Published in final edited form as:

Traffic Inj Prev. 2017 July 04; 18(5): 463–469. doi:10.1080/15389588.2016.1265953.

Examining motor vehicle crash involvement and readiness to change on drinking and driving behaviors among injured emergency department patients

Janette Baird, PhD^{1,2}, Eunice Yang, JD¹, Valerie Strezsak, MS^{1,3}, and Michael J Mello, MD, MPH^{1,2}

¹Injury Prevention Center at Rhode Island Hospital

²Department of Emergency Medicine, Alpert School of Medicine at Brown University

³Department of Epidemiology, Brown University School of Public Health; Department of Health Service, Practice and Policy, Brown University School of Public Health

Abstract

Objective: To measure the effect of motor vehicle crash (MVC) involvement and readiness to change drinking and driving behaviors on subsequent driving and drinking behaviors among injured emergency department (ED) patients who use alcohol at harmful levels.

Methods: A secondary analyses of a randomized controlled trial of injured ED patients who screened positive for harmful alcohol use, who at recruitment reported driving in the past 12 months and received at least one of the intended intervention sessions (brief behavioral intervention versus attention placebo control [N = 407]). Outcome variables were: 1) change in six impaired driving behaviors, 2) report of MVCs and traffic violations in the 12 months following recruitment; predictor variables were: 1) treatment assignment, 2) MVC involvement at recruitment, and 3) baseline readiness to change alcohol use and drinking and driving.

Results: Modeling of change in the six impaired driving variables indicated that neither the recruitment visits being MVC-related, nor baseline readiness to change alcohol use and drinking and driving behaviors, predicted greater changes in impaired driving over time. Baseline reports of past moving traffic violations and the ED visit being MVC related predicted a greater likelihood of each behavior at 12 months following study recruitment.

Conclusions: This study and others have demonstrated that ED patients with harmful alcohol use are willing to engage in behavioral interventions directed at changing risky behaviors. However, this study did not demonstrate that patients considered having the potential to be more engaged with the intervention, because their ED visit was MVC-related and/or they had expressed intent to change their risky alcohol use and drinking and driving behaviors, were more likely to change these risky behaviors.

Keywords

motor vehicle crash; drinking and driving; behavioral interventions

INTRODUCTION

An annual average of nearly 13,000 motor vehicle crash (MVC) fatalities between 2006 and 2010 in the United States have been attributed to alcohol use (Centers for Disease Control and Prevention 2013). The costs of alcohol-related motor vehicle crashes cost are estimated at nearly \$50 billion a year (National Center for Statistics and Analysis 2014). However, the problem of drinking and driving may be much larger; as a survey from the National Highway Traffic Safety Administration concluded that 20% of people over the age of 15 drove within two hours of drinking alcohol (National Highway Traffic Safety Administration 2010).

Changing drinking and driving habits can be difficult, and often a catalyst is required to change them. The impetus for change for many who engage in such risky behaviors may be more self-directed, and result from negative consequences associated with an alcohol-related injury (Barnett et al. 2006; Bogenschutz et al. 2014), or from the inconvenience or ‘hassle’ that often accompanies a MVC (Mello et al. 2005). These experiences can give rise to a readiness or motivation to change behavior. This therapeutic construct is often the focus of behavioral intervention approaches which research has shown can be effective in reducing substance abuse behaviors (Smedslund et al. 2011). Readiness to change is a focus of counseling approaches such as motivational interviewing (MI), and is assessed to determine if an individual is aware of their problem, is making plans to change their problem behavior, or has already engaged in change behaviors (Miller et al. 1996; Rice, et al. 2014). Readiness to change has been shown to affect how well an individual engages with the counselor and the therapy, and there is evidence of the indirect effect of pre-treatment readiness to change on treatment outcomes (Rice et al. 2014).

In a multi-hospital study across several states, it was found that 45% of adult ED patients were risky alcohol users (Sanjuan, et al. 2014); this suggests that the ED may be a prime environment to identify and begin intervening with patients with a spectrum of alcohol use disorders (Brown et al. 2012; Field et al. 2010; Sommers et al. 2013). Studies have investigated the feasibility and efficacy of using behavioral interventions in the ED setting to change drinking and driving behaviors. Longabaugh et al. found that those patients who received an intervention in the ED plus a later booster session had significantly less negative consequences from drinking, including driving-related alcohol consequences, than the standard care group not receiving the BI (Longabaugh, et al. 2001). A secondary analyses of this study found that MVC patients who presented to the ED and received BI had fewer alcohol-related injuries at follow-up than the standard care group (Mello et al. 2005). Subsequent analyses of the Longabaugh study found that readiness to change alcohol prior to the brief intervention predicted better alcohol related outcomes only for those who were highly motivated to change prior to receiving the behavioral intervention (Stein et al., 2009). In the Decreasing Injuries from ALcohol study (DIAL), a brief intervention based on the

principles of motivational interviewing, was delivered over the telephone to injured ED patients, and was found to have decreased impaired driving over the course of three months in the treatment group compared to the control group (Mello et al., 2008).

