The Efficacy of Two Brief Intervention Strategies Among Injured, At-Risk Drinkers in the Emergency Department: Impact of Tailored Messaging and Brief Advice*

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ABSTRACT. Objective: This study used a randomized controlled trial design to compare the effectiveness of four interventions at reducing alcohol consumption, consequences, and heavy episodic drinking among injured, at-risk drinkers in the emergency department (ED). **Method:** Injured patients (n = 4,476) completed a computerized survey; 575 at-risk drinkers were randomly assigned to one of four intervention conditions: tailored message booklet with brief advice, tailored message booklet only, generic message booklet with brief advice, and generic message booklet only. Regression models using the generalized estimating equation approach were constructed comparing the intervention conditions at baseline, 3-month follow-up, and 12-month follow-up. Gender and age were entered in models along with their interaction. **Results:** Each of the intervention groups significantly decreased their alcohol consumption from baseline to 12-month follow-up; subjects in the tailored message booklet with brief advice group significantly decreased their average weekly alcohol consumption by 48.5% ($p < .0001$). Those in the brief advice conditions (tailored or generic) significantly decreased their average consumption during the 12 months of the study compared with the no brief advice conditions. Younger adult women (ages 19-22) who received some brief advice were the most likely to decrease their heavy episodic drinking. **Conclusions:** This was the first large-scale, brief intervention trial that included development and testing of computerized, highly tailored interventions with injured drinkers in the ED. ED-based interventions for alcohol problems would benefit from computerized screening, brief advice, and booklets to positively impact risky drinking practices. (*J. Stud. Alcohol* **67:** 568-578, 2006)

REDUCING DEATH AND DISABILITY caused by alcohol-related intentional and nonintentional injuries is a national health status goal (Department of Health and Human Services, 1991, 2000). For many years, the emergency department (ED) has been posited as an important venue for identifying and intervening for patients with alcohol problems, with a special emphasis on those presenting with injuries (Barry, 2002; Cherpitel, 1989, 1993, 1999; Conigrave et al., 1991; Dowey, 1993; DiClemente and Soderstrom, 2002; Dyehouse and Sommers, 1998; Longabaugh et al., 1995; Maio, 1995; Hungerford and Pollock, 2002; Sommers et al., 2000; Zink and Maio, 1994). Data from the 2001 National Hospital Ambulatory Medical Care Survey indicate an overall 20% increase in ED use between 1992-2001 (McCaig and Burt, 2003). Among ED visits, injuries make up approximately 37% of care (McCaig and Burt, 2003).

Rates of alcohol misuse and related problems among injured ED patients vary by drinking criteria used and population studied. For example, an ED study of injured vehicular crash occupants found that 23% met the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (American Psychiatric Association, 1994), criteria for alcohol misuse or dependence (Maio et al., 1997), whereas a trauma center study demonstrated that 17% of crash victims were alcohol-dependent at the time of injury (Soderstrom et al., 1997b). Studies have also found that up to 36% of injured patients presenting to the ED had positive blood alcohol concentrations (Cherpitel, 1989, 1993; Li et al., 1998; MacDonald et al., 1999; Melnick et al., 2000; Miller and Blincoe, 1994; Soderstrom et al., 1997a), and positive blood alcohol tests have been found in up to 47% of hospital inpatients admitted for trauma (Rivara et al., 1993a; Soderstrom et al., 1988). More recently, Longabaugh and colleagues (2001) found that 14% of injured ED patients met criteria for hazardous drinking and/or had alcohol-involved injuries.

Many of the patients who use the ED do not have their hazardous drinking detected or treated in other primary or tertiary care settings. Studies of injured patients have also

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noted that these patients frequently are not assessed for alcohol use or problems while they are in the ED or by their attending physicians if they are admitted for inpatient care (Adams et al., 1992; Chang and Astrachan, 1988; Cherpitel et al., 1996; Lowenstein et al., 1990; Simel and Feussner, 1988; Soderstrom et al., 1997a,b; Solomon et al., 1980). Furthermore, discharged ED patients present a valuable prevention opportunity. For every trauma patient admitted, 20 are evaluated in the ED and discharged (Rice et al., 1989). Many discharged trauma patients have at-risk drinking patterns and/or alcohol-related problems. Most crucially, patients with alcohol problems are generally released from the ED rather than admitted to hospitals where detection may be more likely. For example, one ED-based study found that almost 55% of motor vehicle crash victims with current alcohol misuse or dependence were treated and released (Maio et al., 1997). Alcohol problems are also associated with an increased risk of readmission to the ED for new trauma (Rivara et al., 1993b).

The efficacy of general, brief alcohol intervention strategies has been tested in a number of clinical trials. These approaches have been effective at reducing alcohol consumption among patients in primary care (Babor and Grant, 1992; Bien et al., 1993; Fleming et al., 1997, 1999; Wilk et al., 1997) and hospital settings (Gentilello et al., 1999; Welte et al., 1998), with effects varying somewhat by study population, setting, and intervention intensity (length of session/number of sessions) (Barry, 1999; Burke et al., 2003; Dunn et al., 2001; Poikolainen, 1999). Several ED-based studies using brief alcohol interventions have been conducted with evidence of modest positive impact on either alcohol consequences (Longabaugh et al., 2001; Monti et al., 1999) or consumption (Gentilello et al., 1999) but not both.

Brief alcohol interventions (ranging from 5 to 60 minutes) may be particularly appropriate for use in fast-paced ED settings. These interventions have been delivered in either one or two sessions, have varied greatly in their alcohol inclusion criteria (e.g., positive blood alcohol level, positive Short-Michigan Alcohol Screening Test [SMAST], positive Alcohol Use Disorders Identification Test [AUDIT], heavy episodic drinking), and have included either admitted or nonadmitted patients. The prevalence of patients presenting to the ED setting with problems related to hazardous drinking is a compelling reason to design and develop alcohol intervention strategies specifically focused on the unique aspects of emergency care.

