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## Brief Alcohol Intervention Among At-Risk Drinkers with Diabetes

Susan E. Ramsey<sup>1,2</sup>, Patricia A. Engler<sup>1,2</sup>, Magdalena Harrington<sup>2,3</sup>, Robert J. Smith<sup>1,2</sup>, Mark J. Fagan<sup>1,2</sup>, Michael D. Stein<sup>1,4</sup> and Peter Friedmann<sup>1,2</sup>

<sup>1</sup>The Warren Alpert Medical School of Brown University, Providence, Rhode Island. <sup>2</sup>Rhode Island Hospital, Providence, Rhode Island. <sup>3</sup>University of Rhode Island, Kingston, Rhode Island. <sup>4</sup>Butler Hospital, Providence, Rhode Island.  
Email: [susan\\_ramsey@brown.edu](mailto:susan_ramsey@brown.edu)

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**Abstract:** Twenty-eight patients with diabetes who screened positive for at-risk drinking were assigned to brief alcohol intervention (BAI) (n = 14) or standard care (SC) (n = 14) treatment conditions. All participants completed a baseline interview and one-, three-, and six-month follow-up interviews. Across the six-month follow-up period, there was a significantly greater reduction in quantity of alcohol consumed in the BAI group. At the six-month follow-up, the BAI group had a greater reduction in quantity of alcohol consumed, percentage of heavy drinking days, and frequency of drinking. Reductions in alcohol use were associated with improved adherence in certain components of diabetes self-care behavior. The results of this study suggest that brief alcohol interventions are efficacious in reducing alcohol use among at-risk drinkers with diabetes and that reductions in alcohol use may result in some improvements in adherence to diabetes self-care behavior.

**Keywords:** diabetes, at-risk drinking, brief alcohol intervention

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## Background

There is increasing evidence linking alcohol use with poor adherence to diabetes self-care behaviors; adherence to these self-care behaviors is key to avoiding diabetes-related morbidity and mortality.<sup>1</sup> Alcohol may decrease one's attention to diet and medication adherence and negatively impact other self-care behaviors such as exercise and glucose self-monitoring<sup>2,3</sup> through a deleterious effect on judgment.<sup>4</sup> Poor insulin adherence and reduced motivation to adhere to diabetes self-care behavior have been found among heavy drinkers.<sup>4</sup> Poor self-care behavior adherence is also present among those who drink moderately,<sup>5</sup> and an association between greater alcohol use and poorer diabetes self-care behavior has been found to emerge even at the level of one drink per day.<sup>1</sup> In addition to the impact of alcohol use on diabetes self-care behavior and morbidity, individuals with diabetes are susceptible to the same negative consequences of at-risk drinking that are found in the general population,<sup>6–8</sup> particularly if they engage in heavy drinking days.<sup>9,10</sup>

There is strong empirical support for the use of brief interventions to reduce at-risk drinking. In McCrady's<sup>11</sup> review of treatments for alcohol use disorders, brief intervention was one of only two treatments deemed to have met the criteria for "efficacious" treatment. Other reviews of the literature have contained similar conclusions,<sup>12,13–16</sup> and numerous studies have yielded empirical support for the efficacy of brief interventions.<sup>17–24</sup> Furthermore, there is considerable empirical support for the use of brief alcohol interventions in primary care settings, and a number of systematic reviews have documented their efficacy in this setting.<sup>15,25,26</sup>

To date, only one published study has examined the efficacy of a brief intervention for alcohol use among individuals with diabetes. Fleming and colleagues<sup>27</sup> evaluated a brief intervention to reduce alcohol use among patients with type 2 diabetes or hypertension in a primary care setting.<sup>19</sup> This intervention consisted of two 15-minute in-person alcohol intervention sessions conducted by either a nurse practitioner or physician assistant as well as two 5-minute follow-up telephone calls from an office nurse. The intervention included feedback regarding an alcohol use biomarker, carbohydrate-deficient transferrin (CDT). The results of this study indicated that, relative to control participants, significantly more intervention participants

reduced their heavy drinking and CDT levels. While this study shows considerable promise for the efficacy of brief alcohol interventions among patients with diabetes in primary care, there are certain factors that limit the conclusions that can be drawn from this study. Most notably, study outcome variables did not include diabetes-related variables, such as diabetes self-care behavior.

