A Multisite Randomized Controlled Trial of Brief Intervention to Reduce Drinking in the Trauma Care Setting

How Brief Is Brief?

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Objective: Determine the efficacy of 3 brief intervention strategies that address heavy drinking among injured patients.

Background: The content or structure of brief interventions most effective at reducing alcohol misuse after traumatic injury is not known.

Methods: Injured patients from 3 trauma centers were screened for heavy drinking and randomly assigned to brief advice (n = 200), brief motivational intervention (BMI) (n = 203), or BMI plus a telephone booster using personalized feedback or BMI + B (n = 193). Among those randomly assigned, 57% met criteria for moderate to severe alcohol problems. The primary drinking outcomes were assessed at 3, 6, and 12 months.

Results: Compared with brief advice and BMI, BMI + B showed significant reductions in the number of standard drinks consumed per week at 3 (Δ adjusted means: −1.22, 95% confidence interval [CI]: −0.99, approximately −1.49, $P = 0.01$) and 6 months (Δ adjusted means: −1.42, 95% CI: −1.14, approximately −1.76, $P = 0.02$), percent days of heavy drinking at 6 months (Δ adjusted means: −5.90, 95% CI: −11.40, approximately −0.40, $P = 0.04$), maximum number of standard drinks consumed in 1 day at 3 (Δ adjusted means: −1.38, 95% CI: −1.18, approximately −1.62, $P = 0.003$) and 12 months (Δ adjusted means: −1.71, 95% CI: −1.47, approximately −1.99, $P = 0.02$), and number of standard drinks consumed per drinking day at 3 (Δ adjusted means: −1.49, 95% CI: −1.35, approximately −1.65, $P = 0.002$) and 6 months (Δ adjusted means: −1.28, 95% CI: −1.17, approximately −1.40, $P = 0.01$).

Conclusions: Brief interventions based on motivational interviewing with a telephone booster using personalized feedback were most effective at achieving reductions in alcohol intake across the 3 trauma centers.

Keywords: at-risk drinking, brief intervention, multisite, randomized controlled trial

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Alcohol consumption, a modifiable behavioral risk factor for disease, is the third preventable cause of death in the United States.[1] Alcohol abuse is also among the top 20 leading causes of premature death and disability as measured by disability-adjusted life-years.[2] More than 60 individual medical conditions including injury have been related to the misuse of alcohol, particularly, irregular heavy drinking.[3] Remarkably, the clinically preventable burden of alcohol misuse is comparable with screening for hypertension, colorectal cancer, and vaccination for influenza or pneumococcal disease.[4] Thus, brief intervention for alcohol misuse is among the highest ranking preventative services.[4] As a result of prior research in the trauma care setting, level 1 trauma centers are required by the American College of Surgeons to provide brief interventions to injured patients identified with alcohol problems.[5–7]

Recent meta-analyses conducted by the Cochrane Collaboration support the effectiveness of brief interventions in the medical setting and indicate that these interventions reduce injury-related deaths and nonfatal injury outcomes.[8] Guidance regarding the content and intensity of brief interventions remains unclear, thus, making it difficult for trauma centers to implement the most effective strategies for reducing drinking subsequent to injury. In a recent meta-analysis of brief intervention, 10 studies evaluated a single session, 8 incorporated motivational interviewing principles, and 8 provided a handout that included advice or information on drinking.[9] Average intervention length varied from 5 minutes to 60 minutes.[7] Other reviews have reported similar variability in duration, approach, and content and concluded that these methodological variations result in significant ambiguity regarding the type of interventions that should be provided to patients with alcohol problems in the medical setting.[10–13] Although supporting the general effectiveness of brief interventions, these meta-analyses have also concluded that the content and structure of the most effective form of brief intervention needs to be determined in future clinical trials.[14,15] This study seeks to resolve ambiguity in the content and structure of brief alcohol interventions so as to inform the implementation and dissemination of brief intervention for alcohol problems in the trauma care setting. This multisite, randomized controlled trial compares the effectiveness of brief advice (BA), brief motivational intervention (BMI + B), and BMI with a telephone booster using personalized feedback for at-risk drinkers admitted to level I trauma centers.

METHODS

Study Design and Setting

Patients were recruited between October 2007 and December 2010 from 3 urban level I trauma centers: Baylor University Medical Center (BUMC; Dallas, TX), Methodist (Dallas, TX), and University Medical Center Brackenridge (Austin, TX). Participants provided written informed consent to participate in a study designed to improve health outcomes among trauma patients. As a condition of approval, the institutional review board required that participants be informed of the basis for their eligibility in the study. Participants received remuneration in the amount of $50 for the

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baseline and 12-month follow-up assessment and $25 for the 3- and 6-month follow-up assessment. The study was 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 at The University of Texas Southwestern Medical Center at Dallas. Additional privacy protection was provided by a federal certificate of confidentiality from the US Department of Health and Human Services. This trial was conducted in accord with the CONSORT statement (http://www.consort-statement.org) for clinical trials.

