

Alcohol Interventions Among Underage Drinkers in the ED: A Randomized Controlled Trial

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abstract

OBJECTIVES: This study examined the efficacy of emergency department (ED)-based brief interventions (BIs), delivered by a computer or therapist, with and without a post-ED session, on alcohol consumption and consequences over 12 months.

METHODS: Patients (ages 14–20 years) screening positive for risky drinking were randomized to: BI ($n = 277$), therapist BI ($n = 278$), or control ($n = 281$). After the 3-month follow-up, participants were randomized to receive a post-ED BI session or control. Incorporating motivational interviewing, the BIs addressed alcohol consumption and consequences, including driving under the influence (DUI), and alcohol-related injury, as well as other concomitant drug use. The computer BI was an offline, Facebook-styled program.

RESULTS: Among 4389 patients screened, 1054 patients reported risky drinking and 836 were enrolled in the randomized controlled trial. Regression models examined the main effects of the intervention conditions (versus control) and the interaction effects (ED condition \times post-ED condition) on primary outcomes. The therapist and computer BIs significantly reduced consumption at 3 months, consequences at 3 and 12 months, and prescription drug use at 12 months; the computer BI reduced the frequency of DUI at 12 months; and the therapist BI reduced the frequency of alcohol-related injury at 12 months. The post-ED session reduced alcohol consequences at 6 months, benefiting those who had not received a BI in the ED.

CONCLUSIONS: A single-session BI, delivered by a computer or therapist in the ED, shows promise for underage drinkers. Findings for the fully automated stand-alone computer BI are particularly appealing given the ease of future implementation.



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Dr Cunningham was responsible for the study concept, design, acquisition, analysis, and interpretation of data; administrative, technical, or material support of the study; study supervision; and drafting of the manuscript, including both the initial draft and subsequent revisions. Dr Chermack was responsible for the study concept and design, study supervision, and critical revisions to the manuscript; Drs Ehrlich, Blow, and Barry were responsible for the study concept and design and critical revisions to the manuscript; Dr Carter was responsible for analysis and interpretation of data and critical revisions to the manuscript; and Dr Booth was responsible for the study concept, design, acquisition, analysis, and interpretation of data, as well as critical revisions to the manuscript. Dr Walton was responsible for the study concept, design, acquisition, analysis, and interpretation of data; administrative, technical, or material support of the study; study supervision; and critical revisions to the manuscript. All authors take responsibility for the integrity and accuracy for their contributions. Dr Cunningham had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

WHAT'S KNOWN ON THIS SUBJECT: Intervention strategies are needed to reduce underage drinking. Meta-analyses of youth alcohol brief interventions (BIs) conclude that therapist-delivered BIs are efficacious; however, to maximize public health impact, recommendations include using technology to streamline intervention delivery, for which evidence is lacking.

WHAT THIS STUDY ADDS: A single-session BI, delivered by a computer or therapist in the emergency department, shows promise for underage drinkers. Findings for the stand-alone computer BI are particularly appealing given the ease of future implementation.

Early intervention strategies are needed to reduce underage drinking, with 16% of individuals aged 15 to 16 years¹ and 19% of those aged 17 to 18 years² reporting binge drinking. Alcohol use during adolescence increases the risk for developing an alcohol use disorder,^{3,4} which occurs in ~5% of adolescents (ages 12–17 years) and ~16% of emerging adults (ages 18–25 years).^{3,5,6} Additional risks of underage drinking include driving under the influence (DUI) of alcohol, with 6% of adolescents (ages 16–17 years) and 15% of emerging adults (ages 18–20 years) reporting past year DUI.⁷ This finding is especially alarming because youth are more likely than adult populations to have a DUI-associated motor vehicle crash,⁸ increasing their risk for mortality.⁹ Alcohol misuse during adolescence is also associated with illicit drug use^{10–21} and misuse of prescription medications (eg, opioids, sedatives, stimulants),^{19,22} thus increasing the risk for overdose, which is an escalating public health problem.^{15,18,23–25}

Alcohol screening, brief intervention, and referral to treatment (SBIRT) approaches have largely been tested among adults in the emergency department (ED), with meta-analyses demonstrating a reduction in consequences but not consumption.²⁶ However, a previous ED-based BI for underage drinking has also shown promise by reducing alcohol-related consequences (ie, injury, DUI) and binge drinking.²⁷ Recent meta-analyses of youth alcohol brief interventions (BIs; up to age 25 years)^{28,29} across settings (eg, ED, colleges) concluded that therapist-delivered BIs are efficacious.