The primary aim of the current study is to examine whether a brief alcohol intervention will result in reduced alcohol consumption, relative to treatment as usual, among patients with diabetes who are at-risk drinkers. Secondly, the current study explores the association between change in drinking and diabetes self-care behavior.

## Methods

### Participants

Participants were 28 patients with diabetes mellitus who were being seen in a medical primary care unit (MPCU) at an urban university-affiliated medical center. The participants were at least 21 years of age, diagnosed with either type 1 or type 2 diabetes mellitus, "at risk" drinkers (>14 drinks per week or five or more drinks on one occasion for men, >7 drinks per week or four or more drinks on one occasion for women) but not dependent on alcohol in the past month, and not currently pregnant. Of the participants, 28.6% were female and 71.4% were male. Participants had an age range of 27 to 69 years ( $X = 49.5$ ,  $SD = 9.9$ ); 53.6% identified as White, 25.0% as Black or African American, and 21.4% as other or more than one race. Twenty-one percent (21.4%) of the sample identified as being of Hispanic/Latino ethnicity. At baseline, 17.9% of the sample were taking a diabetes medication in the sulfonylurea class, 42.9% were taking metformin, 10.7% were taking a medication in the thiazolidinediones class, 28.6% were receiving insulin, and 28.6% were not currently taking medication for diabetes.

### Procedure

All study procedures were approved by the Lifespan Institutional Review Board. Patients with appointments in the MPCU were prescreened for a diagnosis of diabetes mellitus via medical record review, and potentially eligible patients were approached in the waiting room. Patients were asked to complete



a confidential brief screen. Patients with positive screens were given detailed information about the study, had any questions answered, and were asked to schedule a baseline interview. Of the 775 participants approached, eight people refused to complete the screen, 694 were ineligible due to not meeting criteria for at-risk drinking, and 12 were ineligible due to screening positive for past month alcohol dependence. There were 61 patients who appeared to be eligible for the study. Of those who appeared to be eligible for the study, three were unable or unwilling to schedule a baseline interview, and 16 were enrolled in an alternative study. The remaining 42 individuals scheduled baseline interviews. Of those 42, 11 people cancelled or did not keep their appointments, two were ineligible due to past month alcohol dependence, and one was ineligible due to being under 21 years old. This resulted in a total pilot sample of 28 participants.

A study research assistant (RA) obtained informed consent from participants at the time of the baseline interview. This involved the RA reviewing detailed information about the study, answering the potential participant's questions about the study, obtaining a signed informed consent statement, and providing the participant with a copy of the consent statement. Participants then completed the baseline interview, which was used to confirm study eligibility.

The 14 participants recruited during the initial recruitment period (November 2006–April 2007) were assigned to the brief alcohol intervention (BAI) condition, and the 14 participants recruited during the second recruitment period (January 2008–March 2008) were assigned to the standard care (SC) condition.

### Intervention

The one session, 50-minute brief alcohol intervention was administered by one of two doctoral-level clinical psychologists. It was typically scheduled for within one to two weeks after the baseline; however, it could be completed as late as eight weeks following the baseline. The completion rate for the intervention sessions was 100%. Following the intervention, the interventionists mailed a letter to each of the BAI participants summarizing the material discussed in the session. The interaction style employed by the interventionists drew heavily from Motivational Interviewing.<sup>28,29</sup> The session began with a discussion

of the pros and cons of the participant's current level of drinking. Personalized feedback was then provided to the participant regarding drinking level, reasons for drinking, negative consequences of drinking, risk from family history of alcohol problems, risk from other drug use, and current HbA1c and triglyceride levels. In addition, the relationship between alcohol use and diabetes management was discussed. The session concluded with a discussion of the participant's drinking goals and the specification of a plan for making changes in drinking, if desired.

### Follow-up

All participants were asked to complete in-person follow-up interviews at 1, 3, and 6 months after the baseline interview.