Patients who were treated for unintentional injuries such as motor vehicle collisions and falls [*International Classification of Diseases, Ninth Revision*, *Clinical Modifications* (*ICD-9-CM*) codes E810-829 and E880-899] or intentional or violence-related injuries such as gunshot wounds, stab wounds, and other injuries related to assaults (*ICD-9-CM* codes E960-968.9) were eligible for inclusion in the study.[16] Patients were excluded from participation if they (1) were younger than 18 years of age, (2) spoke neither English nor Spanish, (3) had no identifiable residence, (4) were under arrest or in police custody at the time of admission or during their hospital stay, (5) were actively suicidal or psychotic, (6) 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 score of less than 14 were monitored by research staff for inclusion in the study once they were medically stable. Patients with a Glasgow Coma Scale score of less than 14 that did not resolve before discharge or within 30 days after admission were not eligible for screening or enrollment. Dependent drinkers or patients who used other substances of abuse were not excluded from participation in this study. All subjects had to demonstrate orientation to person, place, and time—and adequate recall of recent and remote events—before giving written informed consent as indicated by the Mini-Mental Status Examination. Per standard medical care, trauma center staff, in collaboration with research staff, screened eligible patients during the study period for at-risk drinking. Patients screened positive on the basis of 1 or more of the following criteria: positive blood alcohol concentration (>0.01) at the time of admission, self-reported drinking 6 hours before injury, or sex-specific cutoff scores (a score of ≥ 3 for women and a score of ≥ 4 for men) on the consumption questions from the Alcohol Use Disorders Identification Test (AUDIT-C).[17]

Patients who qualified for the study and agreed to participate were assessed by research staff using a computer-assisted survey. Research staff and participants were blind to intervention assignment during the baseline assessment. After completion of the baseline assessment, patients were randomized to BA, BMI, or BMI plus telephone booster (BMI + B) using personalized feedback. Randomization occurred in blocks of 18 (3 per group) and was assigned on the basis of a computer-generated algorithm using numbered sealed, opaque envelopes. Randomization to 1 of the 3 treatment groups was determined at one time using a computerized randomization algorithm performed by the study statistician before recruitment. To ensure that the interventionist was blind to whether or not the patient would receive a booster and bias the initial intervention, randomization was revealed in 2 stages. First, the interventionist would open a sealed, opaque envelope that would indicate whether the participants were assigned to BA or BMI. If the patients were assigned to BMI, the interventionist would open a second, sealed opaque envelope to determine whether the patient would receive a booster. Telephone follow-ups were completed at 3, 6, and 12 months by research staff blind to intervention assignment. Study recruitment and follow-up rates are presented in Figure 1. Although this study reports results of the primary outcomes (ie, alcohol use and alcohol problems), the baseline and/or follow-up assessments also included patient reports of a history of injury, engagement in injury-related risk behaviors, social support, health outcomes, and physical functioning and legal problems.

Outcome Measures

Primary drinking outcomes were assessed using the timeline follow back method during the past 3 months (for baseline, 3-month, and 6-month follow-ups) or 6 months (for 12-month follow-up).[18] To accurately assess self-reported drinking, 3 procedures were undertaken during baseline and follow-up assessments. First, the patient was provided a handout defining a standard drink and providing standard equivalents on the basis of different container sizes, types of alcohol consumed, and alcohol content (http://pubs.niaaa.nih.gov/publications/Practitioner/pocketguide/pocket_guide2.htm). Second, research staff who conducted baseline and follow-up assessments using the timeline follow back were trained in the conversion of alcoholic beverages to standard drinks based on patient self-reported alcohol intake. Finally, research staff used the Center on Alcoholism, Substance Abuse and Addictions Blood Alcohol Concentration and Standard Drink Calculator with liquor database available for download at http://casaa.unm.edu/dload.html. Using self-reported data from the timeline follow back, the primary drinking outcomes including the average number of standard drinks consumed per week, percent days of heavy drinking, maximum number of standard drinks consumed on 1 occasion, and average number of standard drinks consumed per drinking day were calculated. Heavy drinking was defined as more than 4 drinks for men or more than 3 drinks for women in a single drinking episode.[19] Average drinks per week, maximum numbers of drinks, and drinks per drinking day were log-transformed because of nonnormality.