Although the American Academy of Pediatrics³⁰ and the American College of Emergency Physicians,³¹ as well as government agencies (ie, National Institute on Alcohol Abuse and Alcoholism, Substance Abuse and Mental Health Services Administration),³² endorse alcohol

SBIRT for youth in the ED, implementation of therapist-delivered BIs is limited by lack of staff time and training.^{33,34} To maximize the public health impact, recommendations include using technology to streamline screening and intervention delivery in the ED^{35,36}; however, an evidenced-based, computerized alcohol BI for underage risky drinkers is currently lacking. Furthermore, a single-session BI may not be sufficient to sustain long-term changes given the cyclical nature of alcohol use among youth.^{35,37–39} Despite recommendations that SBIRT methods in the ED include boosters to enhance efficacy, evidence for their benefits are mixed and require further evaluation.

The present study examined: (1) the efficacy of an alcohol BI (Project U-Connect), delivered by computer or therapist, in reducing primary outcomes of alcohol consumption and consequences and secondary outcomes of DUI, alcohol-related injury, and illicit and prescription drug use, compared with control condition at 3, 6, and 12 months; (2) the efficacy of a 3-month post-ED brief session on outcomes at 6 and 12 months; and (3) the most effective combination of ED-based and post-ED intervention strategy on outcomes at 6 and 12 months.

METHODS

Design

Project U-Connect was a randomized controlled trial conducted among underage drinkers presenting to an academic Level 1 ED.⁴⁰ Using a 3 × 2 factorial design, eligible participants were randomized by using a computerized algorithm to 1 of 3 ED-based conditions (computer BI, therapist BI, or control) and 1 of 2 booster conditions (post-ED session or control) that were administered after the 3-month follow-up interview. We obtained Institutional Review Board Approval from the University of

Michigan and a certificate of confidentiality was obtained from the National Institutes of Health.

Protocol

Recruitment occurred between ~2 PM and 2 AM 7 days a week, excluding holidays (September 2010–March 2013); initial sampling of midnight and day shifts was reduced due to low yield. ED patients (ages 14–20 years) were identified for screening by review of electronic medical records. Patients were ineligible if they could not provide informed consent (eg, medical reasons [eg, intubated, unconscious], psychiatric reasons [ie, cognitive impairment], aged <18 years without a parent/guardian present), had acute suicidal ideation or had experienced sexual assault, or could not self-administer the assessment/BI (eg, non-English-speaking [3.1%]) or participate in follow-ups (eg, homeless). Patients who were not stable to be approached in the ED were enrolled on inpatient floors within 72 hours (2.1%). Participants provided written consent (or assent and parent/guardian consent if aged <18 years) to be screened, self-administered the 15- to 20-minute survey via touchscreen tablet, and received a \$1.00 gift.

Eligibility

Participants screening positive on the Alcohol Use Disorders Identification Test–Consumption^{41,42} (AUDIT-C; age 14–17 years, score ≥3; age 18–20 years, score ≥4)^{43,44} were eligible for the randomized controlled trial. After provision of written consent (age ≥18 years) or assent and parent/guardian consent (ages 14–17 years), participants self-administered a 20- to 30-minute computerized baseline survey (\$20 compensation) and were randomized to a condition, stratified according to gender, age (14–17 or 18–20 years), and meeting criteria for an alcohol use disorder (see Measures).

Follow-up assessments at 3, 6, and 12 months were self-administered

by participants either on a computer that was provided by staff in-person or via a Web link that was sent to participants to self-administer online. Remuneration was \$35 for 3-month follow-ups, \$35 for 6-month follow-ups, and \$45 for 12-month follow-ups.

Measures

Demographics

Questions regarding demographic characteristics and background included age, gender, race, ethnicity, receipt of public assistance, and living situation.⁴⁵⁻⁴⁷

Risky Drinking

Participants reporting alcohol use in the past year (Add Health instrument)⁴⁷ self-administered the AUDIT-C.^{41,42}

Primary Outcomes

Alcohol Consumption Index

Responses from the past 3-month frequency variable ("How often did you have a drink containing alcohol?": never = 0; monthly or less = 1; 2 to 4 times per month = 2; 2 to 3 times per week = 3; ≥ 4 times per week = 4) and the past 3-month quantity variable (How many drinks containing alcohol did you have on a typical day when you were drinking?: 1 or 2 drinks = 1; 3 or 4 = 2; 5 or 6 = 3; 7 to 9 = 4; ≥ 10 = 5) of the AUDIT-C were multiplied to produce a quantity-frequency index.⁴⁸ Scores ranged from 0 to 20, with higher scores indicating greater alcohol consumption.

