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The effectiveness of brief intervention among injured patients with alcohol dependence: Who benefits from brief interventions?

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ABSTRACT

Background: Research investigating the differential effectiveness of Brief Motivational Interventions (BMIs) among alcohol-dependent and non-dependent patients in the medical setting is limited. Clinical guidelines suggest that BMI is most appropriate for patients with less severe alcohol problems. As a result, most studies evaluating the effectiveness of BMI have excluded patients with an indication of alcohol dependence.
Methods: A randomized controlled trial of brief intervention in the trauma care setting comparing BMI to treatment as usual plus assessment (TAU+) was conducted. Alcohol dependence status was determined for 1336 patients using DSM-IV diagnostic criteria. The differential effectiveness of BMI among alcohol-dependent and non-dependent patients was determined with regard to volume per week, maximum amount consumed, percent days abstinent, alcohol problems at 6 and 12 months follow-up. In addition, the effect of BMI on dependence status at 6 and 12 months was determined.
Results: There was a consistent interaction between BMI and alcohol dependence status, which indicated significantly higher reductions in volume per week at 6 and 12 months follow-up ($\beta = -.56$, $p = .03$, $\beta = -.63$, $p = .02$, respectively), maximum amount at 6 months ($\beta = -.31$, $p = .04$), and significant decreases in percent days abstinent at 12 months ($\beta = .11$, $p = .007$) and alcohol problems at 12 months ($\beta = -2.7$, $p_{12} = .04$) among patients with alcohol dependence receiving BMI. In addition, patients with alcohol dependence at baseline that received BMI were .59 (95% CI = .39–.91) times less likely to meet criteria for alcohol dependence at six months.
Conclusions: These findings suggest that BMI is more beneficial among patients with alcohol dependence who screen positive for an alcohol-related injury.

1. Introduction

Substance abuse is a major public health burden worldwide contributing significantly to morbidity and mortality (World Health Organization, 2002, 2007). Worldwide, alcohol causes 1.8 million deaths and a loss of 58.3 million of Disability-Adjusted Life Years (World Health Organization, 2002). Of the total number of alcohol attributable deaths globally, 32.0% are the result of unintentional injuries and 13.7% are the result of intentional injuries (World Health Organization, 2007). Furthermore, the WHO estimates that there are about 76.3 million people with diagnosable alcohol use disorders worldwide (World Health Organization, 2002). In the United States, although 17.8 million adults were diagnosed with one or more current alcohol use disorders only about 1 in 7 reported ever having received any kind of alcohol treatment (Grant et al., 2004; Cohen et al., 2007). Analysis of the National Epidemiological Survey of Alcohol and Related Conditions (NESARC) indicated that of those with alcohol dependence in the prior past year only 26% of those ever received treatment (Dawson et al., 2005). Among those who did seek help, Alcoholics Anonymous was the most common treatment option as opposed to formal or specialized treatment (Cohen et al., 2007).

While rates of self-help group attendance and formal treatment are low, people with alcohol use disorders are very likely to be seen in medical settings such as the emergency department and trauma care centers (Cohen et al., 2007). As a result, one approach to increasing the availability of treatment is to promote the use of brief

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interventions in the health care setting (Babor, 1994). Efficacy studies of brief interventions have been summarized in several review articles and meta-analyses, which largely suggest positive and clinically meaningful improvements in drinking outcomes (Bien et al., 1993; Kahn et al., 1995; Wilk et al., 1997; Moyer et al., 2002; Whitlock et al., 2004; Hettema et al., 2005; Vasilaki et al., 2006; Kaner et al., 2007). In addition, these and other studies have found no difference in patient outcomes between brief intervention and more extensive forms of treatment. As a result, brief intervention has become a well-established and cost-effective method to help patients in the medical care setting decrease their alcohol consumption (Chisholm et al., 2004; Fleming et al., 2002).

The rationale for screening and brief intervention in the trauma care setting is compelling. Patients who are intoxicated at the time of their injury may be more accepting of interventions for problem drinking, and the injury event itself may help create a teachable moment. The injury event may also create a window of opportunity for changing drinking behavior for those who are presenting with injuries unrelated to alcohol consumption, but who have a history of hazardous, harmful or dependent drinking. Dawson et al. (2006b) looked at the influence of major life events on recovery from alcohol problems and concluded that transitional life events have a strong effect on recovery, whereas for others, failure to make the transition is associated with continued dependence. Among injured patients, there is significant evidence that brief interventions reduces drinking and risk of future injury (Gentilello et al., 1999). For example, Schermer et al. (2006) found that rates of DUI arrests three years after admission to the trauma care setting were cut in half following brief intervention. Moreover, these interventions have been found to confer $3.81 in cost savings for every dollar spent (Gentilello et al., 2005). Based on the preponderance of the available evidence, the World Health Organization, The United States Preventative Task Force and the Committee on Trauma have endorsed the routine screening and brief intervention in various medical settings including emergency departments and trauma care settings (World Health Organization, 2002; Committee on Trauma, 2006; US Preventive Task Force, 2004).