Alcohol problems were assessed at baseline, 6 months, and 12 months using a 21-item version of the Short Inventory of Problems (SIP).[20] The SIP, a short version of the *Drinker Inventory of Consequences*,[21] consists of self-reported alcohol-related consequences experienced in the last 90 days for baseline and 180 days for 6- and 12-month follow-up. The SIP + 6 retains 6 items pertaining to injury-related behaviors and drinking and has been used in prior studies of brief intervention in the trauma care setting.[22,23]

Interventions

Clinicians were licensed social workers or graduate students in clinical, counseling, or health psychology programs who demonstrated the ability to achieve and maintain proficiency on the Motivational Interviewing Treatment Integrity coding system and the FLO checklist.[24,25] The FLO checklist is used to assess the inclusion of the three primary components of brief motivational intervention: providing personalized feedback (F), listening and eliciting change talk (L) and exploring options for change (O). Clinicians participated in a 3-day training covering the BMI and telephone booster protocols and participated in weekly supervision of approximately 1 hour in length. Supervision was conducted by members of the Motivational Interviewing Network of Trainers throughout the recruitment period (C. F. and S. W.). Dr. Field provided training and supervision in BMI and Dr. Walters provided training and supervision on telephone boosters using personalized feedback.

All patients, regardless of intervention, received handouts from *Helping Patients Who Drink Too Much: A Clinician's Guide*, including information defining a standard drink and at-risk drinking, a summary of adult drinking patterns in the United States, and strategies for cutting down.[26] In addition, all patients received a list of hospital and community services available to them, including substance abuse treatment and self-help groups, and national resources for identifying additional treatment facilities.

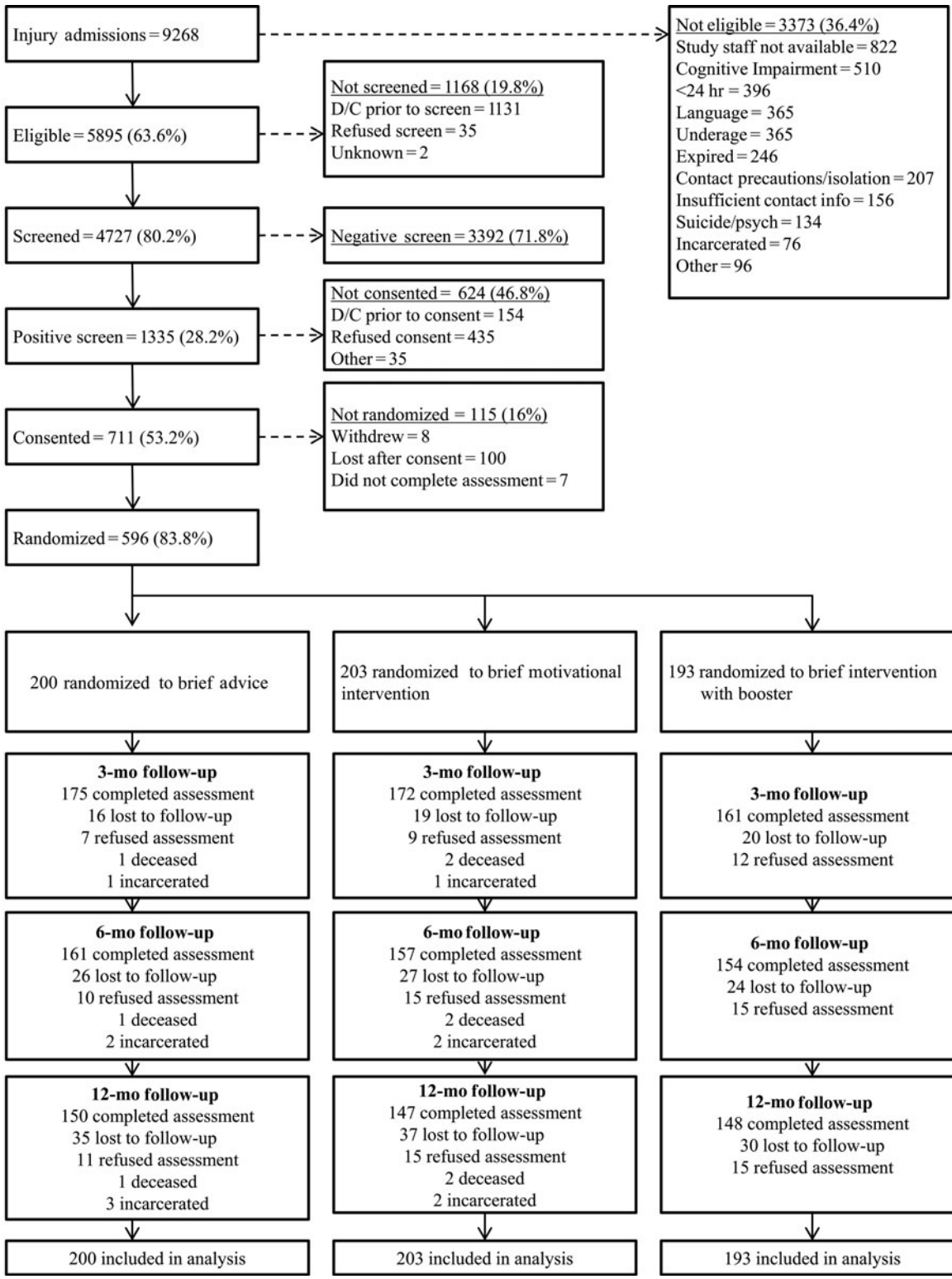

FIGURE 1. Study flow chart.