Study Aims

The ReDIAL study was a randomized controlled trial designed to test the effectiveness of three sessions of telephone-delivered BI, compared to an attention control condition, in reducing alcohol use, injuries and drinking and driving among injured ED patients (Mello et al. 2016). This parent study found that while those patients in the BI condition decreased alcohol use, alcohol-related negative consequences and injuries and reported less drinking and driving, these changes were also found for the attention placebo control group. The authors concluded that the BI had no advantage over the attention placebo control condition. Based on the DIAL study's prior research findings the overall aim of this secondary data analysis is to: determine the effects of MVC involvement as the reason for ED visit at the time of recruitment, and pre-recruitment readiness, to change alcohol use and potentially influence subsequent changes to drinking and driving behaviors. Specifically it is hypothesized that:

1. Participants whose ED visit at the time of recruitment was MVC-related would show a greater reduction in drinking and driving behaviors than those whose ED visit was not MVC-related.
2. Participants who expressed readiness to change their drinking and driving behaviors at the time of study recruitment would show a greater reduction in drinking and driving behaviors than those with lower levels of readiness to change their drinking and driving behaviors.
3. The effects of having an MVC related ED visit and expressing intention to change drinking and driving would produce a superior interaction effect in reducing subsequent alcohol use and other negative driving consequences: specifically, future MVCs and traffic violations.

METHODS

Participants

This was a sub-sample of the original study sample of participants who at baseline: indicated that they had driven in the past four months, and received at least one session of their designated intervention condition. Participants fulfilled the original study eligibility requirement by having an alcohol score ≥ 11 on the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST, version 3.0), being age ≥ 18 , and attending the ED at the time of recruitment for the treatment of an injury. The original exclusion criteria included: not being medically stable, intoxicated, or incarcerated, and not having a telephone. The research protocol for the original study was approved by the Institutional Review Boards at the two hospital sites where the study was conducted. The study is registered at clinicaltrials.gov (NCT01326169).

Study Protocol

After consenting to be part of the study, participants completed the baseline survey questions on a hand-held tablet computer. This survey was hosted through a web-based data entry program (DatStat®, Seattle, WA). Following the survey participants were randomized to receive either the intervention condition or an attention placebo control condition. The intervention condition was designed to deliver three telephone counseling interventions about participants' alcohol use, including drinking and driving, and was based on the principles of motivational interviewing (BI condition). The attention placebo control condition was designed to deliver three didactic telephone calls with a scripted educational intervention on fire and burn home safety (Home Safety, HS). Participants in both conditions received the protocol after discharge from the ED. For complete description of these intervention conditions, including information about training and fidelity, please refer to prior publication (Mello et al. 2016). Participants were contacted via phone or email at 4, 8, and 12 months following recruitment to complete follow-up assessments.

Measures

Participants were administered the assessment instruments described below at a fixed schedule. The baseline assessment occurred at the time of recruitment during the ED visit. Follow-up interviews were conducted at 4, 8 and 12-months after study recruitment.

Demographic: Questions about participants' age, gender, race, ethnicity, education, insurance and relationship status were asked at the baseline assessment only.

ASSIST v3.0: The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST, version 3.0) is a World Health Organization (WHO) validated screening tool for general population use to screen for risk levels of alcohol and other substance use (Humeniuk, et al. 2008). For study eligibility, participants' response on 6 questions about past three-month alcohol use had to total 11 or greater. This score indicates the participants' need for at least a brief intervention for their alcohol use. The ASSIST was administered at the baseline and 12-month assessments. Using the WHO ASSIST cut-offs at baseline alcohol, ASSIST scores were subdivided into $11 < 26$ versus ≥ 27 ; indicating the need for a BI about alcohol use versus more intensive treatment.

Drinking and driving: The Impaired Driving Scale was used to assess the participants' drinking and driving behaviors. It is a six-item tool that was developed for use in prior research (Mello et al. 2008) and this adapted format of the IDS questioned participants about their frequency of six drinking and driving behaviors over the past four months. Five questions were asked of all participants and one question was gender specific (frequency of driving after four or more drinks for females and five or more drinks for males). The IDS was asked at all assessment time points (baseline, 4, 8, and 12-months).

Driving history: A five-item questionnaire was used to assess driving history and consequences. The initial baseline question asked if the participant had driven in the past 12 months; if this was affirmed the participants were asked the remaining questions (endorsement and frequency of motor vehicle crashes and moving traffic violations in the

past 12 months). The initial, past 12-month question was used to determine if participants would be asked the remaining driving history questions and the IDS questions. The initial driving question was re-asked only at the 4- and 8-month assessment (with past 4-month time period used), as a screening question for the IDS. The full driving history assessment was asked at the 12-month assessment if any past 12-month driving was endorsed.