In 1990, the Institute of Medicine (IOM) described a spectrum of unhealthy alcohol use in the general population (Institute of Medicine, 1990). The IOM emphasized that most people with unhealthy alcohol use were not alcohol dependent and that they would be more likely benefit from brief intervention. As a result, many studies evaluating the effectiveness of brief interventions have excluded patients with current diagnosis of alcohol dependence or those who have previously sought treatment. In a meta-analysis of brief intervention provided by health care providers to non-treatment seeking patients, Moyer et al. (2002) reported that 79% of studies excluded patients with alcohol dependence. Many of the studies described in a recent meta-analysis (Moyer et al., 2002) that used alcohol dependence as a basis for ineligibility also excluded individuals who had been previously treated for substance use, potentially confounding any relationship that may exist between effectiveness and dependence status. In the meta-analysis by Moyer et al. (2002), this omission left only 7 studies for comparison because the other 27 of 34 studies excluded dependent participants. Among randomized studies of brief interventions with injured patients, alcohol dependence or prior history of treatment are common exclusion criteria. For example, Longabaugh et al. (2001) excluded patients with a previous diagnosis of alcohol abuse or dependence and Bazargan et al. (2005) excluded patients with a history of alcohol counseling in the last year. More recently, Soderstrom et al. (2007) excluded patients with alcohol dependence and Daeppen et al. (2007) excluded patients with a history of alcohol treatment in the last year. Despite the lack of empirical evidence regarding the effectiveness of brief interventions for patients with alcohol dependence, the consistent exclusion of these patients suggests an implicit assumption that patients with alcohol dependence are unlikely to benefit from brief alcohol interventions.

While there have been no systematic evaluations of the effectiveness of brief interventions for injured patients with alcohol dependence, two prior studies in trauma populations have included patients with more severe alcohol problems, including alcohol dependence (Gentilello et al., 1999; Schermer et al., 2006). In both cases, alcohol-dependent patients were included to reflect the full spectrum of alcohol problems identified in the trauma care setting. In the study conducted by Gentilello et al. (1999), patients with the most severe alcohol problems, presumably dependence, did not appear to benefit from brief intervention. Similarly, patients with prior alcohol treatment also showed a lack of response. In contrast, Schermer et al. (2006) found that reductions in arrest for driving while intoxicated were not dependent upon the severity of alcohol problems. In one other study of brief intervention in the general medical setting, there was no difference in the effectiveness between patients with and without alcohol dependence (Guth et al., 2008). The primary aim of the current study is to provide a focused evaluation of the effectiveness of brief intervention for injured patients with alcohol dependence.

2. Methods

2.1. Study recruitment

Patients were recruited from an urban Level I trauma center during a two year period. Subjects were compensated $25 for the baseline assessment and $50 for the 6 and 12 months follow-up assessments. The study procedures were approved by the Committee for the Protection of Human Subjects at the University of Texas Health Science Center at Houston and the Institutional Review Board of the hospital where data were collected. In addition, a certificate of confidentiality was obtained from the National Institute on Alcohol Abuse and Alcoholism.

2.2. Screening and enrollment

Sampling was limited to injured patients who identified themselves as Black, White or Hispanic. Injury was defined as an intentional or unintentional event caused by an external factor, even if a medical condition was a causal factor. The final sample of patients randomized to TAU+ or BMI consisted of 668 Whites (45%), 537 Hispanics (36%) and 288 (19%) Blacks. The current study is limited to 1336 participants for whom alcohol dependence status was determined.

Patients were excluded from participation for the following reasons: (1) they were less than 18 years of age, (2) they spoke neither English nor Spanish, (3) they had no identifiable residence, (4) they were under arrest or in police custody at the time of admission or during their hospital stay, (5) they were judged by the trauma care or research staff to be actively suicidal or psychotic, (6) they were victims of sexual assault or (7) had a medical condition that precluded a face-to-face interview. Patients who were intoxicated at the time of their injury or presented with a Glasgow Coma Scale (GCS) $\leq$ 14 were monitored by research staff for inclusion in the study. Patients with a GCS $\leq$ 14 that did not resolve prior to discharge were not eligible for screening or enrollment. Written informed consent was obtained from injured patients following medical stabilization and prior to discharge from the hospital regardless of the patient's length of stay. All subjects had to demonstrate orientation to person, place and time and adequate recall of recent and remote events prior to obtaining written informed consent.