Brief Advice

BA represents a minimal intervention that meets the requirements of the American College of Surgeons' Committee on Trauma and can be provided by various health care professionals with limited training and supervision.[5] BA lasted an average of 4.7 minutes (SD = 2.2) and included information regarding alcohol screening results, recommendations to quit or cut down, and identification of hospital and community services.

Brief Motivational Intervention

BMI with injured patients has been described elsewhere.[27,28] In short, BMI is based on motivational interviewing.[29] The primary components consist of acknowledging the patients' autonomy regarding their drinking behavior; providing personalized feedback on the basis of screening results; assessing causal attribution of their admission to alcohol intake; encouraging patients to explore the pros and cons of their drinking; assessing importance, confidence, and readiness to change drinking; supporting patients' self-efficacy; and reinforcing efforts or intentions to make positive changes in drinking. BMIs lasted an average of 22.5 minutes (SD = 10.4) and took place during the patients' hospital stay after medical stabilization.

BMI With Telephone Booster

Those assigned to BMI + B received the BMI described previously, with the addition of a telephone booster session using personalized drinking feedback, conducted approximately 30 days later. Booster sessions lasted an average of 28.0 minutes (SD = 10.4), during which the clinician provided personalized feedback on the basis of information from the client's baseline interview. The feedback report was similar to those used in other trials of motivational interviewing and included information summarizing the client's baseline drinking level, a comparison with sex-specific national norms, and risk indicators such as tolerance, total AUDIT score, and reported alcohol-related consequences.[30,31] Before the call, the client was mailed a computer-generated feedback report and asked to have a copy in view during the call. After reviewing the feedback, the counselor used the importance and confidence rulers to elicit statements in support of motivation to change and self-efficacy. If applicable, the counselor reinforced positive progress, asked about future plans, and ended with a summary of the session.

STATISTICAL ANALYSES

Data were analyzed using SAS version 9.2 (SAS Institute Inc, Cary, NC). On the basis of the sample size of 596, this longitudinal study had 76% power to detect an effect size of $g = 0.22$ at P value of less than 0.05; thus, the analyses conducted for this study were adequately powered.[32] Baseline differences in demographic and other participant characteristics were tested by using analysis of variance and χ^2 tests. A series of linear mixed models were fit using intent to treat. Mixed models use maximum likelihood estimation. We used a 3-piece model, estimating slopes from baseline to 3 months, from 3 months to 6 months, and from 6 months to 12 months.

Mixed models use maximum likelihood estimation, which allows complete cases to be included, in which a case is an observation at a putative time point. Mixed models also enable the estimation of random intercepts and slope coefficients in which repeated observations are nested within participants. This study employed a piecewise time-coding scheme in which all time parameters have direct interpretation. In this piecewise approach, we were able to test differences in overall mean changes and the amount of variation among individuals in their rates of change between time phases.[33,34,35] Based on distributions of primary drinking outcomes in the current and previous studies and fit statistics (eg, Akaike Information Criterion or AIC), we chose a 3-piece model, estimating slopes from baseline to 3 months, from 3 months to 6 months, and from 6 months to 12 months.[22,36] Piecewise approach has been utilized in intervention studies and longitudinal studies of alcohol use.[35,37]

An intent-to-treat analysis was conducted for each primary drinking outcome (ie, average drinks per week, average drinks per drinking day, percent heavy drinking days, and maximum numbers of drinks a day). Thus, all patients randomly assigned to BA (n = 200), BMI (n = 203), or BMI plus a telephone booster with personalized feedback (n = 193) were examined in the analyses of primary outcomes. Individual demographic characteristics, intent of injury, and recruitment site were included in linear mixed models as covariates. Several within-person error covariance matrices were tested and the unstructured covariance matrix provided the best fit to the data on the basis of model fit statistics (eg, AIC and numbers of parameters).[38] From the linear mixed model analyses, the main effects of groups and time and Specific group × Time interactions were estimated. Adjusted means for groups at each time point were also estimated and compared. For log-transformed drinking outcomes, geometric means were derived using back log-transformation. Adjusted or geometric means are used to report changes in drinking behavior. The observed effect sizes were calculated by using Hedge's g, which indicates the strength of the association between the intervention and the observed outcome.[39] Effect sizes for BMI in comparison with BA ranged from 0.23 to 0.27, and effect sizes for BMI + B in comparison with BA ranged from 0.22 to 0.39. A similar approach was taken with the analysis of alcohol problems, the secondary drinking outcome.