Readiness to change: At the baseline assessment participants were asked to indicate on a 5-point scale their readiness to change drinking behavior (1 = No thought of changing, 5 = Taking action to change), based on a prior validated measures of readiness to change called SOCRATES (States of Change Readiness and Treatment Engagement Scale [Miller and Tonnigan, 1996]). Additionally three questions about changing drinking and driving behavior were asked of participants who endorsed drinking and driving: trying to cut down on drinking and driving, importance of cutting back on drinking and driving, and self-efficacy for cutting back on drinking and driving (each asked on a 5 point scale with 1 = low endorsement, 5 = high endorsement). These questions were asked at the baseline assessment.

Emergency department visit: Data on reason for the ED visit at time of recruitment were extracted from the patients' medical records after study enrollment.

Outcome and Predictor Variables

The primary outcome variables were changes in the six IDS items across the four study time periods. Change in motor vehicle crash incidence and motor vehicle traffic violations were also of interest. Predictor variables included ED recruitment visit being MVC-related versus other reason and baseline readiness to change alcohol and drinking and driving behaviors.

Covariates

Important characteristics associated with the IDS and motor vehicle behaviors were included in all prediction models: treatment assignment (BI or HS) age, gender, and baseline alcohol ASSIST score.

Data Handling and Analyses.

Data were transferred from the DatStat secure server to Microsoft Excel for preliminary data cleaning. Statistical analyses were conducted using SAS (Version 9.3, Carey, NC). Analysis of data distribution and homogeneity of variance were conducted and informed the selection of appropriate statistical tests. The primary outcome variables of interest, the six impaired driving behaviors, demonstrated significant positive skew. These variables were dichotomized into did not occur (0) or occurred (1). Alternative transformations were considered, such as treating these behaviors as count variables. However, in addition to an over-representation of 0 counts, there were wide gaps in sequential values of counts. Motor vehicle crash and motor vehicle traffic violations were also dichotomized into did not occur and occurred. Participants' characteristics and outcome variables and baseline values of the outcome and predictor variables are reported with 95% confidence intervals (CIs).

Changes in the primary dependent variables of interest (six impaired driving behaviors) were assessed using a generalized linear mixed effects modeling approach. We used a random

intercept with fixed effects of 1) Covariates: gender, alcohol severity (ASSIST score), and group assignment, 2) Predictors: time, ED visit MVC-related, and readiness to change alcohol use and drinking and driving, and 3) Interactions: time and predictor variables, and a three-way interaction, time by baseline readiness by ED visit MVC-related, covarying for group assignment. These models were conducted using the Proc Glimmix procedure with binary link functions. These models were used to assess changes in impaired driving behaviors after covarying for participant age, which was centered on the median age with one year increments for ease of interpretation; alcohol severity, which was entered as a binary variable (baseline alcohol ASSIST scores $11 < 26$ versus ≥ 27), treatment assignment, and gender, these were also coded as a binary variables. For each dependent variable (the six IDS items) the covariates were entered into the models first, followed by predictors and then the interaction terms. Absolute fit indices, the Akaike's Information Criteria and the Bayesian Information Criteria, were compared. For the variables measured at baseline and 12 months only (motor vehicle crashes and moving traffic violations) we predicted the effects of intervention assignment and predictors on the 12-month scores after covarying for the baseline scores on these variables and the other previously listed covariates. To address issues of multiple comparisons and the inflation of Type 1 errors that can arise from this, the alpha for rejecting the null hypotheses was set to 0.01 for all outcome analyses.

Across the outcome variables of interest, data were examined for completeness. The growth models adjusted for data that were missing at each follow up, and only data available at the baseline and 12-months were included for the motor vehicle crash and moving traffic violations analyses. Within each measure, missingness for individual items was examined. Individual item data could be missing because of a selected response that was not assigned a numerical value ("I do not know" or "I refuse to answer") or because "no response" was given. The number of missing responses within each measure at each time point compared to the number of possible available responses was very small ($< 2\%$), therefore no imputation method was employed.

RESULTS

Participants' Characteristics

Of the 707 participants recruited for the original study, 407 reported at baseline that they had driven in the past 12 months and also received at least one of the interventions to which they were randomly assigned (BI or HS). As can be seen from Table 1, most of the sample was male, white, with a median age of 29 years.

At the baseline assessment across the 407 participants included in these analyses, 149 (36.6%; 95%CI: 31.9, 41.3) reported being involved in a MVC in the prior 12 months. Of those who were MVC involved, 118 reported 1 MVC (79.2%; 95%CI: 72.7, 85.7), and 31 reported 2 or more. Moving traffic violations were reported by 94 participants (23.1%; 95%CI: 19, 27.2), most reporting only one in the past 12 months.

Study Hypotheses

At the initial ED visit 83 (20.4%; 95%CI: 16.9, 23.9) were coded as being MVC-related. The report of baseline MVC injury, readiness to change alcohol and the six driving impaired variables did not significantly differ between the BI and HS groups (Table 2).