Recent studies suggest the enhanced impact of tailored messages over generic approaches at changing health behaviors, such as smoking and dietary and exercise behaviors (Campbell et al., 1994; Skinner et al., 1994; Strecher et al., 1994, 2002). Tailoring allows for messages to be individualized based on demographics (e.g., gender, age, race), stage of change and self-efficacy, and according to the specific barriers or benefits of change. Additionally, Burke et al. (2003) suggested that research is needed to identify the essential components of brief interventions (e.g., Is the advice portion of the brief intervention necessary?). Furthermore, at a recent consensus conference addressing alcohol problems among ED patients, the Centers for Disease Control and Prevention, National Center for Injury Prevention, generated research recommendations that included "developing, evaluating, and implementing ED-based intervention studies" (p. 9) and "exploring and evaluating the role of information and communication technology to facilitate screening, intervention, and referral among ED patients" (p. 12) (Hungerford and Pollock, 2003). Testing the importance of both advice from a health care professional to cut down/stop drinking and the usefulness of tailoring written advice to the specific drinking patterns and characteristics of the injured patient could provide critical new evidence on how best to prevent hazardous drinking and alcohol-related problems.

To address these issues, the present study used a randomized controlled trial to test the effectiveness of tailored versus generic messages, given with or without brief advice, at reducing alcohol consumption and consequences among injured adult patients in an ED setting. The primary hypotheses for this study were that (1) tailored messages would be significantly more effective than generic messages in changing alcohol use, alcohol-related consequences, and health functioning among injured ED patients and (2) brief advice, in conjunction with tailored messages, would be more effective than tailored messages alone. A secondary hypothesis was that women would be more responsive than men to brief interventions (Fleming et al., 1997).

Method

Study design

Injured adult patients presenting to a university hospital ED between August 1999 and February 2002 were recruited to participate in a computer-based survey of health issues. The ED site was a Level I trauma center in the Midwest with an annual adult census of approximately 50,000 patients. During the first 6 months of recruitment, ten shifts per week were staffed by research social workers: 70% evening shifts (4 PM-12 AM every day), 20% day shifts (8 AM-4 PM), and 10% midnight shifts (12 AM-8 AM). Day and midnight shifts were selected at random in sequential 3-day blocks, which rotated across days of the week, and weeks of the month, during the 6 months. Because of low recruitment during midnight shifts and a desire to increase the sample size, the number of day shifts staffed each week was increased and midnight shifts were no longer staffed. Thus, for the remaining 2 years of study recruitment, 14 shifts per week were staffed: seven day shifts (8 AM-4 PM) and seven evening shifts (4 PM-12 AM).

Eligible patients who were able to give informed consent were screened with a computerized health survey using personal digital assistants (PDAs). As an incentive for participation, injured patients willing to complete the survey were entered in a monthly drawing for $100. Research staff connected the screening PDAs to a desktop computer station in the ED. A computer program automatically determined eligibility for the randomized controlled trial and randomly assigned participants to one of four intervention conditions. A 12-page, similarly formatted, tailored or generic color booklet was automatically printed for each participant, depending on group assignment. Because of the large body of research indicating the effectiveness of brief alcohol interventions across clinical settings, the design used in this study did not include a traditional "no-treatment/control" condition. Rather, a generic booklet was used that included information pertaining to all risk drinkers regarding alcohol use, consequences, and safer drinking limits. Thus, the design assumed that brief interventions are effective, compared with no intervention.

Interventions occurred during the participants' ED visit and were preceded by a saliva alcohol test to assess patient competency. The intervention proceeded once the patient's blood alcohol concentration reached 100 mg/dL or less. Participants received telephone follow-up interviews at 3 months and 12 months, for which they were paid $20 and $30, respectively. Study procedures were approved and conducted in compliance with the site institution's Institutional Review Board (IRB) for protection of human subjects.

Participants

Patients were eligible for the study if they were 19 years of age or older and had sustained an injury resulting from transfer of energy (E-codes 800-968; Healthcare Financing Administration, 1995) in the last 24 hours. Both admitted and nonadmitted patients were included. Patients who were severely injured (e.g., unconscious) or in need of immediate life-saving procedures (e.g., intubation) were excluded from the study. Patients whose blood alcohol concentration exceeded 200 mg/dL were also excluded. In addition, the following types of patients were excluded: self-inflicted injury, sexual assault, overdose, poisoning, near drowning, chronic injury without specific event associated with re-injury, pregnant patients, prisoners, and patients who did not speak English.

A total of 6,047 potentially eligible patients presented to the ED during the study recruitment period; 507 (8.4%) patients were missed. Of the 5,540 patients approached for participation in the study, 4,476 (80.8%) of them consented to participate in the study and 1,064 (19.2%) refused. Of those who screened positive for at-risk drinking (n = 649), 89% received their intervention during their ED visit; 74 left the ED before they could be assigned an intervention condition; 56 were mailed either the generic (n = 26) or tailored (n = 30) booklet (via random assignment); and 18 could not be mailed a booklet (initially, we did not have approval from our IRB to mail booklets). These "mailed-booklet" participants are not described in this article. Thus, 575 participants were randomly assigned to one of the four intervention conditions and received their intervention before leaving the ED. Follow-up interview rates exceeded 85% at 3-month and 12-month interviews.