Twenty-four hour, seven day per week coverage was not feasible and, therefore, patient recruitment was limited to Thursday through Monday from 9 am to 6 pm. Recruitment during prior studies conducted at this trauma center as well as the implementation phase of this study suggested that these hours were the most efficient times to screen and enroll patients (Field et al., 2001; Field and O'Keefe, 2004). To minimize the impact of screening procedures on medical care, a sequential screening process was employed; subsequent screening procedures were only implemented if the patient screened negative on prior screening criteria. Screening consisted of four sequential criteria: (1) clinical indication of acute intoxication or alcohol use or positive BAC; (2) self-reported drinking 6 h prior to injury; (3) at risk drinking per the National Institute on Alcohol Abuse and Alcoholism guidelines (e.g., 7 drinks/week women, 14 drinks/week men; more than 4 drinks/day in men; more than 3 drinks/day in women, National Institute on Alcohol Abuse and Alcoholism, 2005); or (4) positive on one or more items of the CAGE (Ewing, 1984; Kitchens, 1994). An assessment of the screening procedures including strengths and limitations has been discussed elsewhere (Field et al., 2008).

2.3. Assessment

Patients who qualified for the study and agreed to participate, were interviewed by study clinicians after written informed consent was obtained. The interview took approximately 30–40 min. The current study focuses on alcohol use, alcohol problems and dependence status among injured patients meeting criteria for alcohol dependence during baseline assessment.

Alcohol use. Since intentional and unintentional injuries have been found to depend on patterns of drinking in addition to average volume of alcohol consumption (Rehm et al., 2003), several measures of alcohol use were assessed at intake and follow-up. Quantity and frequency of alcohol consumption was determined at baseline, 6 and 12 months follow-up using a graduated frequency which assess frequency of intake of combined alcohol with seven quantity levels and eight frequency levels in descending order (Greenfield, 1998, 2000; Hilton, 1989; Midanik, 1994; Rehm et al., 2003). The midpoints of quantity and frequency categories are used to calculate average volume consumed per week. This is a preferred method that reduces underreporting of alcohol consumption and is used in standardized national alcohol surveys (Greenfield, 2000). Weekly alcohol volume in the last year at baseline and the follow-up period at 6 and 12 months follow-up was calculated using the basic quantity/frequency approach by multiplying usual quantity of drinks per occasion by frequency of drinking (Dawson, 2003). In addition, the maximum amount consumed in one day in the last year at baseline and the follow-up period at 6 and 12 months follow-up was collected. Average volume per week and maximum amount consumed on one day are report using standard drinks which were defined as 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of hard liquor (Dawson, 2003). At 6 and 12 months follow-up, percent days abstinent in the last year at baseline and the follow-up period at 6 and 12 months follow-up was estimated using frequency of drinking. Percent days heavy drinking in the last year at baseline and the follow-up period at 6 and 12 months follow-up was estimated using the frequency of drinking five or more drinks per occasion divided by the numbers of drinking days.

Alcohol problems. Alcohol problems during the last year at baseline and during the follow-up period at 6 and 12 months follow-up was measured using the Short Inventory of Problems (SIP; Miller et al., 1995) plus six additional questions relating to injury, resulting in the SIP + 6 (Soderstrom et al., 2007). The SIP is a 15-item, short version drawn from a larger instrument called the Drinker Inventory of Consequences (DrInC; Miller et al., 1995), which contains 50 items. The six additional items relating to injury were also drawn from the DrInC (Miller et al., 1995) and include driving a motor vehicle after having three or more drinks, getting into physical fights while drinking, being arrested for driving under the influence, having an accident while drinking or being intoxicated, having been physically hurt, injured or burned while drinking or being intoxicated, or injuring someone else while drinking or being intoxicated. Patients report the frequency of each problem using a four point Likert-type scale. Thus, the continuous measure is a composite score based on the number and frequency of alcohol problems in the last year or during the follow-up period. Alcohol problems were measured at baseline, 6 and 12 months follow-up (Miller et al., 1995). Higher scores indicate more alcohol-related problems.

Alcohol abuse and dependence. The operational definition of alcohol abuse and alcohol dependence was assessed at baseline using the Composite International Diagnostic Interview (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 fourth edition of the Diagnostic and Statistical Manual or DSM-IV (American Psychiatric Association, 1994). The paper and pencil CIDI can be administered by trained lay interviewers and is widely used in epidemiological investigations. The CIDI maps the symptoms elicited during the interview onto DSM-IV diagnostic criteria and, using a computerized algorithm, determines 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, given the methodological constraints (Andrews and Peters, 1998). 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 (Cherpitel, 1995b). Diagnosis of alcohol abuse and dependence in the past 12 months was determined at baseline. Determination of dependence status at 6 and 12 months was restricted to the follow-up time period (i.e., last 6 months).