At baseline, reports of the six impaired driving behaviors, measured by the IDS, varied by type of behavior with the most commonly reported being driving an hour after having 3 or more drinks (45%; 95%CI: 40.2, 49.8), and driving while drinking alcohol as the least commonly reported (22.5%; 95%CI: 18.4, 26.6). At baseline more than two-thirds of all participants (68.6%; 95%CI: 64.1, 73.1) expressed that they were thinking of changing their alcohol use with varying degrees of intensity of readiness; this was not significantly different between the two groups. The majority of participants stated that they did not drink and drive ($n = 210$, 53.9% [95%CI: 49.1, 58.7]); among those who endorsed this behavior ($n = 180$) the majority ($n = 112$, 62.2% [95%CI: 55.1, 69.3]) thought that it was definitely important for them to cut down on their drinking and driving. Confidence in being able to change drinking and driving was also correspondingly high (Table 4).

Changes in impaired driving behaviors: As can be seen from the unadjusted results reported in Table 4, overall the reports of endorsing each of the six impaired driving behaviors decreases when comparing baseline to any other time period, with the greatest relative decrease occurring between baseline and the 4-month assessments. Many of these variables show an increase after the 4-month follow-up assessment. We conducted a series of growth models, with each of the IDS items as a binary outcome (reported at least one time versus not reported) that adjusted for baseline participants characteristics (Table A 1). When we compare the average score of each of these items that the addition of the predictors (initial ED visit was MVC related; readiness to change alcohol use and drinking and driving) improved the overall fit of the models across all six items compared to covariates alone (AIC and BIC values). However, when we added the interaction terms into these models there were no effects of time on: 1) having an MVC at the initial ED visit, 2) being ready to change alcohol use, drinking and driving, and reporting it being important to change drinking and driving, and being confident to do so, on change in IDS behaviors. A three-way interaction examining the effect of time, baseline readiness to change alcohol use and having a MVC-related ED visit at the time of study recruitment was also entered for each growth model across the six driving behaviors. This is also shown in Table A 1. Prior analyses, not reported here, demonstrated no interactions between treatment assignment and baseline readiness to change, or injury mechanism, on these outcomes or any of the parent study reported outcomes.

Driving consequences: At the 12-month assessment, past 12-month history of motor vehicle crash involvement and moving traffic violations were asked (Table A 2). An adjusted logistic regression showed that after adjusting for the baseline odds of reporting a past MVC only the ED visit being MVC-related at baseline predicted an increased odds of reporting an MVC at the 12-month assessment (AOR: 3.40; 95%CI: 1.52, 7.61). Reporting a moving traffic violation at the 12-month assessment was only predicted by reporting this at the baseline assessment (AOR: 4.09; 95%CI: 1.57, 10.65).

A separate series of analyses were conducted to determine the effect of intervention group assignment (BI v HS) on the predictive models conducted for these analyses. Group assignment did not significantly independently predict any changes in the six IDS, or driving consequences outcome variables.

DISCUSSION

This secondary analysis sought to replicate findings from our prior research that indicated having an ED visit that was MVC-related resulted in greater decreases in alcohol related injuries compared to non MVC participants receiving the same intervention (Mello et al. 2005), and additional findings that pre-treatment readiness to change could predict changes in alcohol related injuries and negative consequences from drinking (Stein et al. 2009). From our analyses, readiness to change alcohol use, or even having initiated changes in alcohol use at the time of study recruitment, did not result in greater changes in the six drinking and driving behaviors we measured. Prior studies have also shown that readiness to change does have a mixed effect in predicting alcohol treatment outcomes (Gaume et al. 2014), although it may be that readiness to change is a pre-requisite for the therapeutic relationship but not in itself sufficient for change in alcohol related outcomes (Stein et al. 2009).

The parent study, from which these data are drawn, ReDIAL, did not demonstrate any superior effects of a telephone intervention compared to an attention placebo control condition in reducing alcohol use, alcohol-related negative consequences or impaired driving (Mello et al. 2016). However, the parent study recruited participants with all types of injury mechanisms into the study and did not specifically focus on MVC-related injuries. Given the results of prior studies we felt it was imperative to more fully examine the effects of having an MVC and readiness to change alcohol-related driving behaviors had on impaired driving-related behaviors. Across all of the six impaired driving behaviors we saw a decrease over time for both groups, but having an MVC as the reason for the ED visit when recruited into the study did not enhance the effects of the intervention or indeed differentially decrease the reports of impaired driving behaviors independently compared to those whose recruitment injury was by another mechanism.

Based on the results of our prior research (Mello et al. 2005), the intervention we designed for this parent study had a definite focus on drinking and driving, and as such we hypothesized that there would be a significant effect of the BI on these behaviors. As part of the telephone brief intervention, the counselors were trained in a protocol whereby participants were asked about their typical and maximum amount of alcohol consumed and given gender-specific feedback about their maximum blood alcohol levels. Participants were asked if they were likely to drive after drinking, and if affirmed they were given feedback about 1) the legal blood alcohol levels at which they would be considered to be driving while intoxicated, and 2) the impairing effects of alcohol at below legal intoxication, specifically how lower levels of alcohol could affect cognitive abilities necessary for safer driving. This was also based on evidence that personal feedback, as a component of a brief motivational intervention, may account for some of the effect of the BI on reducing alcohol use and negative consequences (Huh et al. 2015).