Missed patients

Among the 507 potentially eligible patients who were missed, the following reasons were recorded: The research assistant was unable to enroll the patient because of ED staff presence (43.2%), the research staff was unable to locate the patient (22.9%), the research staff was too busy and could not approach all patients (15.4%), a computer crash or other technical problem occurred (8.9%), and other reasons (9.6%). Demographic statistics were abstracted from the ED log for missed subjects: 56.8% were men; 9.1% were black, 84.0% were white, 1.1% were Hispanic, 2.7% were Asian, 0.3% were American Indian, 2.1% were from the subcontinent of India, and 0.8% were multi-ethnic. The average (SD) age was 23.0 (20.8). The missed patients were slightly younger ($p < .0001$) and slightly less likely to be men ($p < .0001$), compared with the intervention sample.

Patients who refused to participate

Among the 1,064 patients who refused enrollment in the study, the following reasons for refusal were recorded: sickness/injury (18.2%); emotional stress (12.7%); pain (19.1%); no reason given (15.8%); survey too long (11.4%); hostility to research (8.7%); and other reasons (14.1%). Most refusals occurred before the patient completed the consent form (90.1%). A few refusals occurred after the consent but before the computerized survey (3.6%) or during/after the computerized survey (5.3%). Among refusals, 53.5% were men, 14.8% were black, 76.1% were white, 2.5% were Hispanic, 3.7% were Asian, 0.2% were American Indian, 1.7% were from the India subcontinent, and 1.0% were multi-ethnic. The average age was 28.8 (21.7). Compared with the intervention sample, patients who refused were about the same age (p = .3341) but less likely to be men ($p < .0001$). IRB issues prevented obtaining further information on patients who refused consent.

Table 1 shows characteristics of the screening sample (n = 4,476) and intervention sample who had complete follow-up data (n = 494). The mean age of the enrolled subjects in the intervention study was 27.8 (SD = 11.2; median = 22; range: 19-76), with 351 (71.0%) men and 143 (29.0%) women. Seventy percent were never married, reflecting the younger population in the study, and nearly 17% were married. In terms of race/ethnicity, 86.0% (n = 425) of the

TABLE 1. Patient characteristics: Screening and intervention samples

Variables	Screening sample (n = 4,476)	Intervention sample (n = 494)	Test statistics
Age, mean (SD)	34.7 (14.0)	27.8 (11.2)	t = 12.50, 673 df, $p < .001$
median	31	22	
Gender, n (%)			χ^2 = 40.61, 2 df, $p < .001$
Male	2,512 (56.1%)	351 (71.0%)	
Female	1,964 (43.9%)	143 (29.0%)	
Race, n (%)			χ^2 = 6.86, 2 df, p = .0324
White	3,635 (81.2%)	425 (86.0%)	
Black	379 (8.5%)	28 (5.7%)	
Other	462 (10.3%)	41 (8.3%)	
Marital status, n (%)			χ^2 = 153.52, 2 df, $p < .001$
Never married	1,829 (40.9%)	345 (70.0%)	
Married	1,754 (39.2%)	82 (16.6%)	
Other	893 (19.9%)	67 (13.6%)	
Years of schooling, n (%)			χ^2 = 62.03, 3 df, $p < .001$
<High school	216 (4.8%)	20 (4.0%)	
High school graduate	676 (15.1%)	78 (15.8%)	
Some college	1,699 (38.0%)	270 (54.7%)	
College graduate or higher	1,881 (42.0%)	126 (25.5%)	
Unintentional injury, %			χ^2 = 28.48, 8 df, $p < .001$
Motor vehicle crash	17.30%	12.60%	
Bike crash	2.00%	1.40%	
Fall	35.40%	34.40%	
Firearm	0.20%	0.00%	
Burn/scald	2.50%	1.80%	
Cut/pierce	21.50%	22.90%	
Struck by object	6.40%	8.10%	
Other	11.80%	12.50%	
Intentional injury, %	2.80%	6.30%	

sample was white, 5.7% was black, and 8.3% was another race/ethnicity. This was a well-educated sample, with more than 80% having some college education or higher.

There were no significant differences across the four intervention groups in baseline age (F = 0.47, 3/490 df, p = .7066), gender (χ^2 = 4.62; 3 df, p = .2018), marital status (χ^2 = 1.97, 6 df, p = .92), race/ethnicity (χ^2 = 1.06, 6 df, p = .98), and years of education (χ^2 = 3.02, 9 df, p = .96).

Measures

Participating patients completed the screening instrument on PDAs. Patients were asked about type and mechanism of current injury. Alcohol questions were embedded in a larger health and lifestyle screening survey to encourage accurate reports of drinking. Three additional quantity and frequency questions were added to further assess alcohol consumption and heavy episodic drinking in the past 3 months. Alcohol-related consequences were assessed using the Drinker Inventory of Consequences (DrInC) Short Inventory of Problems (Miller et al., 1995). In addition, two items from the longer DrInC were added because of their relevance to this project: "While drinking or intoxicated, I have been physically hurt, injured, or burned," and "I have been arrested for driving under the influence of alcohol."

Threshold criteria for at-risk drinking (based on average weekly consumption or heavy episodic drinking episodes) varied by age and gender: 15 or more drinks a week for men younger than 65, 12 or more drinks per week for women younger than age 65 and men age 65 and older, and 9 or more drinks per week for women age 65 and older in the past 3 months. For younger men (below age 65), the heavy episodic drinking cutoff chosen was five or more drinks per occasion on at least four occasions in the last month (e.g., weekly episodes). For younger women (below age 65) and for men and women age 65 and older, the heavy episodic drinking cutoff was defined as drinking four or more drinks per occasion on four or more occasions in the past month.