Alcohol Consequences

The 18-item Rutgers Alcohol Problem Index assessed past 3-month alcohol-related consequences.⁴⁹⁻⁵¹ Responses were scored dichotomously and summed (range: 0-18)⁵¹; previous research found that scores ≥ 8 indicate an alcohol use disorder.⁵¹

Secondary Outcomes

Driving Under the Influence

The 5-item Young Adult Driving Questions⁵²⁻⁵⁵ assessed past

3-month drinking and driving, with responses summed.

Alcohol-Related Injury

A question from the Adolescent Injury Checklist evaluated past 12-month alcohol-related injury.^{53,56,57}

Drug Use

The National Institute on Drug Abuse Alcohol, Smoking, and Substance Involvement Screening Test^{58,59} assessed use and consequences of 6 illicit drugs (ie, marijuana, cocaine, inhalants, hallucinogens, methamphetamine, street opioids) and the nonmedical use and consequences of 3 prescription drugs (ie, opioids, sedatives, stimulants) (range per drug: 0-39).

Conditions

Computer- and Therapist-Delivered BIs

The computer BI and therapist BI incorporated principles of motivational interviewing⁶⁰ to primarily address alcohol use⁶¹⁻⁶³ (see Walton et al⁴⁰ for additional information on intervention content). Although the modes of delivery for these 2 interventions were different (which affected some specific content included), they were designed to be parallel in structure with similar key components addressed. The tailored computer BI was an offline, Facebook-styled program (Supplemental Appendix) delivered by using touchscreen tablets with audio (via headphones). Participants chose a top "friend" to guide them and 6 virtual "friends." Sections included: (1) reasons to avoid drinking and drugs, including prescription drugs; (2) benefits of drinking less or not drinking (ie, avoiding injury); (3) better things to do; (4) risky situations; (5) protective behavioral strategies; (6) handling negative affect (eg, chat room-style posts followed by comments expressed by virtual friends, YouTube-styled videos); and (7) avoiding DUIs (ie, zero tolerance laws, peer video sharing difficulties after

a DUI). Therapist BIs were facilitated by a computerized workbook for real-time clinical decision support at each step, presenting tailored feedback and screens to prompt content. Therapists elicited change talk about alcohol and drug consequences, reasons to avoid or reduce use and combining alcohol and prescription drugs, benefits of change, building discrepancy between actions and goals, risky situations, protective behavioral strategies,⁶⁴ handling negative affect, and preventing consequences (eg, injury, DUI). Therapist BI sessions were coded (97.3% [$n = 249$]) by using the Motivational Interviewing Treatment Integrity 3.0 system,⁶⁵ with data demonstrating acceptable fidelity (mean global spirit rating: 4.6 [SD: 0.6; range: 2.7-5.0], which exceeds the competency of 4).⁴⁰

Control

Considered enhanced usual care, the control condition comprised staff reviewing a brochure listing resources (eg, mental health and substance use services, leisure activities). This brochure was also given to participants in the intervention conditions.

Post-ED Session

After the 3-month follow-up data collection, the booster condition assignment was revealed on the computer, and youth received either a BI delivered by a therapist blinded to ED condition assignment or no BI (control). The post-ED session was based on motivational interviewing⁶⁰ (mean: 39.7 ± 12.9 minutes). Post-ED sessions were audiotaped and coded using the Motivational Interviewing Treatment Integrity 3.0 system⁶⁵; among randomly selected sessions (51% [$n = 70$]), the mean global spirit rating was 4.8 (SD: 0.3; range: 4.0-5.0), which exceeds the competency level of 4. Sessions addressed alcohol use, other drug use (as appropriate), and other risky behaviors (eg, injury, DUI) based on responses to the 3-month