Preplanned moderator analyses were conducted to examine the impact of baseline alcohol severity and reasons for screening positive and their interaction with intervention on primary drinking outcomes. These moderators were examined because patients with more severe alcohol problems or those admitted with a positive blood alcohol content may respond differently to brief intervention than those with less severe alcohol problems or those who indicated risky drinking at some point in the recent past. Analysis of baseline alcohol severity compared people with moderate alcohol problems (n = 214, 35.9%) with severe alcohol problems (n = 124, 20.8%) on the basis of total scores from the AUDIT, which ranged from 8 to 15 and 16 to 40, respectively.[40] For the subgroup analysis examining reason for screening positive, those with any indication of drinking at the time of their injury—positive blood alcohol concentration or self-reported drinking 6 hours before injury (n = 460, 77.2%)—were compared with those who screened positive on the basis of a positive score on the AUDIT-C alone (n = 136, 22.8%). For these comparisons, adjusted or geometric means and P value are also reported.

A separate set of linear mixed models were performed to examine the impact of session length (eg, total minutes) and recruitment site and their interactions with intervention on primary drinking outcomes. We examined the effect of session length of BA, BMI, or BMI + B in total minutes on primary drinking outcomes using 329 audio recordings (55.2% of total interventions). Before analyzing the impact of recruitment sites on primary drinking outcomes, descriptive analyses using analysis of variance and χ^2 tests were conducted to examine demographic characteristic differences between recruitment sites. The recruitment site with the largest number of participants (BUMC) served as the reference group.

RESULTS

Among 5895 potentially eligible patients, 1335 (28.2% of the 4727 patients screened) met 1 or more of the screening criteria (Fig. 1). Of the 1335 patients who screened positive, 711 (53.2%) agreed to participate in the study and 596 (44.6% of positively screened, 83.8% of consented) were randomly assigned. Patients who

were younger and nonwhite were more likely to consent ($t = 3.24$, $df = 1266.84$, $P = 0.001$; $\chi^2 = 23.55$, $df = 3$, $P < 0.001$). Because staff who screened patients and consented those who screened positive did not conduct baseline assessments and randomize consented patients, 100 patients were lost between consent and randomization. There is no significant difference in demographic characteristics or baseline drinking between the 115 patients who were lost after consent and those who were randomized. Supplemental Digital Content Table 1, available at: http://links.lww.com/SLA/A487, presents demographic characteristics for the total sample and the sample by intervention assignment.

There were no significant differences in attrition between intervention groups. There were significant group differences in race/ethnicity and education between those participants who completed follow-ups and participants lost to follow up. Hispanic participants were more likely to be missing at follow-up ($\chi^2 = 8.44$, $df = 3$, $P = 0.04$); also, participants who had less than a high school degree were more likely to be missing at follow-up ($\chi^2 = 6.52$, $df = 2$, $P = 0.04$). However, there were no baseline differences between treatment groups in terms of race/ethnicity or education, thereby reducing the potential biases introduced by these differences between participants lost to follow up and participants who completed follow-ups (see Supplemental Digital Content Table 1, available at: http://links.lww.com/SLA/A487).

Primary Drinking Outcomes

Results from linear mixed models examining changes in alcohol use at 3, 6, and 12 months are shown in Figures 2A-D and reported in Supplemental Digital Content Table 2, available at: http://links.lww.com/SLA/A488. Regardless of intervention, significant time effects from baseline to 3 months were observed in 3 of 4 primary drinking outcomes (drinks per week, percent heavy drinking days, and maximum numbers of drinks a day). No significant time effects were observed from 3 months to 6 months or from 6 months to 12 months on any drinking outcomes.

For average number of standard drinks consumed per week (see Fig. 2A and Supplemental Digital Content Table 2 Section A, available at: http://links.lww.com/SLA/A488), there was a significant intervention effect of BMI + B at 3 and 6 months; BMI + B participants reported fewer drinks per week than BA participants (3 months: $t = -2.64$, $df = 440$, 95% CI of Δ adjusted means: -0.99 approximately -1.49, $P = 0.01$, g = 0.28; 6 months: $t = -2.31$, $df = 400$, 95% CI of Δ adjusted means: -1.14 approximately -1.76, $P = 0.02$; $g = 0.25$). A significant Intervention × Time interaction was also observed at 3 months; BMI + B participants significantly reduced their average drinks per week compared with BA participants ($t = -1.97$, $df = 440$, $P = 0.049$).