Follow-up assessments were conducted by a trained interviewer at 3 months and 12 months, either by telephone (90%-95%), in-person (1%), or self-administered by mail (4%-9%), depending on individual circumstances at each follow-up interview (e.g., no access to a phone, subject preference). Measures used at baseline were repeated identically at the 3-month and 12 month follow-ups.

Intervention

The four following interventions were aimed at altering alcohol consumption, consequences, and health functioning: (1) tailored message booklet with brief advice (TM/BA), (2) tailored message booklet only (TM/NoBA), (3) generic message booklet with advice (GM/BA), and (4)

generic message booklet only (GM/NoBA). For the TM/BA and GM/BA conditions, the research social worker conducted a brief advice session before they left the ED. During the advice session, the booklet, either tailored or generic, was reviewed with the participant. Research social workers were trained in principles of motivational interviewing (e.g., rolling with resistance, developing discrepancy, etc.), including those encompassed in FRAMES (**F**eedback, **R**esponsibility, **A**dvice, **M**enu, **E**mpathy, **S**elf-Efficacy; Miller and Rollnick, 1991). For the TM/NoBA and GM/NoBA conditions, the appropriate booklet was given to participants by the research social worker. They were told that, based on their responses to the health screen, they scored as at-risk for hazardous drinking and should review the booklet provided.

Based on predefined computer codes and a library of possible text pieces that were developed by the investigators, individual responses to the screening survey were used to select relevant behavior and change text that appeared in the tailored booklet in a predetermined graphic layout. For example, one page showed graphically the participant's injury and alcohol consumption (average weekly consumption and heavy episodic drinking) in comparison with others of their same gender and age (derived from national survey data); safer drinking limits were presented based on age and gender (Dawson et al., 2005; National Institute on Alcohol Abuse and Alcoholism, 1995). Another page presented the potential benefits of changing their alcohol consumption. The generic booklet was identical to the tailored booklet in length, content, and graphics but included standard text/graphics rather than tailored content. The development of comparable booklets for the generic and tailored conditions was done to provide a fair, unbiased comparison of the content rather than a comparison of the style and content of the materials.

Analyses

Outcome analyses. Preliminary descriptive analyses examined changes over time for each of the four intervention groups as well as for the entire sample receiving interventions and involved an examination of the percentage change in the outcome variables at 12 months, compared with baseline. Nonparametric tests for paired differences, particularly the sign and Kruskall-Wallis tests, were used because of the skewed nature of the outcome measures. The outcome measures included average weekly alcohol consumption (quantity/frequency) using the Health Screening Survey (Fleming and Barry, 1991), heavy episodic drinking, and alcohol-related consequences as measured by the DrInC.

The primary analysis strategy to evaluate the effects of the interventions over time used Poisson regression modeling using generalized estimating equations (GEE). The GEE methodology was introduced by Liang and Zeger (1986) to properly estimate the regression coefficient and variance of the regression coefficient when correlated data are used in regression analyses. In this study, the GEE approach was used because of the correlated structure of our data from repeated measures at baseline, 3 months, and 12 months. The software used was SAS Version 9, particularly PROC GENMOD (SAS Institute, Inc., Cary, NC). This analysis used all data available for subjects, including those lost to attrition. Dependent measures from each time point were included (baseline, 3 months, 12 months). Appropriate distributions were used based on the nature and distribution of the response variable (e.g., negative binomial distribution for alcohol consumption, etc.). Independent variables included tailored (yes/no), advice (yes/no), gender, age (≤22 or >22), race, follow-up (baseline, 3 months, 12 months), and their related interactions. Gender was included as a covariate based on the literature showing differential impacts of brief interventions based on gender. Because of the large proportion of college students in the sample (median age = 22), the age variable was categorized into two age groups: (1) ≤22 years and (2) >22 years. Statistical significance comparing the characteristics of the intervention sample with the screening sample, missed patients, and patients who refused were analyzed using *t* tests with adjustments for unequal variances and chi-square tests.

Because a primary focus of the study involved determining the effectiveness of tailored versus generic messages and the effectiveness of advice versus no advice, the a priori primary analysis strategy involved repeated-measures approaches examining the impact of tailoring (yes/no—collapsing across advice conditions) and advice (yes/no—collapsing across tailoring conditions) separately. Such an approach provides a more powerful test of the main effects of both tailoring and advice. The primary analyses also examined the potential impact of gender and age as important potential moderators of the intervention effects. Each of these multivariate analyses provided evidence of significant changes over time in the outcome variables, and only those results, including intervention condition, are detailed herein. Finally, additional analyses that involved 2 × 2 designs (i.e., tailored [yes/no] by advice [yes/no]) were conducted to test for potential interaction effects of tailoring and advice. However, these additional analyses did not yield significant interaction effects and, therefore, are not reported.

Results

Average weekly alcohol consumption: Quantity/frequency

In analyses comparing the average weekly alcohol consumption (quantity/frequency) of subjects in each of the four intervention groups across time (baseline, 3 months,

TABLE 2. Quantity/frequency: Means by follow-up and intervention group

Variable	Total sample (n = 494)	Intervention group: Tailored advice (n = 129)	Tailored no advice (n = 121)	Generic advice (n = 124)	Generic no advice (n = 120)
Follow-up					
Baseline, mean (SD)	21.2 (21.5)	23.9 (31.0)	19.2 (14.7)	20.1 (15.1)	21.3 (20.2)
median	16.0	15.0	15.0	16.0	16.0
3 months, mean (SD)	14.3 (16.1)	16.6 (24.6)	13.4 (12.1)	14.5 (12.6)	12.5 (10.3)
median	10.0	12.0	9.0	12.0	10.0
12 months, mean (SD)	13.3 (12.8)	12.3 (8.6)	14.3 (13.3)	13.1 (11.3)	13.6 (16.8)
median	10.0	10.0	12.0	10.0	10.0
Baseline to 12 months					
Difference in mean	-7.9	-11.6	-4.9	-7.0	-7.7
Change in mean, %	-37.2	-48.5	-25.5	-34.8	-36.2
Sign test p value	<.0001	<.0001	.0014	<.0001	<.0001

12 months), subjects in the tailored message/brief advice group significantly decreased their quantity/frequency of alcohol use by approximately 12 drinks per week, from 24 drinks per week at baseline to 12 drinks per week at 12-month follow-up. This represents a significant 48.5% decrease from baseline to 12-month follow-up ($p < .0001$). This percentage decrease in mean drinks per week was the highest compared with the other intervention groups and is one of the highest decreases reported in the literature. Each of the intervention groups significantly decreased their alcohol consumption from baseline to 12-month follow-up (see Table 2).