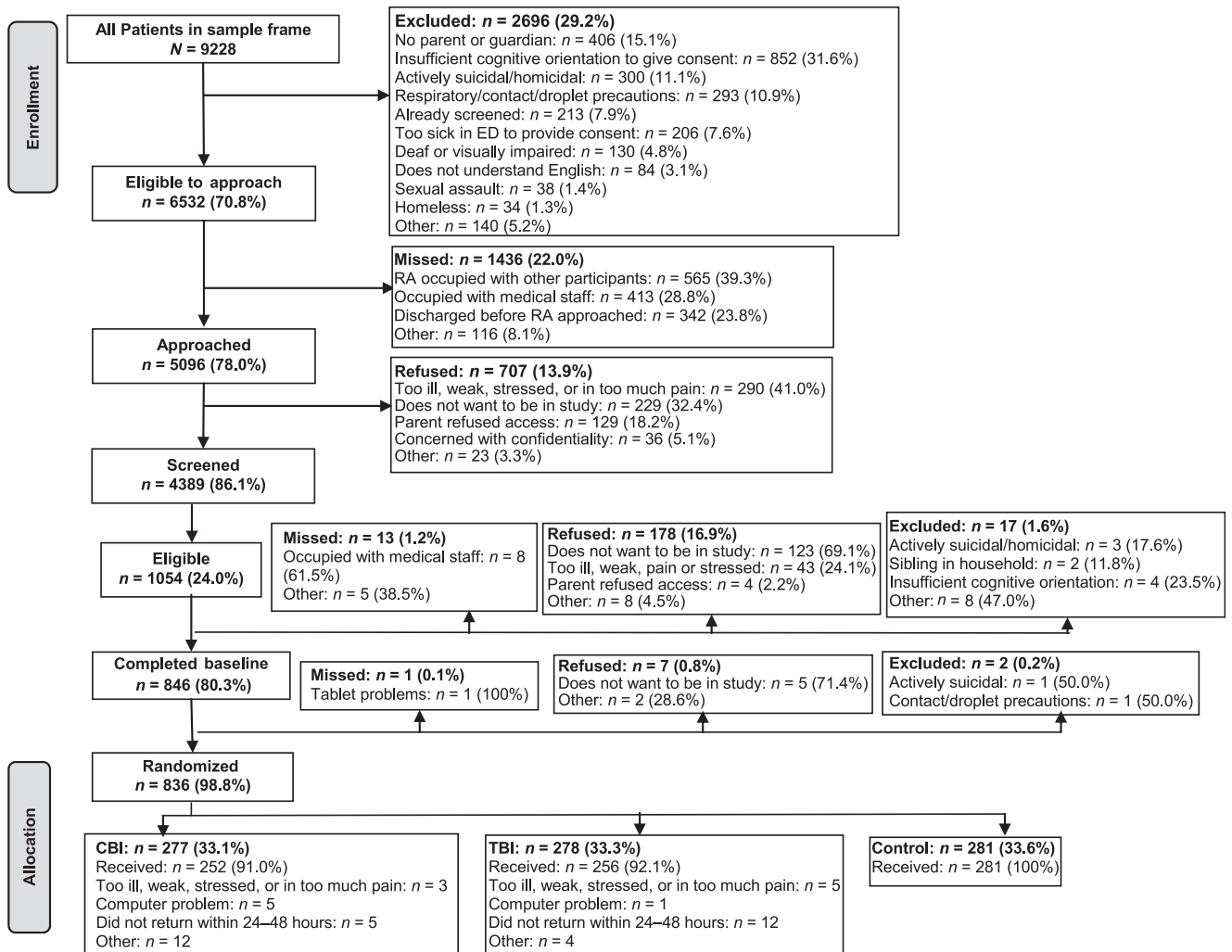


FIGURE 1 Project U-Connect flow sheet. CBI = computer BI; M = months; RA = research assistant; TBI = therapist BI.

follow-up. Therapists used touchscreen tablets to guide the session and provide tailored feedback for substance use and consequences.

Data Analysis

Data were analyzed by using SAS version 9.4 (SAS Institute, Inc, Cary, NC). No statistically significant differences were found in baseline characteristics according to condition. Nonetheless, analyses controlled for randomization strata (gender; age group [14–17 years or 18–20 years]); we did not control for meeting criteria for an alcohol use disorder because it was strongly correlated with outcomes. Sample size was determined a priori based on

expected effect sizes. Although 80% to 90% received the assigned conditions, an intent-to-treat approach was used (eg, includes those who did not receive assigned condition). Attrition analyses showed that baseline characteristics (ie, age group, gender) were not significantly related to follow-up completion, suggesting data were missing at random. Thus, analyses included all available cases at follow-ups, which is preferred to imputation when data are missing at random and attrition is low (ie, the follow-up rate was 86.8% at 3 months, 87.1% at 6 months, and 88.0% at 12 months). White participants were less likely than participants of other races to

complete the 3-month follow-up, and male participants were less likely than female participants to complete the 12-month follow-up; however, models including race did not change the findings (data available on request). Overall, regression analyses (ie, negative binomial or Poisson based on distribution) were conducted for interventions (compared with the control) on primary outcomes (ie, alcohol consumption index, alcohol consequences) at 3, 6, and 12 months. First, to determine the most effective ED-based strategy compared with control condition, regression analyses were conducted for 3-month outcomes, controlling for baseline