It is important that non-significant effects be reported and understood, to guide future adaptations or changes that may be needed to improve interventions for alcohol and drinking and driving. The ED has been shown to be a venue where patients engaging in drinking and driving can be found, and to engage in directed interventions designed to address this behavior. The absence of a direct effect of the BI on the impaired driving behaviors left us to consider if the change that we did measure across participants could be more simply explained by the lasting effects of a MVC, and/or the readiness to change behaviors that may be related to the negative experience of an ED visit. This leaves us with several issues to consider. Readiness to change prior to treatment may by itself be important to engage with treatment, as has been previously reported, but differences in pre-treatment readiness do not predict any of the outcomes we measured in these analyses across participants. It may be that the treatment in the parent ReDIAL study failed to take advantage of this cognitive and emotional state to engender more change, or that readiness to change is not sustained sufficiently after the patient has left the ED to become a motivator of change.

Mello et al (2005) showed that behavioral change was greater for those who had sustained an MVC related injury and had the intervention plus booster. In the current study this is not the case, there is no apparent behavioral change advantage for any participants who had an MVC related injury at the time of recruitment. It is difficult to offer explanations for this. The ReDIAL study had considerably more questions on drinking and driving and driving behaviors in general at baseline compared to the prior ED studies that this was based on (Longabaugh et al., 2001; Mello et al. 2005, 2008), which could have sensitized participants to this the importance of this behavior across both groups, which may have led to these reported behavioral changes. Furthermore, ReDIAL was delivered by telephone after the patient had left the ED and this may have negatively mediated its impact compared to the in-person BI delivered in the Longabaugh study. We also have to consider that changes in these drinking and driving behaviors may also reflect fluctuations in these behaviors associated with any injury that result in ED care. To test these putative hypotheses we need to design a study that will a priori stratify recruited patients by injury mechanism and pre-treatment readiness to change alcohol, and test the effectiveness of a further developed BI protocol in association with these potentially explanatory variables.

At this time however, we must conclude that despite these conditions being met in this study, our intervention protocol that directly addressed the issue of impaired driving has not shown efficacy, and that factors such as injury mechanism or readiness to change alcohol use do not amplify changes in drinking and driving behaviors. Injuries and fatalities related to drinking and driving remain a serious public health issue. Other more robust interventions to address this problem should be developed and tested.

LIMITATIONS

This study was a secondary data analysis from a parent study that was conducted to determine the effectiveness of a telephone brief intervention in reducing alcohol use, injuries, and drinking and driving among injured ED patients. The primary eligibility of the parent study, being injured and having an ASSIST score ≥ 11 was not the same as the eligibility criteria for data being included in this secondary analyses (enrolled in the parent

study and reported driving in the past 4-months at recruitment), and therefore this subgroup analysis does not share the same generalizability of the original study. Also, as was stated in the parent study outcomes, we have not controlled for a possible contamination effect in the study that may have been caused by both our recruitment protocol and the assessments that were given to all participants. Specifically, the recruitment consent involved informing participants that the study aims was to assess the effect of the intervention on change in alcohol and alcohol related behaviors, this with assessments which focused on alcohol and drinking and driving behaviors may have acted as a catalyst to change the behaviors of participants who were not exposed to the BI. This may explain why all of the measured behaviors across all participants changed over time. Other explanatory factors include the possibility that the placebo intervention did have active ingredients for behavior change, or the potential for regression to the mean effects.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

FUNDING

This study was supported by Award Number R01AA017895 from the National Institute on Alcohol Abuse and Alcoholism. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Alcohol Abuse and Alcoholism or the National Institutes of Health.

REFERENCES

1. Barnett NP, Goldstein AL, Murphy JG, Colby SM, Monti PM. "I'll never drink like that again": characteristics of alcohol-related incidents and predictors of motivation to change in college students. *J Stud Alcohol*. 2006;67(5):754–763. [PubMed: 16847545]
2. Bernstein E, Bernstein J, Feldman J, et al. An evidence based alcohol screening, brief intervention and referral to treatment (SBIRT) curriculum for emergency department (ED) providers improves skills and utilization. *Subst Abus*. 2007;28(4):79–92. [PubMed: 18077305]
3. Bogenschutz MP, Donovan DM, Mandler RN, et al. Brief intervention for patients with problematic drug use presenting in emergency departments: a randomized clinical trial. *JAMA internal medicine*. 2014;174(11):1736–1745. [PubMed: 25179753]
4. Brown TG, Dongier M, Ouimet MC, et al. The role of demographic characteristics and readiness to change in 12-month outcome from two distinct brief interventions for impaired drivers. *J Subst Abuse Treat*. 2012;42(4):383–391. [PubMed: 22119179]
5. Centers for Disease Control and Prevention. Alcohol Related Disease Impact (ARDI). 2013; http://nccd.cdc.gov/DPH_ARDI/Default/Default.aspx. Accessed 23 February, 2016.
6. Field CA, Caetano R. The effectiveness of brief intervention among injured patients with alcohol dependence: who benefits from brief interventions? *Drug Alcohol Depend*. 2010;111(1–2):13–20. [PubMed: 20493644]
7. Foley K, Duran B, Morris P, et al. Using motivational interviewing to promote HIV testing at an American Indian substance abuse treatment facility. *J Psychoactive Drugs*. 2005;37(3):321–329. [PubMed: 16295016]
8. Gaume J, McCambridge J, Bertholet N, Daeppen JB. Mechanisms of action of brief alcohol interventions remain largely unknown - a narrative review. *Front Psychiatry*. 2014;5:108. [PubMed: 25206342]