Treatment utilization. Utilization of services associated with alcohol problems was assessed at 6 and 12 months follow-up. At each follow-up, participants were asked if they had used the following services within the last six months: (1) Alcoholics Anonymous, (2) alcohol detox program, (3) alcohol recovery home or residential program, (4) outpatient program, (5) drinking and driving program or other mandated education, or (6) other type of services for alcohol problems.

2.4. Treatment as usual with assessment (TAU+) and assessment with Brief Motivational Intervention (BMI)

Patients were randomized to either treatment as usual with assessment (TAU+) or an assessment with Brief Motivational Intervention (BMI) using a permuted block design (block size 6) to ensure approximately equal distribution of patients according to their race/ethnicity. To reduce interviewer bias, study clinicians were blinded to patient randomization prior to completion of the baseline assessment. All patients, regardless of treatment assignment received information regarding hospital and community services relevant to the injured patient. This information included, but was not limited to, substance abuse treatment and self-help groups and the availability of drug and alcohol counselors. Information pertaining to hospital and community resources relevant to the care of injured patients was also provided. All patients were also provided handouts regarding the effects of alcohol, definition of at risk drinking and strategies to quite or cut down.

2.4.1. Treatment as usual with assessment (TAU+). Following the initial assessment, all patients assigned to TAU+ were provided patient handouts. This was consistent with general practice for treating patients with alcohol problems at the Level I trauma center at the time the clinical trial was conducted.

2.4.2. Brief Motivational Intervention (BMI). Brief Motivational Intervention (BMI) with injured patients has been described elsewhere (Dunn et al., 2005; Field et al., 2005). In short, brief intervention is based on Motivational Interviewing and the primary components consist of acknowledging the patients responsibility for changing drinking, encouraging the patient to explore pros and cons of drinking, assessing importance, confidence and readiness to change drinking behavior, reinforcing patient's sense of self-efficacy, and providing support for any efforts or intention to quit drinking or reduce harm associated with drinking, including injury. Following BMI, patients were provided the handouts described above in a manner consistent with Motivational Interviewing (e.g., provided by request of the patient or with their permission).

2.4.3. Training and supervision. Initial training for study clinicians consisted of a mix of didactic lectures, video examples and role play. Clinicians read the first 11 chapters of the Second Edition of Motivational Interviewing: Preparing People for Change by Miller and Rollnick (2002) and watched the training videos with the Study Psychologist, Dr Craig Field. All clinicians received three days of training in Motivational Interviewing from an experienced trainer in the Motivational Interviewing Network of Trainers. In addition, clinicians received two days of training regarding the application of Motivational Interviewing principles in the trauma care setting from an experienced trainer in the Motivational Interviewing Network of Trainers.

Clinicians were selected on the basis of their ability to achieve and maintain threshold proficiency in Motivational Interviewing as indicated by the Motivational Interviewing Skill Code v1.0 (MISC; Moyers and Martin, 2003). The clinicians included students obtaining a Masters Degree in Public Health and licensed professional counselors. Successful completion of the certification process by study clinicians required submission of three audio taped interventions with clients which exceeded threshold proficiency as indicated by coding on the MISC. Following training, three procedures were used to monitor clinician performance: group supervision, coaching using direct observation and audio recording of interventions. Ten percent of interventions were randomly selected to be audio taped. Clinicians were required to submit an audio tape at least once per month. Remedial training and additional supervision was provided to clinicians who did not maintain threshold proficiency on the MISC. In all, 113 of the 736 interventions were taped and coded using the Motivational Interviewing Skill Code v1.0. The mean of the Global Therapist Rating ($M = 5.8$, SE = .08), Reflection to Question Ratio ($M = 1.6$, SE = .13), Percent Open Questions ($M = .55$, SE = .02), Percent Complex Reflections ($M = .41$, SE = .02) and Percent MI Consistent ($M = .97$, SE = 1.3) behaviors counts were determined from the MISC ratings. With the exception of the percent of complex reflections, in which some audio tapes were below threshold proficiency (>40%), the means and 95% CI indicated that therapist behaviors were at or above the threshold or expert proficiency levels. There was no significant difference in the performance of BMI as measured by the MISC between degreed and non-degreed clinicians or those with training in psychology or other counseling field and those without.

2.5. Follow-up assessment

Research staff blind to treatment assignment conducted follow-up assessments by telephone at 6 and 12 months. The follow-up assessments included the measurements of baseline alcohol use, alcohol problems, diagnosis of alcohol dependence and treatment utilization described above. Of the patients eligible for follow-up, 77% completed a 6 month assessment and 66% completed a 12 month assessment. Hispanics (OR = .59, 95% CI = .43–.83) were less likely to complete six month follow-up. There were no significant predictors of loss to follow-up at 12 months.

