteria 4 (CAGE)	35 (6)	2 (2)	21 (4)
Total (%)	100	100	100

Values within the parentheses indicate percentage.

Table 6

Association Between Screening Criteria and Clinician Assessment of Patient's Stage of Change

	Pre, n = 292	Con, n = 943	Prep, n = 124	Action, n = 28
Criteria 1 (BAC/RN)	107 (37)	377 (40)	48 (39)	8 (29)
Criteria 2 (Self report)	68 (23)	222 (24)	41 (34)	10 (36)
Criteria 3 (NIAAA)	109 (37)	311 (33)	23 (19)	7 (25)
Criteria 4 (CAGE)	8 (3)	33 (4)	12 (10)	3 (11)
Total (%)	100	100	100	100

Values within the parentheses indicate percentage.