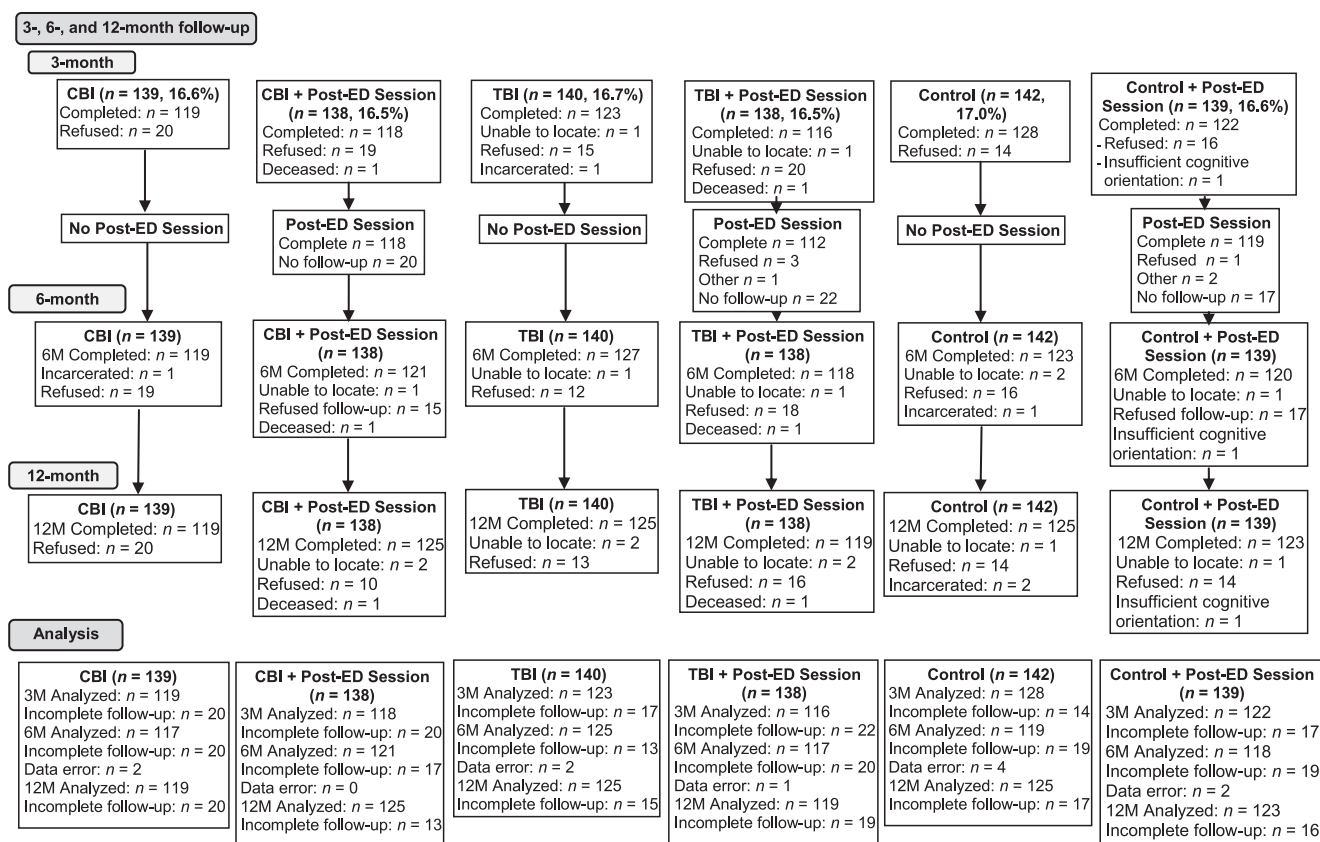


FIGURE 1
Continued.

alcohol variables. Second, to examine the main effects of the post-ED session, regression models were conducted for 6-month outcomes, controlling for 3-month alcohol variables. Third, to examine long-term main effects of the therapist BI, computer BI, and post-ED session, regression models were conducted for 12-month outcomes, controlling for baseline alcohol variables. Fourth, to determine the most effective combination, regression models were conducted, including interaction effects for ED condition by post-ED condition on outcomes controlling for baseline alcohol variables. Finally, main effects and interaction effects on secondary outcomes were examined at 12 months (ie, illicit drug use, prescription drug use, DUI, and alcohol-related injury [not measured at 3 or 6 months]). For DUI, alcohol-related injury, and prescription drug use, zero-inflated

models were used to account for the large proportion of zeros.

RESULTS

Enrollment

A total of 9228 patients (aged 14–20 years) presented to the ED during recruitment hours. Of the 5096 who were approached, 86.1% were screened ($n = 4389$) and 13.9% ($n = 707$) refused (Fig 1). At screening, male participants were more likely to refuse than female participants (15.1% and 13.0%, respectively; $\chi^2 [1] = 4.76$; $P < .05$) and participants of other races were more likely to refuse than white participants and African-American participants (35.0% vs 9.6% and 7.7%, respectively; $\chi^2 [2] = 393.20$; $P < .001$). Of those screened, 24% ($n = 1054$) met the criteria for risky drinking, and 79.3% ($n = 836$) were enrolled in the randomized controlled trial. At baseline, white participants and

participants of other races were more likely to refuse than African-American participants (17.7% and 19.5% vs 3.7%, respectively; $\chi^2 [2] = 11.02$; $P < .01$). Compliance with assigned conditions and follow-ups exceeded 80%.