2.6. Statistical analysis

Longitudinal analyses were conducted using hierarchical linear modeling (HLM) of drinking outcomes with random effects for subject and time within subject. Analyses were carried out using HLM Version 6.06 (Raudenbush and Bryk, 2002; Raudenbush et al., 2004). The primary outcomes of interest in this study were volume per week, maximum amount consumed in one day, percent days abstinent, alcohol problems and dependence status. Volume per week and maximum amount per occasion were log transformed. Analyses controlled for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity. HLM was used to model the effects of treatment, alcohol dependence an interaction between treatment and alcohol dependence and covariates of interest on change from baseline to the 6 and 12 months follow-up. With the exception

Table 1a
Volume per week at baseline and follow-up by treatment assignment and dependence status.

	BMI			TAU+		
	Baseline	6 months	12 months	Baseline	6 months	12 months
Dependent	25.3 (29.1)	11.7 (22.1)	12.9 (23.1)	27.0 (35.8)	14.7 (28.9)	17.5 (31.3)
Non-dependent	8.2 (10.1)	7.3 (13.4)	8.4 (14.9)	8.1 (9.3)	7.2 (14.3)	7.8 (13.9)

Table 1b
Volume per week[a].

	6 months			12 months		
	Coefficient	Std error	*p* value	Coefficient	Std error	*p* value
Brief Motivational Intervention	.17	.16	.31	.16	.17	.35
Alcohol dependence	−.38	.18	.03[†]	−.38	.19	.045[†]
Interaction between Brief Motivational Intervention and dependence status at baseline	−.56	.25	.03[†]	−.63	.27	.02[†]

[a] Log normalized, controls for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity.
[†] $p \leq .05$.

of dependence status and treatment utilization, drinking outcomes were modeled using maximum likelihood. The logit function was used to model dependence status and treatment utilization at follow-up which were binary outcomes. When a significant treatment effect was observed, effect sizes were calculated using changes in mean score from baseline to 6 months or from baseline to 12 months (Cohen, 1988; Rosnow and Rosenthal, 1996). The pooled standard deviation was calculated using the standard deviations for BMI and TAU+ of patients meeting criteria for alcohol dependence at baseline (Cohen, 1988; Rosnow and Rosenthal, 1996). Because the parent study indicated a significant interaction between Brief Motivational Intervention and ethnicity, with Hispanics benefiting from the intervention, subsequent analysis controlled for this interaction. However, inclusion of this interaction did not influence the significance of the findings or their implications. As a result, the current study reports the effects of BMI among dependent and non-dependent drinkers without controlling for the interactions observed in the parent study.

3. Results

The patient population was predominately male ($n = 1095$, 82%), employed ($n = 917$, 69%), currently single or never married ($n = 615$, 46%) with an average age of 33 (SD = 11). Approximately one-third ($n = 455$, 34%) of the current sample were Hispanic, 20% ($n = 264$) were Black or/and 46% ($n = 617$) were White, non-Hispanic. Additionally, 37% ($n = 502$) had less than a high school education and 36% ($n = 476$) had a high school diploma or the equivalent. Forty-four percent ($n = 588$) of participants met criteria for alcohol dependence at baseline. An additional 9% ($n = 116$) met criteria for alcohol abuse and 47% ($n = 1095$) did not meet criteria for either alcohol dependence or alcohol abuse.

In comparison to patients that did not meet criteria for alcohol dependence, patients meeting criteria for alcohol dependence were more likely to be Hispanic ($X^2 = 14.5$, $p < .001$), male ($X^2 = 7.5$, $p < .01$), single or never married ($X^2 = 9.3$, $p < .01$) with less than a high school education ($X^2 = 21.7$, $p < .0001$). There was no significant difference in age, employment status or type of injury.

3.1. Volume per week

Table 1a shows average volume per week for injured patients receiving BMI and TAU+ at 6 and 12 months follow-up among those with and without a diagnosis of alcohol dependence. After controlling for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity, there was a significant interaction between BMI and alcohol dependence status at 6 and 12 months follow-up ($p = .03$ and $p = .02$, respectively; Table 1b). Observed effect sizes among patients meeting criteria for alcohol dependence at baseline were $d = -.07$ at 6 months and $d = -.17$ at 12 months. Patients with alcohol dependence who received BMI reduced the average number of standard drinks per week from baseline to 6 and 12 months follow-up by 11.9 (SD = 34.1) and 12.2 standard drinks per week (SD = 36), respectively. In contrast, observed effect sizes of BMI at 6 and 12 months among non-dependent drinkers were $d = .02$ and $d = .03$, respectively. Thus, the observed effect of BMI among non-dependent drinkers was in the opposite direction and reflected a small, although non-significant, increase from baseline in volume per week.