### Measures

#### Screening measures

During the clinic screening interview, the RA collected information regarding demographic characteristics, pregnancy status, knowledge of diabetes mellitus status, and questions about the quantity and frequency of alcohol use within the past month. Patients who reported high rates of alcohol use were also asked alcohol dependence screening questions, using a checklist version of the Diagnostic and Statistical Manual criteria for alcohol dependence.<sup>30</sup>

In order to determine lifetime and current prevalence of substance use disorders and to confirm eligibility for the study, the Structured Clinical Interview for DSM-IV-Patient Version (SCID-P) Module E (Substance Use Disorders) was administered<sup>31</sup> at the baseline interview.

#### Alcohol measures

Blood Alcohol Level (BAL) was measured at the outset of each assessment interview in order to verify that the participant was alcohol-free at the time of data collection.

The Timeline Followback (TLFB) interview<sup>32</sup> was used to assess alcohol use at baseline, as well as during the follow-up intervals. The TLFB interview is a calendar-assisted structured interview, which provides a way to cue memory so that accurate recall is enhanced. The TLFB was used to collect data regarding the number of standard drinks consumed on each day during the assessment period. At the baseline interview,



it was used to assess the previous six months. It was also administered at each follow-up interview, to assess the period from the previous interview.

### Diabetes-related measures

The Summary of Diabetes Self-Care Activities Measure (SDSCA<sup>33</sup>) is a self-report measure used to assess adherence to core diabetes self-care behaviors: general diet, diabetes-specific diet, exercise, blood glucose testing, foot care, diabetes medication and insulin injection adherence, and smoking. Respondents are asked about adherence for the prior seven days; respondents are asked to circle the number of days (0–7) in which they have been adherent regarding each behavior. Smoking is assessed with a yes/no item that asks the respondent whether she or he has smoked a cigarette in the past week. Those who respond affirmatively are asked to list the number of cigarettes smoked on an average day in the past week. Given the individual variability that exists in the number of times diabetic patients are instructed to check their blood glucose per day and the individual variability in medication regimen (insulin injections, pills, both insulin injections and pills, or neither insulin injections nor pills), these items are phrased such that the respondents rate the number of days out of the last seven in which they followed their treatment provider's specific recommendations in regard to these areas of self-care behavior.

### Statistical analyses

Statistical analyses were conducted using SAS (Version 9.1.3). For the primary analyses, Repeated Measures Analysis of Covariance (RM-ANCOVA) was performed to determine the effects of BAI on alcohol use among patients with diabetes over the 6-month follow-up period. The effects of BAI, relative to SC, were assessed at 1-, 3-, and 6-month follow-up. The analyses were performed on three outcome variables: mean number of drinks per day, percentage of heavy drinking days, and percentage of drinking days, after controlling for their baseline levels. Days spent in controlled environments (e.g. an inpatient hospital stay) were excluded from consideration in the analyses due to restricted access to alcohol in these environments.

## Results

Table 1 contains the demographic characteristics of the sample. T-tests and chi-square tests were performed

to determine whether there were any significant differences between groups on these characteristics. Significant differences between the two groups were found only on age. However, age was found not to be significantly related to the outcome variables, and the difference between the BAI and SC groups on age is not clinically meaningful as it does not reflect different developmental stages. Therefore, age was not included as a co-variate in the RM-ANCOVA analyses.

### Mean number of drinks per day

Controlling for baseline levels of the dependent variable, RM-ANOVA yields a significant within-subjects time effect for mean number of drinks per day ( $\Lambda = 0.67$ ,  $F(2, 23) = 5.53$ ,  $P < 0.05$ ), a significant within-subjects interaction effect of group by time ( $\Lambda = 0.73$ ,  $F(2, 23) = 4.27$ ,  $P < 0.05$ ), and a significant between-subjects group effect ( $F(1, 24) = 6.90$ ,  $P < 0.05$ ), with a small to medium effect size of  $\eta^2 = 0.04$ . There was a medium-size treatment effect ( $d = 0.67$ ) between the BAI (1.36,  $CI\ 95\% = 0.39\text{--}2.34$ ) and SC groups (3.47,  $CI\ 95\% = 2.49\text{--}4.45$ ) on adjusted means at the 6-month follow-up. In the BAI group, there was a mean reduction of 1.6 drinks/day between baseline and 6-month follow-up, whereas the SC group had an increase of 0.6 drinks/day. See Figure 1.