Participant Characteristics

No significant differences were found in participant characteristics (gender, age group, race, ethnicity, receipt of public assistance, living with parents, ED visit characteristics of seeking care for injury, alcohol-related ED visit, discharge from ED, or baseline alcohol consumption, consequences, DUI, alcohol-related injury, or drug use) according to condition. Overall, 51.6% of participants were male, with a mean age of 18.6 ± 1.4 years, and 65.8% were currently in college. Most participants were white (79.4%), with 9.5% African-American and 11.1% other races; 5.5% were of Hispanic ethnicity. Only 20.1% received public

assistance; 43.3% lived with their parents. About two-thirds (63.8%) presented with a medical complaint, and most youth were discharged from the ED (86.8%).

Three-Month Primary Outcomes

Regression analyses showed that the computer BI and therapist BI significantly decreased the alcohol consumption index score and alcohol consequences compared with control (Table 1). Cohen's *d* effect sizes were as follows: alcohol consumption index, 0.10 (computer BI) and 0.13 (therapist BI); alcohol consequences, 0.11 (computer BI) and 0.14 (therapist BI).

Six-Month Primary Outcomes: Main Effects

Regression models examining the main effects of the computer BI, therapist BI, and post-ED session on alcohol consumption index scores and consequences at 6 months (controlling for 3-month levels of alcohol domain) showed no

TABLE 1 Main Effects of Computer and Therapist BIs (Versus Control) on the Alcohol Consumption Index and Alcohol Consequences at 3-Month Follow-up

Variable	3-Month (<i>N</i> = 726) IRR (95% CI)	<i>P</i>
Alcohol consumption index ^a		
Computer BI	0.88 (0.78–0.99)	.041
Therapist BI	0.86 (0.77–0.98)	.018
Alcohol consequences ^b		
Computer BI	0.85 (0.76–0.95)	.004
Therapist BI	0.87 (0.79–0.97)	.014

The reference group is the control group. These models controlled for baseline values of the domain (ie, alcohol consumption index or alcohol consequences) and age group and gender.

^a Responses from the past 3-month frequency variable ("How often did you have a drink containing alcohol?": never = 0; monthly or less = 1; 2–4 times per month = 2; 2–3 times per week = 3; ≥4 times per week = 4) and the past 3-month quantity variable ("How many drinks containing alcohol did you have on a typical day when you were drinking?": 1 or 2 drinks = 1; 3 or 4 = 2; 5 or 6 = 3; 7 to 9 = 4; ≥10 = 5) of the AUDIT-C were multiplied to produce a quantity-frequency index. Scores ranged from 0 to 20, with higher scores indicating greater alcohol consumption.

^b The 18-item Rutgers Alcohol Problem Index assessed past 3-month alcohol-related consequences. Responses were scored dichotomously and summed (range: 0–18).

significant effects for either of the BIs. The main effect of the post-ED session was significant for alcohol consequences but not for consumption (data not shown, Cohen's *d* = 0.12).

Twelve-Month Primary Outcomes: Main Effects

At 12 months, the therapist BI and computer BI did not significantly affect alcohol consumption index scores but did reduce alcohol consequences (Cohen's *d* effect sizes = 0.12 [therapist BI versus enhanced usual care] and 0.17 [computer BI versus enhanced usual care]) (Table 2). There were no main effects of the post-ED session on alcohol-related outcomes at 12 months.

Six- and 12-Month Primary Outcomes: Interaction Effects

At 6 months, among those receiving the control condition in the ED, those who received the post-ED session had fewer alcohol consequences (incidence rate ratio [IRR]: 0.84 [confidence interval (CI): 0.71–0.99]) than those who did not receive the post-ED session (Table 3). Among those receiving the therapist BI in the ED, those who received the post-ED session had more alcohol consequences (IRR: 1.33 [CI: 1.05–1.68]) than those who did not receive the post-ED session. At 12 months, among those receiving the control condition in the ED, those who received the post-ED session had fewer alcohol consequences (IRR: 0.73 [CI: 0.61–0.88]) than those who did not receive the post-ED session, and among those receiving the computer BI in the ED, those who received the post-ED session noted more alcohol consequences (IRR: 1.38 [CI: 1.06–1.79]) than those who did not receive the post-ED session.