3.2. Maximum amount

Table 2a shows the maximum amount consumed in one day for injured patients receiving BMI and TAU+ at 6 and 12 months follow-up among those with and without a diagnosis of alcohol dependence. After controlling for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity, there was a significant interaction between BMI and alcohol dependence status at six months ($p = .04$; Table 2b). The observed effect size among patients meeting criteria for alcohol dependence at baseline was $d = -.18$ at 6 months. While no significant treatment effect was found for BMI among patients without alcohol dependence, the estimated effect at 6 months was $d = -.10$. Patients without alcohol dependence who received BMI reduced the maximum amount consumed by an average of 4.2 (SD = 9.0) standard drinks from baseline to six months. In contrast, patients with alcohol dependence that received BMI reduced the maximum amount consumed by more than twice that amount (mean = 8.5, SD = 12.6 standard drinks).

Table 2a
Maximum amount at baseline and follow-up by treatment assignment and dependence status.

	BMI			TAU+		
	Baseline	6 months	12 months	Baseline	6 months	12 months
Dependent	18.0 (13.0)	8.2 (8.4)	9.0 (9.7)	17.0 (11.1)	9.5 (9.1)	10.0 (8.9)
Non-dependent	10.8 (7.7)	6.8 (7.5)	7.1 (7.4)	10.4 (6.9)	6.8 (7.5)	7.2 (7.0)

Table 2b
Maximum amount[a].

	6 months			12 months		
	Coefficient	Std error	*p* value	Coefficient	Std error	*p* value
Brief Motivational Intervention	.02	.10	.81	−.04	.10	.66
Alcohol dependence	−.03	.11	.80	−.09	.11	.40
Interaction between Brief Motivational Intervention and dependence status at baseline	−.31	.15	.04[†]	−.24	.16	.14

[a] Log normalized, controls for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity.
[†] $p \leq .05$.

Table 3a
Percent days abstinent at baseline and follow-up by treatment assignment and dependence status.

	BMI			TAU+		
	Baseline	6 months	12 months	Baseline	6 months	12 months
Dependent	55% (33%)	74% (31%)	73% (31%)	53% (33%)	70% (33%)	64% (35%)
Non-dependent	75% (25%)	80% (26%)	77% (28%)	75% (24%)	81% (26%)	79% (28%)

Table 3b
Percent days abstinent[a].

	6 months			12 months		
	Coefficient	Std error	*p* value	Coefficient	Std error	*p* value
Brief Motivational Intervention	−.02	.02	.68	−.04	.03	.14
Alcohol dependence	.11	.03	.0001[‡]	.06	.03	.03[†]
Interaction between Brief Motivational Intervention and dependence status at baseline	.03	.04	.50	.11	.04	.007[‡]

[a] Controls for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity.
[†] $p \leq .05$.
[‡] $p \leq .01$.

Table 4a
Alcohol problems at baseline and follow-up by treatment assignment and dependence status.

	BMI			TAU+		
	Baseline	6 months	12 months	Baseline	6 months	12 months
Dependent	16.3 (14.2)	10.0 (14.5)	9.8 (13.5)	15.9 (14.0)	10.6 (14.3)	11.9 (15.5)
Non-dependent	2.3 (3.8)	2.8 (7.1)	3.0 (6.8)	2.5 (4.0)	3.0 (8.6)	2.4 (6.0)

3.3. Percent days abstinent

Table 3a shows percent days abstinent for injured patients receiving BMI and TAU+ at 6 and 12 months follow-up among those with and without a diagnosis of alcohol dependence. After controlling for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity, there was a significant interaction between BMI and alcohol dependence status at 12 months ($p = .007$; Table 3b). The observed effect size of BMI among patients meeting criteria for alcohol dependence at baseline was $d = -.23$ at 12 months. Patients with alcohol dependence who received BMI reported an additional 25.6 days abstinent in comparison to patients with alcohol dependence who were assigned to TAU+ (65.7 days abstinent and 40.15 days abstinent, respectively). Although no significant treatment effect was observed among non-dependent drinkers, the effect size was $d = .11$. Patients without alcohol dependence who received TAU+ increased the average number of days abstinent by an average of 14.6 days per year at 12 month follow-up. In contrast, patients without alcohol dependence who received BMI reported an average increase of 7.3 days abstinent over the one year follow-up period. Thus patients without alcohol dependence assigned to TAU+ experienced more days abstinent than those who received BMI.