Regression model with covariates: Alcohol consumption

Next, analyses comparing average weekly alcohol consumption for two message conditions (tailored vs generic) across time were not significant ($\chi^2 = 1.04$, 2 df, $p = .5948$). There was, however, a significant Group × Time interaction effect for the analysis comparing the two advice conditions (brief advice vs no advice) on average weekly consumption over time ($\chi^2 = 8.21$, 2 df, $p = .0165$) (see Figure 1). Those in the brief advice conditions (tailored or generic) significantly decreased their average weekly consumption during the 12 months of the study, compared with the no-advice conditions.

Heavy episodic drinking

In analyses comparing heavy episodic drinking of subjects in each of the four intervention groups across time (baseline, 3 months, 12 months), there was a significant difference in each of the four groups in changes in heavy episodic drinking from baseline to 12-month follow-up (see Table 3). In the tailored-advice group, heavy episodic drinking significantly decreased by about two episodes per month, going from 7.0 at baseline to 5.3 at the 12-month follow-up. The decrease in heavy episodic drinking among patients in the generic, no-advice group was significant from 7.5 episodes during the previous month at baseline to 4.7 at 12 months, thus indicating a 37% reduction from baseline. Patients in both generic conditions, regardless of whether they received advice or no advice, had the highest decreases in heavy episodic drinking (see Table 3).

Regression model with covariates: Heavy episodic drinking

In the analysis comparing the two message conditions (tailored vs generic), there was no significant impact of tailored message compared with generic message on heavy

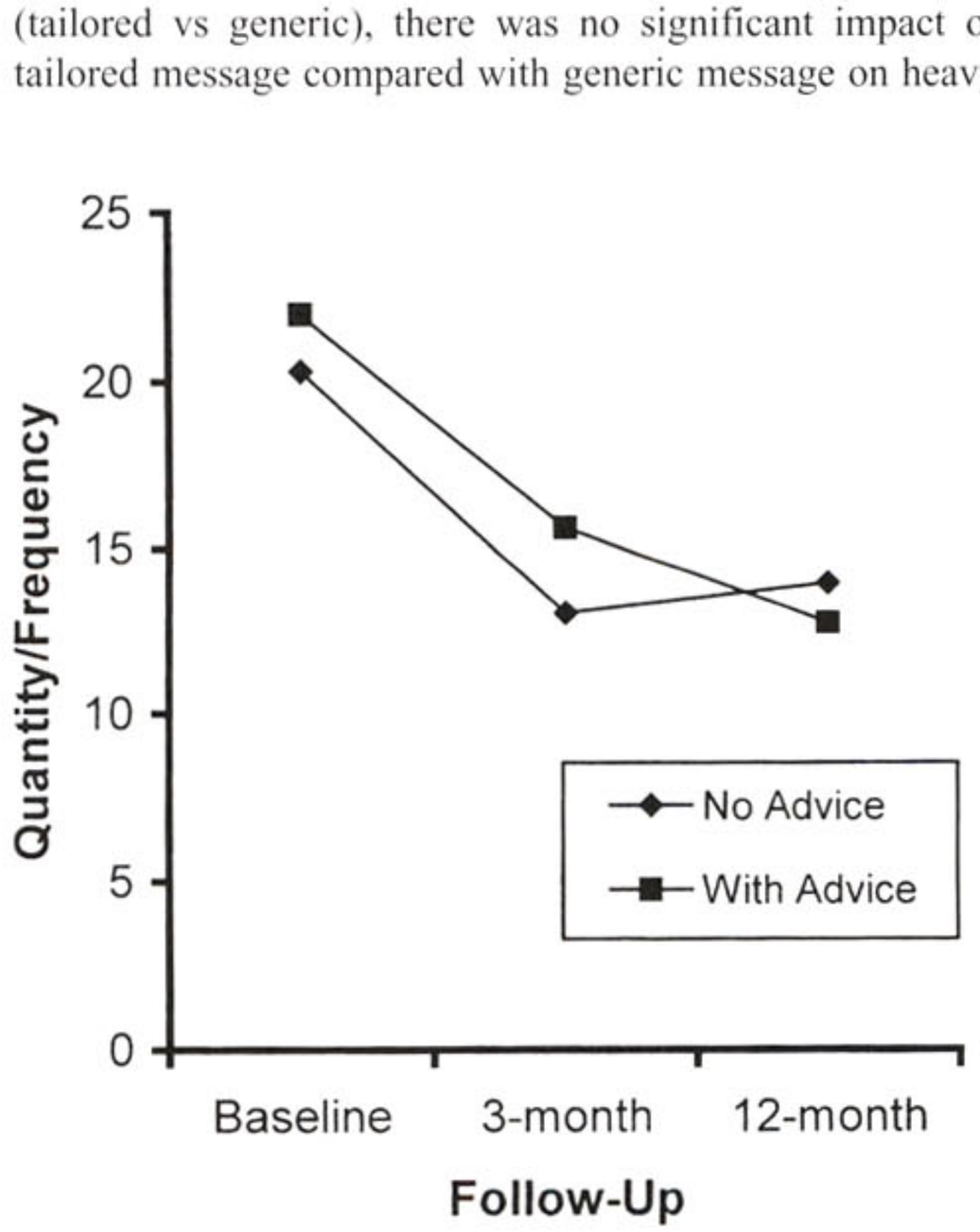

FIGURE 1. Average drinks per week at baseline and 3- and 12-month follow-up: Quantity/frequency for advice/no advice conditions