Secondary Outcomes

The computer BI reduced the frequency of DUI (Cohen's *d* = 0.13) and prescription drug use (Cohen *d* = 0.20) at 12 months. The therapist BI

TABLE 2 Main Effects for the ED BIs and Post-ED Session on the Alcohol Consumption Index and Alcohol Consequences at 12 Months

Variable	12-Month (<i>N</i> = 735) IRR (95% CI)	<i>P</i>
Alcohol consumption index		
Computer BI	1.05 (0.92–1.20)	.478
Therapist BI	1.00 (0.88–1.15)	.956
Post-ED session	0.95 (0.86–1.06)	.393
Alcohol consequences		
Computer BI	0.86 (0.75–0.98)	.024
Therapist BI	0.87 (0.76–0.98)	.029
Post-ED session	0.98 (0.88–1.09)	.726

The reference group is the control group. These models controlled for baseline values of the domain (ie, alcohol consumption index or alcohol consequences) and age group and gender.

reduced alcohol-related injury (Cohen's *d* = 0.22) and prescription drug use (Cohen's *d* = 0.25) at 12 months (Table 4) compared with the control. No significant main effects were found for illicit drug use, and interaction effects (data not shown) were not significant for these secondary outcomes.

DISCUSSION

Our results provide novel data supporting the efficacy of brief, single-session alcohol interventions among youth in the ED, delivered by a therapist or a computer, in decreasing alcohol consumption index scores and alcohol-related consequences. Furthermore, the Project U-Connect BIs reduced DUI and/or alcohol-related injury. For example, youth receiving a BI experienced a ~10% reduction in consequences (eg, arguments, physical or mental health problems due to drinking) at the 1-year follow-up. These findings, albeit modest, are clinically significant given that alcohol-related injury and DUI are leading causes of mortality and morbidity among youth⁹ and that drinking during adolescence is related to the development of alcohol use disorders as well as other psychosocial problems as adults.^{66–69} Importantly, reduction in prescription

TABLE 3 Six- and 12-Month Interaction Effects to Examine the Most Effective Combination of ED and Post-ED Session

Variable	6-Month (N = 717) IRR (95% CI)	P	12-Month (N = 735) IRR (95% CI)	P
Alcohol consumption index^a				
Computer BI	0.93 (0.74–1.17)	.5422	0.97 (0.81–1.17)	.7431
Therapist BI	0.80 (0.64–1.01)	.0615	0.99 (0.82–1.18)	.8713
Post-ED session	0.86 (0.68–1.09)	.2041	0.89 (0.74–1.08)	.2367
Computer BI * post-ED session	1.16 (0.84–1.62)	.3670	1.17 (0.90–1.52)	.2441
Therapist BI * post-ED session	1.29 (0.93–1.80)	.1327	1.04 (0.80–1.35)	.7733
Alcohol consequences^b				
Computer BI	0.99 (0.85–1.17)	.9410	0.73 (0.61–0.88)	.0011
Therapist BI	0.90 (0.76–1.06)	.2044	0.86 (0.72–1.02)	.0792
Post-ED session	0.84 (0.71–0.99)	.0409	0.88 (0.74–1.05)	.1665
Computer BI × post-ED session	1.09 (0.86–1.39)	.4871	1.38 (1.06–1.79)	.0167
Therapist BI × post-ED session	1.33 (1.05–1.68)	.0199	1.02 (0.79–1.33)	.8594

The reference group is the control group. These models controlled for baseline values of the domain (ie, alcohol consumption index or alcohol consequences) and age group and gender.

^a Quantity-frequency index; higher scores indicate greater alcohol consumption.

^b The 18-item Rutgers Alcohol Problem Index assessed alcohol-related consequences.

drug use (computer BI: ~30%; therapist BI: ~50%) among risky drinkers is clinically significant because the combination of alcohol and prescription drugs increases the risk for overdose and other negative health consequences.²³

Findings supporting the efficacy of the stand-alone computer BI are particularly innovative and

important. Although evidence-based, computerized, brief alcohol interventions are available for college students,^{70–74} no evidence-based interventions exist to date for underage youth in the ED who are risky drinkers. One prior ED study that was focused on youth with any alcohol use (instead of risky drinkers) tested a computerized alcohol BI and

TABLE 4 Main Effects for the ED-Based BIs and Post-ED Session on Secondary Outcomes at 12 Months