3.4. Alcohol problems

Table 4a shows the total number of alcohol problems for injured patients receiving BMI and TAU+ at 6 and 12 months follow-up among those with and without a diagnosis of alcohol dependence. After controlling for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity, there was a significant interaction between BMI and alcohol dependence status at 12 months ($p = .04$; Table 4b). The observed effect size among patients meeting criteria for alcohol dependence at baseline was $d = -.02$ at 12 months. While no significant treatment effect was observed among non-dependent drinkers the estimated effect size was $d = .10$. Thus, patients without alcohol dependence who received BMI experienced an increase in the occurrence of alcohol problems as measured by the SIP + 6 at 12 month follow-up.

3.5. Alcohol dependence status

Table 5a shows dependence status at 6 and 12 months follow-up for injured patients receiving BMI and TAU+ with and without a diagnosis of alcohol dependence at baseline. After controlling for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity, patients with alcohol dependence who received BMI were significantly less likely to meet

Table 4b
Alcohol problems[a].

	6 months			12 months		
	Coefficient	Std error	*p* value	Coefficient	Std error	*p* value
Brief Motivational Intervention	.28	.84	.74	.78	.85	.36
Alcohol dependence	−4.9	.91	.0001[‡]	−3.1	.93	.001[‡]
Interaction between Brief Motivational Intervention and dependence status at baseline	−.68	1.3	.60	−2.7	1.4	.04[†]

[a] Controls for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity.
[†] $p \leq .05$.
[‡] $p \leq .01$.

Table 5a
Dependence status at 6 and 12 months follow-up[a].

Dependence status at baseline	Dependence status at follow-up	6 months		12 months	
		TAU+	BMI	TAU+	BMI
Dependent	Dependent	83 (45)	60 (33)	78 (49)	56 (38)
	Non-dependent	100 (55)	122 (67)	82 (51)	89 (61)
Non-dependent	Dependent	42 (15)	29 (12)	35 (14)	34 (15)
	Non-dependent	235 (85)	213 (88)	219 (86)	187 (85)

[a] Frequency (% within treatment group).

Table 5b
Dependence status at follow-up[a].

	6 months			12 months		
	Coefficient	Std error	*p* value	Coefficient	Std error	*p* value
Brief Motivational Intervention	−.62	.22	.005[†]	−.34	.23	.13

[a] Controls for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity.
[†] $p \leq .01$.

criteria for alcohol dependence at six month follow-up ($p = .005$; Table 5b). Patients with alcohol dependence at baseline were .59 (95% CI = .39–.91) times less likely to meet criteria for alcohol dependence at six months. In contrast, patients without alcohol dependence at baseline were no less likely to report changes in alcohol dependence status (OR = .76, 95% CI = .46–1.27).

3.6. Treatment utilization

At 6 and 12 months follow-up, 149 (14.5%) and 135 (15.2%) participants, respectively, had sought specialized treatment or attended self-help groups for their alcohol problems. Throughout the entire 12 month follow-up period, 199 (22.7%) participants sought help for their alcohol problems. A large majority of the patients who sought help attended Alcoholics Anonymous (67%). After controlling for age, gender, ethnicity, employment status, marital status, education, type of injury and injury severity, patients who received BMI were no more likely to seek services for alcohol problems. There was also no significant interaction between treatment assignment and dependence status at baseline.

4. Discussion

Contrary to implicit assumptions in the research literature and current clinical guidelines, the current study indicates that patients with alcohol dependence may be among the most appropriate candidates for brief intervention in the medical setting. While the effect of BMI varied across time, the impact of brief intervention among alcohol-dependent patients was consistent across measures of alcohol use commonly associated with injury and other problems commonly associated with alcohol dependence. Thus, at least among injured patients, brief intervention may be most beneficial for patients with alcohol dependence. It may be that injured patients with alcohol dependence are more likely to be responsive to intervention following injury because they have already experienced a significant amount of problems as a result of their drinking. In contrast, the injury event itself in combination with screening and assessment may effectively reduce drinking and its associated problems among injured patients with less severe alcohol problems. These findings may seem counterintuitive given that one might assume that patients with more severe alcohol problems, those who are alcohol dependent, would require more intense treatment to change their drinking behavior. However, several reviews have observed that brief interventions are just as effective as more extended treatment (Bien et al., 1993; Moyer et al., 2002; Wilk et al., 1997). Given that the current investigation has significant implications for public health and clinical guidelines, the generalizability and consistency of current findings across patient populations and settings should be further evaluated.