9. Huh D, Mun EY, Larimer ME, et al. Brief motivational interventions for college student drinking may not be as powerful as we think: an individual participant-level data meta-analysis. *Alcohol Clin Exp Res.* 2015;39(5):919–931. [PubMed: 25872599]
10. Humeniuk R, Ali R, Babor TF, et al. Validation of the Alcohol, Smoking And Substance Involvement Screening Test (ASSIST). *Addiction.* 2008;103(6):1039–1047. [PubMed: 18373724]
11. Longabaugh R, Woolard RE, Nirenberg TD, et al. Evaluating the effects of a brief motivational intervention for injured drinkers in the emergency department. *J Stud Alcohol.* 2001;62(6):806–816. [PubMed: 11838918]
12. Mello MJ, Baird J, Lee C, Strezsak V, French MT, Longabaugh R. A Randomized Controlled Trial of a Telephone Intervention for Alcohol Misuse With Injured Emergency Department Patients. *Ann. Emerg. Med* 2016;67(2):263–275. [PubMed: 26585044]
13. Mello MJ, Longabaugh R, Baird J, Nirenberg T, Woolard R. DIAL: a telephone brief intervention for high-risk alcohol use with injured emergency department patients. *Ann. Emerg. Med* 2008;51(6):755–764. [PubMed: 18436341]
14. Mello MJ, Nirenberg TD, Longabaugh R, et al. Emergency department brief motivational interventions for alcohol with motor vehicle crash patients. *Ann. Emerg. Med* 2005;45(6):620–625. [PubMed: 15940095]
15. Miller WR, Tonigan JS. Assessing drinkers' motivation for change: the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors.* 1996;10(2):81.
16. National Center for Statistics and Analysis. Alcohol-impaired driving: 2013 data. Washington, DC: National Highway Traffic Safety Administration; 2014.
17. National Highway Traffic Safety Administration. National survey of drinking and driving attitudes and behaviors Washington, DC: U.S. Department of Transportation; 2010.
18. National Institute on Alcohol Abuse and Alcoholism. Alcohol-related emergency department visits and hospitalizations and their co-occurring drug-related, mental health, and injury conditions in the United States: Findings from the 2006–2010 nationwide emergency sample (NEDS) and nationwide inpatient sample (NIS). Vol 9 Bethesda, MD: National Institutes of Health; 2013.
19. Nilsen P, Baird J, Mello MJ, et al. A systematic review of emergency care brief alcohol interventions for injury patients. *J Subst Abuse Treat.* 2008;35(2):184–201. [PubMed: 18083321]
20. Rice SL, Hagler KJ, Tonigan JS. Longitudinal trajectories of readiness to change: alcohol use and help-seeking behavior. *J Stud Alcohol Drugs.* 2014;75(3):486–495. [PubMed: 24766761]
21. Sanjuan PM, Rice SL, Witkiewitz K, Mandler RN, Crandall C, Bogenschutz MP. Alcohol, tobacco, and drug use among emergency department patients. *Drug Alcohol Depend.* 2014;138:32–38. [PubMed: 24594289]
22. Smedslund G, Berg RC, Hammerstrom KT, et al. Motivational interviewing for substance abuse. *Cochrane Database Syst Rev.* 2011(5):CD008063. [PubMed: 21563163]
23. Sommers MS, Lyons MS, Fargo JD, et al. Emergency department-based brief intervention to reduce risky driving and hazardous/harmful drinking in young adults: a randomized controlled trial. *Alcohol Clin Exp Res.* 2013;37(10):1753–1762. [PubMed: 23802878]
25. Stein LAR, Minugh PA, Longabaugh R, et al. Readiness to change as a mediator of the effect of a brief motivational intervention on posttreatment alcohol-related consequences of injured emergency department hazardous drinkers. *Psychol Addict Behav.* 2009; 23 (2): 185–195 [PubMed: 19586135]

Table 1.

Demographic characteristics of the study sample.