TABLE 3. Heavy episodic drinking: Means by follow-up and intervention group

Variable	Total sample (n = 494)	Intervention group: Tailored advice (n = 129)	Tailored no advice (n = 121)	Generic advice (n = 124)	Generic no advice (n = 120)
Follow-up					
Baseline, mean (SD)	7.1 (6.0)	7.0 (5.9)	6.6 (6.0)	7.2 (5.5)	7.5 (6.6)
median	5.0	6.0	5.0	5.0	5.0
3 months, mean (SD)	4.8 (5.5)	5.5 (6.2)	4.6 (5.3)	4.8 (4.8)	4.4 (5.5)
median	3.0	4.0	3.0	3.0	3.0
12 months, mean (SD)	5.0 (5.6)	5.3 (5.5)	5.3 (5.8)	4.6 (5.1)	4.7 (6.1)
median	3.0	4.0	4.0	3.0	3.0
Baseline to 12 months					
Difference in mean	-2.1	-1.7	-1.3	-2.6	-2.8
Change in mean, %	-29.6	-24.3	-19.7	-36.1	-37.3
Sign test p value	<.0001	.0114	.0059	<.0001	<.0001

episodic drinking over time (χ^2 = 4.03, 2 df, p = .1336). In a secondary analysis comparing the two advice conditions (brief advice, no advice), there was a four-way interaction for heavy episodic drinking (Time × Gender × Age × Advice [χ^2 = 6.70, 2 df, p = .0351]), indicating that, during the 12 months of the study, women age ≤22 who received some advice were the most likely to decrease their heavy drinking episodes (see Figure 2).

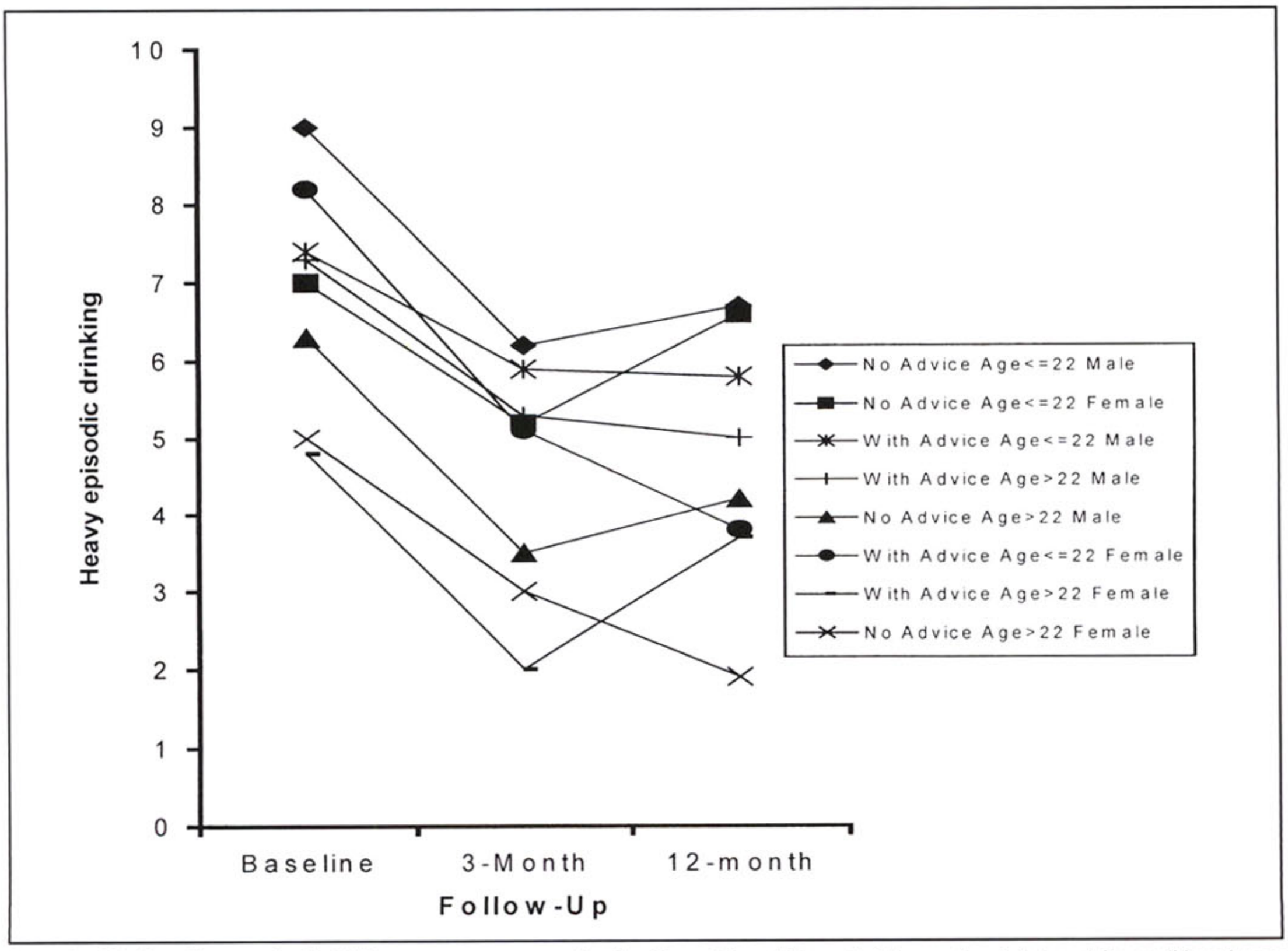

FIGURE 2. Number of heavy episodic drinking occurrences per month at baseline and 3- and 12-month follow-up for advice/no advice conditions, by age group and gender