For percent heavy drinking days (see Fig. 2B and Supplemental Digital Content Table 2 Section B, available at:

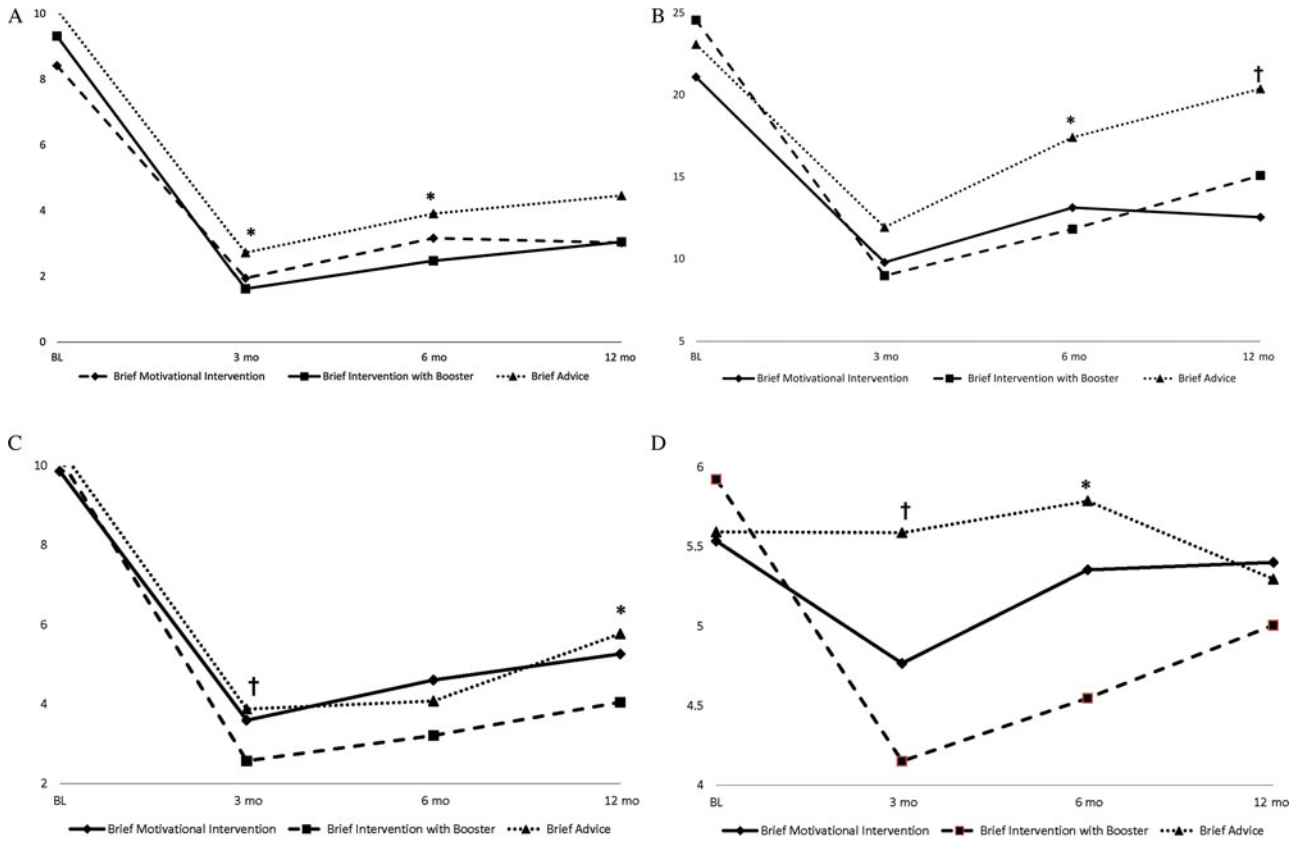

FIGURE 2. Primary drinking outcomes by intervention group. A, Average number of drinks per week. *Brief intervention with booster < Brief advice, $P < 0.05$. BL indicates baseline assessment. B, Percent days of heavy drinking. *Brief intervention with booster < Brief advice, $P < 0.05$. †Brief motivational intervention < Brief advice, $P < 0.05$. BL indicates baseline assessment. C, Maximum number of drinks per day. *Brief intervention with booster < Brief advice, $P < 0.05$. †Brief intervention with booster < Brief advice, $P < 0.01$. BL indicates baseline assessment. D, Average number of drinks per drinking day. *Brief intervention with booster < Brief advice, $P < 0.05$. †Brief intervention with booster < Brief advice, $P < 0.01$. BL indicates baseline assessment.

http://links.lww.com/SLA/A488), there was a significant intervention effect of BMI + B at 6 months; BMI + B participants reported a lower percent days of heavy drinking than BA participants ($t = 2.11$, $df = 400$, 95% CI of Δ adjusted means: −11.40 approximately −0.40, $P = 0.04$; $g = 0.22$). Although the intervention effect of BMI + B was not significant, BMI participants reported lower percent days of heavy drinking than BA participants ($t = -2.40$, $df = 373$, 95% CI of Δ adjusted means: −13.61 approximately −1.35, $P = 0.02$; $g = 0.27$). A significant Intervention × Time effect of BMI was observed at 12 months.