Characteristic	Sample	BI	HS
%Mean (95%CI)	(N=406)	(n ₁ =204)	(n ₂ =203)
Median age (IQR)	29 (19)	27 (14)	31 (11)
Sex, % women	35.22 (30.60, 39.80)	33.99(27.47, 40.51)	36.45 (29.83, 43.07)
Hispanic, %	17.69 (13.98, 21.40)	20.59 (15.04, 26.14)	14.78 (9.90, 19.66)
Race, %			
White	74.33 (69.65, 79.07)	70.37 (63.34, 77.40)	78.03 (71.86, 84.20)
African American	18.21 (14.08, 22.34)	20.37 (14.17, 26.57)	16.18 (10.70, 21.67)
Asian	1.49 (0.19, 2.79)	1.23 (0, 2.93)	1.73 (0, 3.67)
Native Hawaiian/Pacific Islander	0.30 (0, 0.89)	0	0.58 (0, 1.71)
American Indian/Alaskan Native	1.19 (0.03, 2.35)	1.85 (0, 3.93)	0.58 (0, 1.71)
Other	4.48 (2.26, 6.70)	6.17 (6.13, 6.21)	2.89 (0.39, 5.39)
Insured			
Private	44.09 (39.26, 44.92)	40.2 (33.47, 46.93)	48.02 (41.13, 54.91)
Governmental	18.23 (14.47, 21.99)	19.61 (14.07, 25.15)	16.83 (11.67, 21.99)
Private and Governmental	3.69 (1.86, 5.52)	2.45 (0.33, 4.57)	4.95 (1.96, 7.94)
None	33.74 (29.14, 38.34)	37.75 (31.10, 44.40)	29.70 (23.40, 36.00)
Not know	0.25 (0, 0.74)	0	0.50 (0, 1.47)
Baseline ASSIST Mean (95%CI)			
Baseline ASSIST 26	81.08 (77.28, 84.89)	82.35 (77.12, 87.58)	79.80 (74.28, 85.32)
Baseline ASSIST 27	18.92 (15.11, 22.73)	17.65 (12.42, 22.88)	20.20 (14.68, 25.72)

ASSIST = Alcohol, Smoking and Substance Involvement Screening Test

Table 2:**Baseline Driving History and Emergency Department Visit**

	Sample N = 407	BI n = 204	HS n = 203
Drive a vehicle in past 12 months	Yes = 407 (100%)	Yes = 204 (100%)	Yes = 203 (100%)
Involved in motor vehicle crash in the past 12 months	Yes = 149 (36.6)	Yes = 76 (37.3)	Yes = 73 (36)
Number motor vehicle crashes in the past 12 months	0 = 258 1 = 118 2 = 24 3 = 5 4 = 1 5 = 1	0 = 128 1 = 64 2 = 7 3 = 4 4 = 1 5 = 2	0 = 130 1 = 54 2 = 17 3 = 1 5 = 1
Had a moving traffic violation in the past 12 months?	Yes = 94 (23.1)	Yes = 47 (23)	Yes = 47 (23.2)
Number moving traffic violations in the past 12 months	0 = 313 1 = 57 2 = 19 3 = 13 4 = 1 5 = 4	0 = 157 1 = 32 2 = 5 3 = 7 4 = 1 5 = 2	0 = 156 1 = 25 2 = 14 3 = 6 5 = 2
Emergency department visit on recruitment was related to a motor vehicle crash	83 (20.4)	48 (23.5)	35 (17.2)

Table 3.

Impaired Driving Scale over time.