### Percentage of heavy drinking days

RM-ANCOVA, after controlling for baseline levels of the dependent variable, yields a significant within-subjects time effect for percentage of heavy drinking days ( $\Lambda = 0.68$ ,  $F(2, 23) = 5.34$ ,  $P < 0.05$ ) and a significant within-subjects interaction effect of group by time ( $\Lambda = 0.63$ ,  $F(2, 23) = 6.78$ ,  $P < 0.01$ ). There was a non-significant between-subjects group effect ( $F(1, 24) = 0.79$ ,  $P > 0.05$ ). There was a small treatment effect ( $d = 0.31$ ) between the BAI (13.00,  $CI\ 95\% = 4.05\text{--}21.93$ ) and SC groups (21.46,  $CI\ 95\% = 12.52\text{--}30.40$ ) on adjusted means for percentage of heavy drinking days at the 6-month follow-up. In the BAI group, there was a mean reduction of heavy drinking days by 9% between baseline and 6-month follow-up, whereas there was no change in SC group. See Figure 2.

### Percentage of drinking days

RM-ANCOVA, after controlling for baseline levels of the dependent variable, yields a non-significant

**Table 1.** Demographic characteristics of the total sample and the BAI and SC groups.

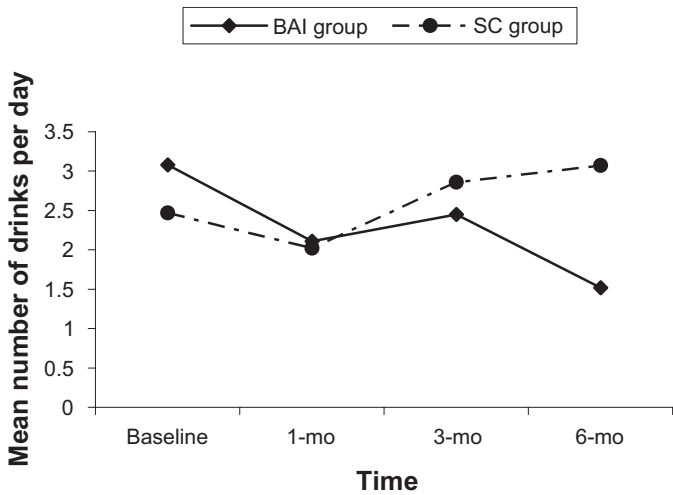
Variable	Total sample (N = 28)	BAI group (N = 14)	SC group (N = 14)	Test statistic
<b>Age</b>				
M (SD)	49.57 (9.93)	53.43 (11.07)	45.71 (7.10)	$t(26) = -2.19^*$
<b>Gender</b>				
N (%)				
Male	20 (71.43%)	10 (71.43%)	10 (71.43%)	$\chi^2(1) = 1.00$
<b>Race</b>				
N (%)				
White	15 (53.57)	7 (50.00%)	8 (57.14%)	$\chi^2(2) = 0.88$
Black/African-American	7 (25.00%)	3 (21.43%)	4 (28.57%)	
Other/more than one race	6 (21.43%)	4 (28.57%)	2 (14.29%)	
<b>Ethnicity</b>				
N (%)				
Hispanic	6 (21.43.0%)	2 (14.29%)	4 (28.57%)	$\chi^2(1) = 0.85$
Non-Hispanic	22 (78.57%)	12 (85.71%)	10 (71.43%)	
<b>Education</b>				
N (%)				
<High school	13 (46.43%)	6 (42.86%)	7 (50.00%)	$\chi^2(2) = 3.74$
HS/GED	6 (21.43%)	5 (35.71%)	1 (7.14%)	
>High school	9 (32.14%)	3 (21.43%)	6 (42.86%)	
<b>Marital status</b>				
N (%)				
Single/never married	14 (50.00%)	8 (57.14%)	6 (42.86%)	$\chi^2(2) = 3.62$
Married	2 (7.14%)	2 (7.14%)	0 (0%)	
Other	12 (42.86%)	4 (28.57%)	8 (57.14%)	
<b>Time since diabetes diagnosis (in years)</b>				
M (SD)	6.67 (8.42)	7.20 (8.82)	6.14 (8.30)	$t(26) = -0.33$