TABLE 4. DrInC: Means by follow-up and intervention group

Variable	Total sample (n = 494)	Intervention group: Tailored advice (n = 129)	Tailored no advice (n = 121)	Generic advice (n = 124)	Generic no advice (n = 120)
Follow-up					
Baseline, mean (SD)	4.7 (5.5)	4.7 (5.8)	4.7 (5.4)	5.1 (6.0)	4.2 (4.6)
median	3.0	3.0	3.0	3.0	3.0
3 months, mean (SD)	3.6 (5.5)	3.8 (6.5)	3.1 (4.3)	4.4 (6.2)	3.3 (4.6)
median	2.0	2.0	2.0	2.0	2.0
12 months, mean (SD)	3.5 (5.2)	3.2 (5.4)	3.5 (4.5)	4.3 (6.7)	2.9 (3.7)
median	2.0	2.0	2.0	2.0	2.0
Baseline to 12 months					
Difference in mean	-1.2	-1.5	-1.2	-0.8	-1.3
Change in mean, %	25.5	-31.9	-25.5	-15.7	-31.0
Sign test p value	<.0001	.0037	.0028	.0056	.0399

Note: DrInC = Drinker Inventory of Consequences.

Alcohol consequences: DrInC

Changes in scores on the DrInC, a measure of alcohol-related consequences, from baseline to the 12-month follow-up showed the following pattern over time: In all four intervention groups, DrInC scores decreased from baseline to the 12-month follow-up. This decrease was significant in all of the four intervention groups (see Table 4).

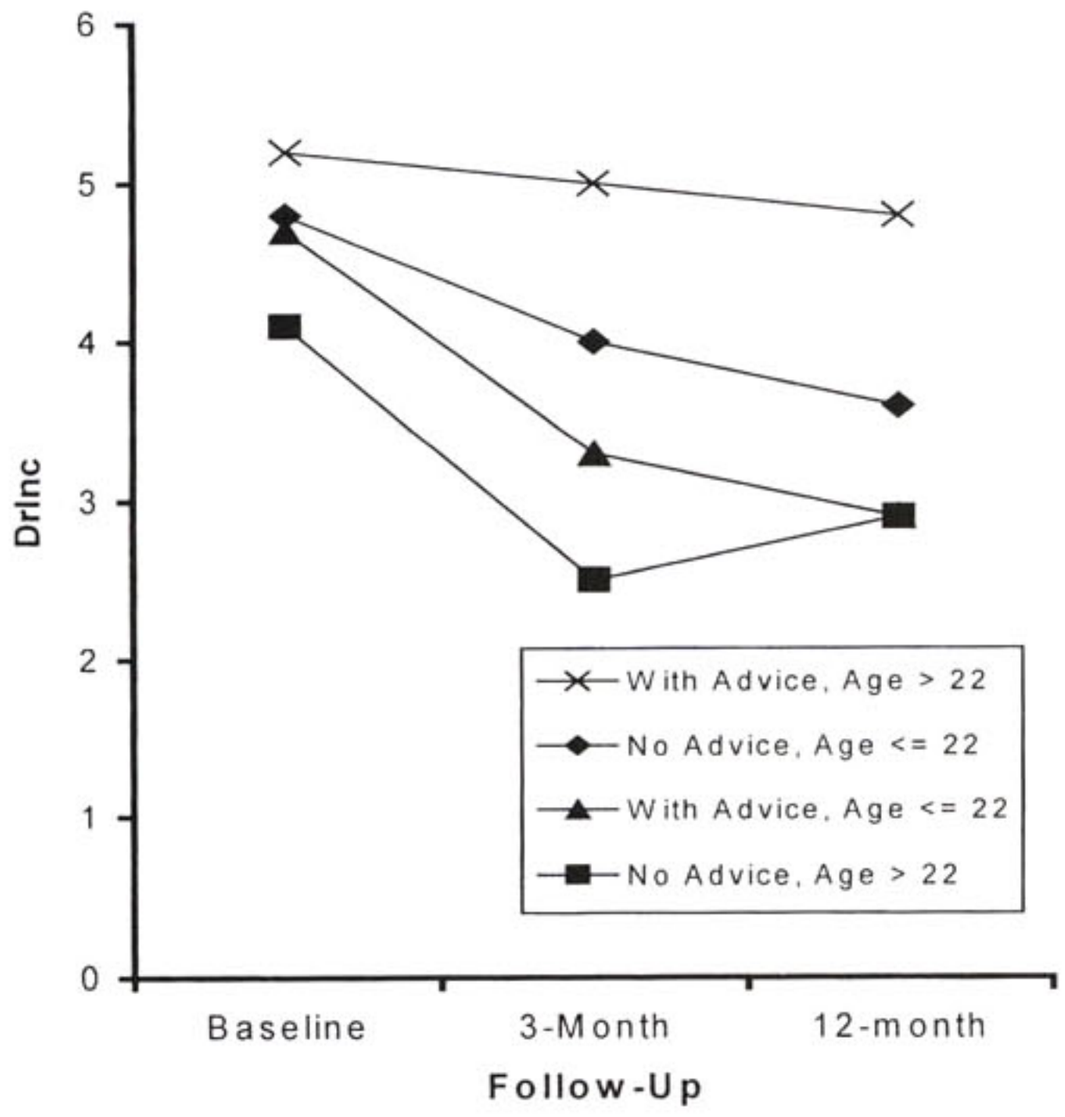

FIGURE 3. Scores on the Drinker Inventory of Consequences (DrInC) at baseline and 3- and 12-month follow-up for advice/no advice conditions, by age group