For maximum numbers of standard drinks consumed per day (see Fig. 2C and Supplemental Digital Content Table 2 Section C, available at: http://links.lww.com/SLA/A488), there was a significant intervention effect of BMI + B at 3 and 12 months; BMI + B participants reported lower maximum numbers of drinks per day than BA participants (3 months: $t = -2.95$, $df = 440$, 95% CI of Δ adjusted means: −1.18 approximately −1.62, $P = 0.003$, $g = 0.27$; 12 months: $t = -2.34$, $df = 1236$, 95% CI of Δ adjusted means: −1.47 approximately −1.99, $P = 0.02$, $g = 0.25$). A significant Intervention × Time interaction at 3 months was observed; BMI + B participants reduced their maximum amount compared with BA participants ($t = -2.31$, $df = 440$, $P = 0.02$).

For number of standard drinks consumed per drinking day (see Fig. 2D and Supplemental Digital Content Table 2 Section D, available at: http://links.lww.com/SLA/A488), there was a significant intervention effect of BMI + B at 3 and 6 months; BMI + B participants reported fewer drinks per drinking day than BA participants (3 months: $t = -3.19$, $df = 304$, 95% CI of Δ adjusted means: −1.35 approximately −1.65, $P = 0.002$, $g = 0.39$; 6 months: $t = -2.67$, $df = 243$, 95% CI of Δ adjusted means: −1.17 approximately −1.40, $P = 0.01$; $g = 0.35$). A significant Intervention × Time interaction was observed at 3 months; BMI + B participants significantly reduced their maximum amount of drinks compared with BA participants ($t = -3.79$, $df = 304$, $P < 0.001$).

Alcohol Problems

Regardless of intervention, significant time effects from baseline to 6 months and baseline to 12 months were observed in the total SIP score (baseline to 6 months: $t = -4.57$, $df = 852$, $P < 0.001$; baseline to 12 months: $t = -4.03$, $df = 431$, $P < 0.001$). However, there were no significant intervention effects (see Supplemental Digital Content Table 2 Section E, available at: http://links.lww.com/SLA/A488).

Effect of Session Length, Reasons for Screening Positive, and Alcohol Severity

There were no significant effects of session length on drinking outcomes. There were also no significant interactions between reasons for screening positive and the effects of BMI and BMI + B.

Alcohol Severity

With regard to severity of alcohol problems, 338 participants (56.7% of total sample) with moderate or severe alcohol problems were included in the analyses. There were significant interactions between baseline alcohol severity and intervention on average drinks per week, percent heavy drinking days, and maximum number of drinks per day. Among participants with severe alcohol problems at baseline, those who received BMI or BMI + B showed a significantly lower average number of drinks per week at 3 months than those assigned to BA (BMI: geometric mean = 3.07, BMI + B: geometric mean = 4.26, BA: geometric mean = 8.05, $P < 0.001$, $P = 0.03$, respectively). Effects of BMI on average drinks per week were also observed at 6 months (BMI: geometric mean = 4.84, BA: geometric mean = 11.69, $P = 0.003$) and 12 months (BMI: geometric mean = 5.09, BA: geometric mean = 11.12, $P = 0.01$), whereas there were no significant differences between BMI + B and BA. Similar effects were observed at 3 months for maximum number of drinks per day (BMI: geometric mean = 4.72, BMI + B: geometric mean = 4.58, BA: geometric mean = 8.49, $P = 0.01$, $P = 0.01$, respectively). With regard to percent heavy drinking days, among participants with severe alcohol problems at baseline, those who received BMI reported significantly lower percent heavy drinking days than those who received BA at 3 months (BMI: adjusted mean = 15.15, BA: adjusted mean = 26.96, $P = 0.04$) and 12 months (BMI: adjusted mean = 22.50, BA: adjusted mean = 37.04, $P = 0.01$).