Prior to this investigation, no studies have empirically evaluated the effectiveness of opportunistic brief interventions among alcohol-dependent patients in the trauma care setting. As described in the introduction, previous findings have not focused on the effect of dependence status and the ancillary findings in these studies have been inconsistent (Gentilello et al., 1999; Schermer et al., 2006; Guth et al., 2008). Guth et al. (2008) specifically assessed the effects of dependence status on drinking outcomes in the primary care setting. Guth et al. (2008) found no evidence that patients with alcohol dependence in the primary care setting realized any less benefit from brief intervention in terms of alcohol consumption. In contrast, the current study suggests that brief intervention significantly reduces alcohol consumption, alcohol problems and dependence status among injured patients meeting criteria for alcohol dependence at the time of the intervention. The setting in which brief intervention is provided may impact its effect. It is possible that in the absence of an emotionally salient event such as

serious injury a brief intervention will not have a positive effect on drinking outcomes among dependent participants. It is also possible that the marked reduction in drinking and alcohol problems may be attributed to something other than the combined effects of intervention and the natural response to the injury event. For example, the observed effect might also be explained as regression to the mean among individuals with more severe problems. Given that the legal and financial pressures to underreport are probably greatest at the time of injury, regression to the mean seems to provide an inadequate explanation for the observed effects. Finally, there was no significant difference in treatment utilization at follow-up which further suggests that the observed treatment effects is a function of the BMI rather than subsequent treatment or involvement in self-help groups.

The results reported herein should be interpreted in light of the overrepresentation of alcohol-dependent patients in the trauma care setting. For example, Cherpitel (1995a) determined that 19% of injured patients met criteria for alcohol dependence. Soderstrom et al. (1992) found that 67% of trauma patients who had a positive BAC met criteria for alcohol dependence and an additional 46% of those with a negative BAC also met dependence criteria. Similarly, nearly half of all participants in the current study met DSM-IV criteria for alcohol dependence (Field et al., 2008). Thus, screening procedures commonly employed in the trauma care setting are very likely to yield a relatively large proportion of patients with alcohol dependence. Both Guth et al. (2008) and Saitz et al. (2007) observed similarly high rates of alcohol dependence in the general medical setting (68% and 77%, respectively). Thus, the current results indicating that brief interventions can be effective with alcohol-dependent patients hold considerable promise for application in other medical settings where a large proportion of identified patients have severe alcohol problems. Furthermore, the current findings may also help explain why some studies of the effectiveness of brief interventions that excluded injured patients with an indication of alcohol dependence have resulted in null findings (Soderstrom et al., 2007; Daeppen et al., 2007).

Although some alcohol-dependent individuals recover without treatment, many do not (Bischof et al., 2003; Dawson et al., 2005; Wang et al., 2005). Moreover, participation in alcohol treatment is clearly associated with improved outcomes. For instance, Weisner et al. (2003) found clear benefits of treatment. Specifically, 30-day abstinence rates one year after baseline were 57% for the treatment sample and 12% for the population sample. Non-problematic drinking at follow-up also favored the treated sample (40% versus 23%). A recent examination of the NESARC data by Dawson et al. (2006a) also suggests that treatment increases the chance of recovery among individuals with a diagnosis of alcohol dependence. More specifically, individuals who met the criteria for alcohol dependence in the last year and sought treatment were more likely to be classified as having recovered during the survey period than those who never sought help (45.7% versus 32.5%). Unfortunately, the prevalence of past year treatment use was merely 12% among respondents with a past year diagnosis (Cunningham and Blomviqst, 2006). Individuals who both participated in 12-Step programs *and* received formal treatment had more than twice the increased likelihood of AR as those who received formal treatment only (Dawson et al., 2006a). Brief intervention in the emergency department and trauma care setting may facilitate the recovery process. In the current study, a large majority of patients sought help through Alcoholics Anonymous. While those who attended AA attended nearly one meeting per week (results not shown), they were very unlikely to seek formal treatment. Thus, while a stepped care approach involving formal treatment followed by AA attendance may increase success among these patients, they were very unlikely to follow this path to recovery. Thus, there is a continued need to encourage people meeting criteria for alcohol dependence to seek formal treatment followed by involvement in AA. This may further improve outcomes among patients with severe alcohol problems. Active referral for formal treatment should continue to be a part of standardized brief interventions in the medical setting. While there is a continuing need to further evaluate the effectiveness of brief interventions across settings and patient populations, the assumption that brief intervention is either not effective or less effective for patients with an indication of alcohol dependence should not be a foregone conclusion in future studies.

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Contributors

Dr Ceatano was the principal investigator for the grant and participated in the design, conduct and conceptualization of the study. Dr Field was responsible for the design, conduct, conceptualization and data analysis. Dr Field prepared the first draft of the manuscript.

Conflicts of interest

The authors have no conflicts of interest to report.

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