Regression model with covariates: Alcohol consequences

In the analysis comparing message conditions (tailored vs generic), there were no significant differences between tailored compared with generic messages on alcohol consequences over time, as measured by the DrInC (χ^2 = 1.58, 2 df, p = .4531). However, there was a significant three-way interaction for DrInC (Time × Age × Advice) (χ^2 = 10.11, 2 df, p = .0064). Those subjects in the advice condition who were ≤22 years of age were significantly more likely than the three other groups to show a reduction over time in alcohol consequences on the DrInC (see Figure 3).

Discussion

There have been few studies, to date, of tailored messaging for alcohol problems in any setting. This study found that generic and tailored ED-based interventions, with and without advice, could reduce quantity/frequency and some consequences of alcohol use, and did not require a post-ED visit booster session to be effective (Longabaugh et al., 2001). This was the first study to examine the potential benefits of tailored versus generic written messages for at-risk alcohol use. Furthermore, this study sought to determine the impact of brief advice along with detailed written feedback. Determining the efficacy of the use of tailored messages and advice/no advice conditions is a critical step in disentangling the crucial elements in brief interventions in ED settings. These questions are particularly relevant to a busy ED where, given current health care costs and restrictions, staff advice sessions must be very brief (Hungerford and Pollock, 2003).

This research tested an innovative approach to screening and brief intervention for hazardous drinking in a widely used health care setting using state-of-the art computer technology and graphics. In contrast to previous studies using tailored versus generic written materials, this study addressed

the content of the materials (generic vs tailored) rather than the structure of the materials. To make the structure of the materials similar, the tailored and generic booklets looked almost identical in terms of length, quality, color, graphics, etc. The tailored booklets, however, varied the content of the booklets based on individual responses to the screening and baseline assessment items. By varying content rather than format, this study did a more direct test of tailored content than seen in previous investigations (Campbell et al., 1994; Skinner et al., 1994; Strecher et al., 1994, 2002).

The findings of this study indicated that high-quality intervention materials combined with, at least, brief advice enhanced the effectiveness of the brief interventions. Tailored compared with generic written materials did not add to the effectiveness of the intervention; however, brief advice sessions combined with written materials did appear to be essential to maximizing drinking outcomes. The results of this study also indicated that, as expected, *all* intervention groups (tailored advice, generic advice, tailored no-advice, generic no-advice) significantly reduced their quantity/frequency from baseline to the 12-month follow-up.

The entire sample reduced their drinking by an average of 30%. The effect size for the entire sample compares favorably with most brief intervention studies, with positive results in which the effect size is from 30% to 40% (see Hungerford and Pollock [2002] for a recent review of research on brief interventions in the ED).

The findings also showed that those subjects who received advice (regardless of whether it was accompanied by tailored or generic written booklets) were significantly more likely to show improvements on alcohol-related consequence variables. These findings are consistent with an ED-based study using brief advice (not using tailoring technology) (Monti et al., 1999).

Because heavy episodic drinking is a national epidemic on college campuses, an intervention strategy that significantly reduces heavy drinking episodes in young adults may be useful as a means of decreasing risks for this segment of the population. In a secondary analysis, subjects ages 19-22 who received advice showed the most significant decreases in alcohol consequences. This study also found that younger women (ages 19-22) who received advice were most likely to decrease the number of heavy drinking episodes over time. This finding regarding advice is interesting because of the risks involved in heavy episodic drinking for young women of child-bearing age. These findings showing women are most receptive to brief interventions are consistent with the literature on brief interventions across medical settings (Barry, 1999; Bien et al., 1993; Dunn et al., 2001). The results of this study point to the need to focus intervention types to the specific demographic characteristics (e.g., gender, age) of injured patients in the ED.

The use of automated screening and written materials with minimal advice may be particularly relevant in the ED setting in terms of improving potential long-term outcomes for injured adults. Results suggest that providing tailored written materials alone (without brief advice) is not as effective in reducing alcohol misuse and consequences among the large majority of injured, at-risk drinkers; interventions that incorporate computerized screening and the "real-time" production of alcohol intervention booklets in the ED may serve as a reminder to medical staff to provide additional brief advice to their injured patients who are risk drinkers. This combination of written intervention materials and advice may be the most effective approach in this setting, but further research is needed in this area.

A limitation of this study was the lack of a traditional control condition. Although omitting a true control was based on previous research showing the effectiveness of brief interventions across a variety of populations and settings, that omission does not allow a direct comparison of the findings to a "no-intervention" condition. Furthermore, whereas sample sizes were large and provided adequate power to detect group differences, some subgroup analyses could not be conducted because of sample size.

Future studies are needed to replicate and expand these findings to other ED settings serving populations with different demographic characteristics. This study is a valuable step in the process of disentangling the necessary components of an effective brief alcohol intervention in a fast-paced, health care environment. It is important to note that the brief advice was delivered to participants by social workers in the ED. This points to the potential for having allied health care providers other than ED physicians effectively deliver prevention and early intervention messages in this setting, freeing up physicians to address the medical care needs of ED patients. In a period of increasing health care costs and diminishing health care dollars, it is essential to find more efficacious methods to intervene with at-risk injured drinkers.

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