Variable	IRR (95% CI)	IRR (95% CI)	P Value	P Value
	Prevalence	Frequency	Prevalence	Frequency
Drinking and driving				
Computer BI	0.53 (0.23–1.25)	0.48 (0.29–0.80)	.147	.005
Therapist BI	0.63 (0.28–1.41)	0.69 (0.41–1.17)	.256	.166
Post-ED session	0.80 (0.41–1.58)	0.80 (0.52–1.21)	.527	.286
Alcohol-related injury				
Computer BI	0.92 (0.26–3.24)	0.63 (0.30–1.32)	.900	.216
Therapist BI	0.87 (0.26–2.96)	0.44 (0.22–0.92)	.828	.028
Post-ED session	0.56 (0.16–1.95)	0.71 (0.37–1.37)	.362	.312
Prescription drug use				
Computer BI	0.83 (0.56–1.25)	0.59 (0.52–0.66)	.376	<.001
Therapist BI	1.16 (0.77–1.76)	0.63 (0.56–0.70)	.474	<.001
Post-ED session	1.14 (0.81–1.59)	1.08 (0.98–1.19)	.453	.103
Illicit drug use				
		Estimate (SE)		P
Computer BI	—	0.96 (0.72–1.27)	—	.772
Therapist BI	—	0.96 (0.72–1.28)	—	.790
Post ED session	—	0.89 (0.71–1.12)	—	.330

The reference group is the control group. Zero-inflated negative binomial for DUI, zero-inflated Poisson for alcohol-related injury, zero-inflated Poisson for prescription drug use (and thus have both prevalence and frequency). A negative binomial was conducted for illicit drug use (thus only data in frequency columns is available). These models controlled for baseline values of the domain and the strata on which the participants were randomized (age group and gender). Illicit drug use includes marijuana, cocaine, inhalants, hallucinogens, methamphetamine, and street opioids.

found efficacy among a subsample of youth reporting drinking and driving at baseline.⁷⁵ Another study of a computerized BI also focused on the combination of youth violence and any alcohol found a reduction in alcohol consequences.^{76,77} Our therapist BI was guided by a computerized workbook guide for real-time clinical decision support that the therapist used to structure the session, which may increase fidelity in the busy ED setting.

Findings regarding the efficacy of BIs on reducing DUI and alcohol-related injury were mixed, with the computer BI reducing DUI and the therapist BI reducing alcohol-related injuries. These findings may reflect differences in the content based on delivery mechanism. For example, the computer BI contained a video clip in which a teen described financial and legal stresses after a DUI charge. In contrast, therapists had discretion to elicit alcohol-related consequences, such as injury.

The present study contributes to the literature by examining the efficacy of a post-ED session, with and without an initial ED-based BI. The post-ED session had minimal short-term benefits (at 6 months) for those who did not receive a BI in the ED; however, as indicated by the analysis of the interaction effects, this post-ED session did not enhance the efficacy of the Project U-Connect BI delivered by either the computer or the therapist in the ED. This finding is notable because >80% who were assigned actually received the post-ED session, addressing dose and retention issues that can occur with post-ED therapy delivery. Previous data on the efficacy of a follow-up booster are inconsistent, perhaps reflecting variation in participation and content.^{78–80}

In terms of future translation and implementation, the Project U-Connect BI seems to be efficacious delivered by either a computer or a therapist, and a post-ED session at

3 months after the ED visit is of possible benefit for settings in which there is no staff mechanism to deliver the BI during the ED visit. Given resources required to re-contact youth and deliver a session postdischarge, administration of the BI in the ED seems preferable, although future studies could consider technology-based staff-free boosters. In particular, findings for the computer BI are promising because this delivery mode addresses barriers regarding staff time and training, with youth completing the intervention independently. Future examination of the costs for this intervention is needed to aid implementation decisions.

A limitation of the present study is that the findings may not be generalized to patient groups who were not included in this single-site study or to those excluded (eg, those with acute suicidal ideation); replication among larger, more diverse samples is necessary to examine all outcomes as well as the

characteristics of responders/nonresponders. The use of self-report data is a potential limitation; however, recent reviews support their reliability and validity when privacy/confidentiality is assured and when self-administered, computerized assessments are used.⁸¹ In addition, despite follow-up rates exceeding 85% at 12 months, concerns regarding attrition cannot be completely eliminated.

CONCLUSIONS

A single-session BI delivered by a computer or therapist reduced risky drinking and alcohol consequences among these underage drinkers in the ED. A post-ED session added benefit for youth who did not receive a BI during the ED visit; however, no additional benefit of the booster was found after an ED-based BI. Although effect sizes were modest, findings for the stand-alone single-session, fully automated computer BI are particularly

appealing given the ease of future implementation.

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ABBREVIATIONS

AUDIT-C: Alcohol Use Disorders Identification Test–Consumption
BI: brief intervention
CI: confidence interval
DUI: driving under the influence
ED: emergency department
IRR: incidence rate ratio
SBIRT: screening, brief intervention, and referral to treatment

This trial has been registered at www.clinicaltrials.gov (NCT01051141).

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