IDS endorsement	Baseline (n ₁ = 204; n ₂ = 203)	4-month (n ₁ = 125; n ₂ = 98)	8-month (n ₁ = 137; n ₂ = 140)	12-month (n ₁ = 135; n ₂ = 146)
IDS 1 (Did you drive when you felt high or light-headed from drinking?)	% (95%CI) BI: 39.7 (33.0, 46.5) HS: 39.9 (33.2, 46.6)	% (95%CI) BI: 24.0 (17.3, 30.7) HS: 33.7 (26.9, 40.4)	% (95%CI) BI: 27.01 (20.3, 33.8) HS: 19.29 (12.6, 26.0)	% (95%CI) BI: 32.59 (25.9, 39.3) HS: 26.03 (19.3, 32.8)
IDS 2 (Did you drive within an hour or so after drinking 3 or more beers or other alcoholic beverages?)	BI: 45.59 (38.8, 52.4) HS: 43.35 (36.5, 50.2)	BI: 31.2 (23.1, 39.3) HS: 40.82 (31.1, 50.6)	BI: 32.85 (25.0, 40.7) HS: 23.57 (16.5, 30.6)	BI: 34.81 (26.8, 42.9) HS: 27.4 (20.2, 34.6)
IDS 3 (Did you drive when you knew that your drinking had already affected you?)	BI: 40.69 (34.0, 47.4) HS: 40.39 (33.6, 47.1)	BI: 27.2 (19.4, 35.0) HS: 36.73 (27.2, 46.3)	BI: 29.93 (22.3, 37.6) HS: 21.43 (14.6, 28.2)	BI: 28.15 (20.6, 35.7) HS: 21.92 (15.2, 28.6)
IDS 4 (Did you drink beers or other alcoholic beverages in a car while you were driving?)	BI: 25.0 (19.1, 30.9) HS: 20.2 (14.7, 25.7)	BI: 13.6 (7.6, 19.6) HS: 11.22 (5.0, 17.5)	BI: 10.95 (5.7, 16.2) HS: 9.29 (4.5, 14.1)	BI: 13.33 (7.6, 19.1) HS: 10.27 (5.4, 15.2)
IDS 5 (Female) (Have you driven after having 4 or more beers or other alcoholic beverages?)	(n ₁ = 69; n ₂ = 74) BI: 24.64 (14.5, 34.8) HS: 25.68 (15.7, 35.6)	(n ₁ = 42; n ₂ = 35) BI: 14.29 (3.7, 24.9) HS: 22.86 (9.0, 36.8)	(n ₁ = 51; n ₂ = 56) BI: 9.8 (1.6, 18.0) HS: 14.29 (5.1, 23.5)	(n ₁ = 47; n ₂ = 56) BI: 17.02 (6.3, 27.8) HS: 12.5 (3.8, 21.2)
IDS 7 (Male) (Did you drive after having 5 or more beers or other alcoholic beverages?)	(n ₁ = 135; n ₂ = 129) BI: 35.56 (27.5, 43.6) HS: 34.88 (26.7, 43.1)	(n ₁ = 83; n ₂ = 63) BI: 26.51 (17.0, 36.0) HS: 31.75 (20.3, 43.3)	(n ₁ = 86; n ₂ = 84) BI: 23.26 (14.3, 32.2) HS: 19.05 (10.7, 27.5)	(n ₁ = 89; n ₂ = 90) BI: 22.47 (13.8, 31.1) HS: 20.0 (11.7, 28.3)
IDS 6 (During the past 30 days, how many times have you driven when you've had too much to drink?)	BI: 27.94 (21.8, 34.1) HS: 25.62 (19.6, 31.6)	BI: 15.2 (8.9, 21.5) HS: 24.49 (16.0, 33.0)	BI: 16.06 (9.9, 22.2) HS: 15.0 (9.1, 20.9)	BI: 18.52 (12.0, 25.1) HS: 16.44 (10.4, 22.5)

n₁ = BI; n₂ = HS IDS = Impaired driving scale.

Table 4:**Baseline Readiness to Change Alcohol Use and Drinking and Driving**

	Sample N = 407	BI n = 204	HS n = 203
[‡] Readiness to change alcohol use	1 = 125 (31.4)	1 = 57 (28.8)	1 = 68 (34)
	2 = 71 (17.8)	2 = 41 (20.7)	2 = 30 (15)
	3 = 37 (9.3)	3 = 23 (11.6)	3 = 14 (7)
	4 = 71 (17.8)	4 = 34 (17.2)	4 = 37 (18.5)
	5 = 94 (23.6)	5 = 43 (21.7)	5 = 51 (25.5)
	Missing = 9	Missing = 6	Missing = 3
[‡] Trying to change drinking and driving	1 = 31 (8)	1 = 16 (8.3)	1 = 15 (7.5)
	2 = 10 (2.6)	2 = 6 (3.1)	2 = 4 (2)
	3 = 19 (4.9)	3 = 10 (5.2)	3 = 9 (4.5)
	4 = 20 (5.3)	4 = 9 (4.7)	4 = 11 (5.5)
	5 = 100 (25.6)	5 = 53 (27.8)	5 = 47 (23.6)
	6 = 210 (53.9)	6 = 97 (50.1)	6 = 113 (56.8)
	Missing = 17	Missing = 13	Missing = 4
^{##} Importance of changing drinking and driving	1 = 26 (14.8)	1 = 13 (14.1)	1 = 13 (15.5)
	2 = 11 (6.3)	2 = 6 (6.5)	2 = 5 (6)
	3 = 10 (5.7)	3 = 4 (4.4)	3 = 6 (7.1)
	4 = 17 (9.7)	4 = 10 (10.9)	4 = 7 (8.3)
	5 = 112 (62.2)	5 = 59 (64.1)	5 = 53 (63.1)
	Missing = 4	Missing = 2	Missing = 2
^{##} Could change drinking and driving	1 = 23 (13)	1 = 10 (10.8)	1 = 13 (15.5)
	2 = 6 (3.4)	2 = 3 (3.2)	2 = 3 (3.6)
	3 = 8 (4.5)	3 = 4 (4.3)	3 = 4 (4.8)
	4 = 33 (18.6)	4 = 17 (18.3)	4 = 16 (19.1)
	5 = 107 (60.5)	5 = 59 (63.4)	5 = 48 (57.1)
	Missing = 3	Missing = 1	Missing = 2

[‡] 1 = No thought of changing; 2 = Think I need to consider changing one day; 3 = Think I need to change, but not quite ready; 4 = Starting to think about how to change; 5 = Taking action to change

^{##} 1 = Definitely Not; 2 = Probably Not; 3 = Maybe; 4 = Probably; 5 = Definitely; 6 = Does not apply because I do not drink and drive

^{##}[‡] 1 = Definitely Not; 2 = Probably Not; 3 = Maybe; 4 = Probably; 5 = Definitely