Site Effects

See Supplemental Digital Content Table 3, available at: http://links.lww.com/SLA/A489, for sample demographic characteristics by recruitment site. Patients from University Medical Center Brackenridge were more likely to be non-Hispanic whites, have at least a high school degree, and be admitted with unintentional injuries than patients from either BUMC or Methodist ($\chi^2 = 86.66$, $df = 6$, $P < 0.001$; $\chi^2 = 23.60$, $df = 4$, $P < 0.001$; $\chi^2 = 19.92$, $df = 2$, $P < 0.001$, respectively). Based on the linear mixed model analyses, there were no significant effects of recruitment site on primary drinking outcomes.

CONCLUSIONS

This study indicates that brief interventions that incorporate motivational interviewing are more effective at reducing alcohol intake than those that rely on simple advice and information. In addition, BMIs are more effective if they include a follow-up contact to reinforce changes in alcohol intake. Personalized feedback provides a structured format for delivering this type of follow-up booster session. Although contact time was confounded with condition—on average, BMI + B was longer than BMI, which was longer than BA—we found that the treatment effect did not vary as a result of session length itself.

There are some notable limitations that may influence the generalizability of these findings, including the number of injured patients who did not meet eligibility criteria and the moderate rate of consent among injured patients who were eligible. Blinding of patients to intervention assignment throughout the follow-up period was not possible. However, those conducting baseline and follow-up assessments were blind to intervention assignment. Similar to other randomized trials on drinking behavior, drinking outcomes were determined using self-report. In contrast to our prior research comparing brief intervention with treatment as usual, this study compares 3 viable intervention strategies that can be adequately standardized in the trauma care setting.[37] A control group or treatment-as-usual group was not approved by the Institutional Review Board because of the American College of Surgeons mandate to provide screening and brief intervention to injured patients with alcohol problems.[5] Thus, the comparison group in this study is BA, a minimal intervention that does not require specialized training. BA was also chosen as the comparison group because of its potential cost-effectiveness. However, in our study, BA was significantly less effective than BMI + B at reducing alcohol intake.

Despite these potential limitations, this study is unique from several perspectives. This is the first multisite trial of brief intervention for heavy drinking in the trauma care setting. Site effects are common in multisite trials of behavioral interventions.[41,42] Thus, it is remarkable that no significant site effects were observed in this study despite significant differences in patient characteristics across the 3 trauma centers. This suggests that BMIs can have robust

effects across a range of patient populations when they are adequately standardized through rigorous training and supervision.

This is one of the few studies of brief intervention to include participants with more severe alcohol problems, that is, probably alcohol dependence. Patients with more severe alcohol problems are frequently excluded from studies of brief intervention with the presumption that they are less likely to benefit.[22,43] This distinguishing feature may explain why this study, but not other studies that excluded patients with more severe alcohol problems, found significant effects on drinking outcomes.[22,43] Our results indicate that those with more severe alcohol problems benefited as much from a single session of BMI as from multiple sessions provided in BMI plus telephone booster. That is, patients with more severe alcohol problems were more likely to benefit from the less intensive BMI. These findings are consistent with our prior findings, suggesting that patients with alcohol dependence are more likely to benefit from brief intervention.[44] Although these effects may be limited to the trauma care setting, they should inform the use of BMIs with injured patients with severe alcohol problems.

In this study, all patients, regardless of intervention, decreased their alcohol intake at 3 months and subsequent alcohol problems at 6 and 12 months. Prior studies have hypothesized that there may be an effect of the screening and assessment on alcohol use; however, empirical assessment of this hypothesis in a randomized trial found no effect of assessment.[43] Taken as a whole, this suggests that trauma center admission for the treatment of an injury related to alcohol use or heavy drinking may significantly influence subsequent alcohol use. This and other studies also suggest that drinking at the time of admission does not seem to be a necessary or sufficient condition for brief interventions to influence drinking outcomes.[45,23] Heavy drinkers not drinking at the time of the injury were just as likely to change their drinking after BMI + B as those who had been drinking at the time of their injury. These results suggest that admission for the treatment of trauma injury does constitute a teachable moment or window of opportunity to successfully engage at-risk drinkers, including those with more severe alcohol problems and those who were not drinking at the time of their injury, in BMIs. Future research should examine what aspects of the injury are most influential in response to BMIs.

This study suggests that best practices for brief intervention in the trauma care setting should include motivational interviewing and a telephone booster using personalized feedback. Multiple sessions based on motivational interviewing in the trauma care setting seem to be instrumental in enhancing long-term changes in drinking outcomes, particularly for injured patients with moderate alcohol problems. The provision of these services should not be limited to those who are intoxicated at the time of their injury or with less severe alcohol problems. Injured patients with a recent history of heavy drinking and more severe alcohol problems also benefited from BMI with a booster. Standardized methods for training and ensuring the ongoing fidelity of interventions by health care providers or behavioral health specialists should be adopted to ensure that brief interventions are adequately standardized across settings and patient populations.

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