\* $P < 0.05$ .

within-subjects time effect ( $\Lambda = 0.97$ ,  $F(2, 23) = 0.36$ ,  $P > 0.05$ ) and a non-significant interaction effect of group by time ( $\Lambda = 0.90$ ,  $F(2, 23) = 1.22$ ,  $P > 0.05$ ), as well as a non-significant between-subjects group effect ( $F(1, 24) = 0.92$ ,  $p > 0.05$ ). There was a medium-size treatment effect ( $d = 0.54$ ) between the BAI (24.06,  $CI$  95% = 13.73–34.38) and SC groups (41.61,  $CI$  95% = 31.00–52.21) on adjusted means at 6-month follow-up. In the BAI group, there was a mean reduction in percentage of drinking days of 20% between baseline and 6-month follow-up, whereas there was no change in SC group. See Figure 3.

### Association between alcohol use and diabetes self-care behavior

Secondary analyses were performed to explore the relationship between the change in alcohol use and change in diabetes self care behaviors, collapsing across treatment condition groups. All variables were transformed to reflect the change from baseline to 6-month follow-up such that positive values for alcohol use variables reflect the magnitude of reduction in alcohol use over time and positive values for self-care variables reflect the magnitude of increase in these behaviors over time. Pearson correlation coefficients were used to examine the relationship



**Figure 1.** Change in mean number of drinks per day over time for the BAI and SC groups.

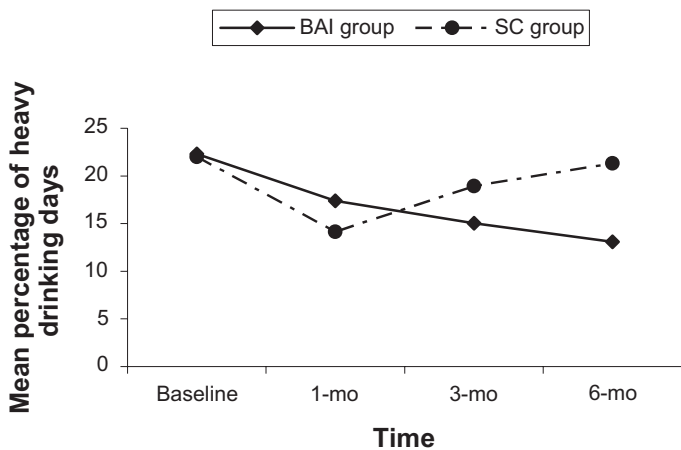
between the change in alcohol use and change in diabetes self-care behaviors across the 6 months of follow-up. The analyses show a significant, moderate-size positive relationship between the reduction in percentage heavy drinking days and both the increase in days of specific diet adherence ( $r(26) = 0.42, P = 0.03$ ) and the increase in exercise adherence days ( $r(26) = 0.43, P = 0.02$ ). Also, the reduction in percentage of drinking days has a significant, moderate-size positive relationship with the increase in days of specific diet adherence ( $r(26) = 0.41, P = 0.03$ ). There is a significant, large positive relationship between the reduction in percentage of drinking days and the reduction in number of cigarettes smoked per day ( $r(10) = 0.80, P < 0.01$ ) and a similarly

strong relationship between the reduction in mean number of drinks per day and number of cigarettes smoked per day ( $r(10) = 0.71, P = 0.01$ ). There is also a non-significant, moderate-size positive relationship between the reduction in number of heavy drinking days and the number of cigarettes smoked per day ( $r(12) = 0.55, P = 0.06$ ). The other relationships between changes in alcohol use variables and changes in diabetes self-care behaviors are not significant and are of small magnitude.

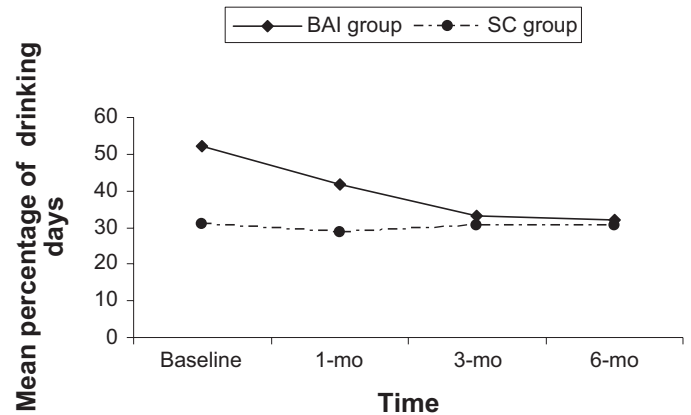
### Discussion and Conclusions

The results of this study suggest that brief alcohol interventions hold promise for reducing at-risk drinking among patients with diabetes. Across follow-up, there was a significantly greater reduction in quantity of alcohol (mean number of drinks per day) consumed by the intervention group, relative to the control group, after controlling for baseline level of alcohol use. At six months, the intervention group demonstrated a greater reduction than the control group on quantity of alcohol consumed, percentage of heavy drinking days, and frequency of drinking (percentage of drinking days). The magnitude of these effects, which were in the small to medium range, is consistent with previous work examining the efficacy of brief alcohol interventions<sup>34</sup> and suggest that previous findings generalize to patients with diabetes.

Significant associations were found between both reduced heavy drinking days and reduced frequency of drinking and an increase in adherence to diabetes-specific diet recommendations. In addition, reduced



**Figure 2.** Change in percentage of heavy drinking days over time for the BAI and SC groups.



**Figure 3.** Change in percentage of drinking days over time for the BAI and SC groups.



heavy drinking days was found to be significantly associated with an increase in adherence to exercise recommendations. Furthermore, both a reduction in frequency of drinking and a reduction in quantity of alcohol consumed were significantly associated with a decrease in number of cigarettes smoked per day. While these analyses were exploratory in nature and were conducted on a modest-size sample, the results suggest that diabetes-specific diet, exercise, and smoking may be the diabetes self-care behaviors that are most positively impacted by reductions in alcohol use.

This study has some important limitations. First, the sample size in this pilot study is quite modest. Second, random assignment to treatment condition was not used; patients during an initial recruitment phase received the brief alcohol intervention while patients recruited during a second recruitment phase received standard care. The authors chose this study design due to uncertainty regarding whether study resources would be sufficient to allow for the recruitment of patients for the standard care control condition. During the time period spanning the two recruitment phases, no changes were made in the services provided in the medical clinic from which study participants were recruited. Therefore, it is implausible that the observed treatment effects between groups are attributable to factors other than the study intervention, even in the absence of random assignment. Third, due to limited resources, measures of glycemic control (i.e. HbA1c) were not collected as outcome variables. Fourth, we did not exclude patients with high levels of baseline self-care behavior adherence, restricting our ability to find an association between reduced alcohol consumption and improvement in self-care behavior. For example, over 86% of our sample reported perfect medication adherence at baseline.

In conclusion, the results of this study suggest that brief alcohol interventions are efficacious in reducing alcohol use among at-risk drinkers with diabetes, and reductions in alcohol use are associated with improved adherence in some components of diabetes self-care behavior. These results should be considered preliminary due to the modest sample size employed in this study and should be replicated in a larger-scale study. Future work should attempt to gain a better understanding of the mechanism by which alcohol

use impacts diabetes self-care behavior in order to aid individuals with diabetes in their management of the disease.

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## Disclosures

This manuscript has been read and approved by all authors. This paper is unique and is not under consideration by any other publication and has not been published elsewhere. The authors report no conflicts of interest.

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