
Three-month Follow-up of Brief Computerized and Therapist Interventions for Alcohol and Violence Among Teens

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Abstract

Objectives: Alcohol use and violent behaviors are well documented among adolescents and have enormous effects on morbidity and mortality. The authors hypothesized that universal computer screening of teens in an inner-city emergency department (ED), followed by a brief intervention (BI), would be 1) feasible (as measured by participation and completion of BI during the ED visit) and well received by teens (as measured by posttest process measures of intervention acceptability) and 2) effective at changing known precursors to behavior change such as attitudes, self-efficacy, and readiness to change alcohol use and violence.

Methods: Adolescent patients (ages 14–18 years) at an urban ED were approached to complete a computerized survey. The survey was conducted daily from 12 noon to 11 PM from September 2006 through November 2008. Adolescents reporting both alcohol use and violence in the past year were randomized to a control group or a 35-minute BI delivered by a computer or therapist as part of the SafERteens study. Validated measures were administered, including demographics, alcohol use, attitudes toward alcohol and violence, self-efficacy for alcohol and violence, readiness to change alcohol and violence, and process questions, including likeability of intervention.

Results: A total of 2,423 adolescents were screened. Thirteen percent of those approached refused. The population was 45% male, 58% African American, and 6.2% Hispanic. Of those screened, 637 adolescents (26%) screened positive; 533 were randomized to participate, and 515 completed the BI prior to discharge. The BIs were well received by the adolescents overall; 97% of those randomized to a BI self-reported that they found one intervention section “very helpful.” At posttest, significant reductions in positive attitudes for alcohol use and violence and significant increases in self-efficacy related to alcohol/violence were found for both therapist and computer interventions. At 3-month follow-up there was 81% retention, and generalized estimating equations (GEE) analysis showed that participants in both interventions had significant reductions in positive attitudes for alcohol use (therapist $p = 0.002$, computer $p = 0.0001$) and violence (therapist $p = 0.012$, computer $p = 0.007$) and significant increases in self-efficacy related to violence (therapist $p = 0.004$, computer $p = 0.002$); alcohol self-efficacy improved in the therapist BI condition only (therapist $p = 0.050$, computer $p = 0.083$). Readiness to change was not significantly improved.

Conclusions: This initial evaluation of the SafERteens study shows that universal computerized screening and BI for multiple risk behaviors among adolescents is feasible, well received, and effective at altering attitudes and self-efficacy. Future evaluations of the SafERteens study will evaluate the interventions' effects on behavioral change (alcohol use and violence) over the year following the ED visit.

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In the United States, there are over 100 million emergency department (ED) visits each year; 3 million are the result of violence.¹ In 2004, of all causes of mortality among youth, 71% were due to preventable injury.² Intentional injury is the leading cause of death among African American adolescents and the second leading cause of death among white adolescents.³ Although injury prevention programs have historically relied on primary care providers, adolescent programs initiated or occurring during an ED visit are increasing in number.^{4–9} Adolescents who present to the ED for care may be more likely to engage in risky behaviors relative to other adolescents,^{10,11} and ED-based injury prevention programs may provide access to adolescents who lack a primary care physician, as well as those who do not regularly attend school.

Alcohol use is associated with the four leading causes of death among adolescents, including homicide.¹² The relationship between alcohol and violence can be explained by problem behavior clustering, as well as alcohol's pharmacologic effects.^{13–16} Prior research has found almost half of adolescent drinkers are also involved in violent behaviors (e.g., physical fighting),¹⁷ and adolescents who use alcohol and report violent behaviors are at increased risk for other drug use^{11,18–20} and injury^{21,22} during adolescence and into adulthood.^{23,24} Screening and brief intervention (BI) approaches focusing on both alcohol use and violent behaviors during adolescence could potentially prevent the progression of alcohol problems and more lethal assaultive injury.^{18,19,25,26}

Crucial to the translation of effective ED-based BIs to routine practice is incorporating strategies to systematically deliver BIs with inherent fidelity and feasibility, particularly given the current clinical demands on staff in busy, crowded, and underresourced inner city EDs. The use of computer technology for both screening and BI is one such strategy.

The primary goal of this study was to compare computer- and therapist-delivered interventions in the ED. We hypothesized that universal computer screening of all teens (ages 14–18 years) in an inner-city ED, followed by a BI for alcohol and violence, will be 1) feasible (as measured by participation and completion of a BI during the ED visit) and well received by teens (as measured by posttest process measures of intervention acceptability) and 2) effective at significantly changing known precursors to behavior change such as attitudes, self-efficacy, and readiness to change alcohol use and violence 3 months following the BI in the ED. We provide a detailed description of the SaFERteens intervention, including methods used in computerized screening and intervention delivery with adolescents, as well as preliminary outcomes (precursors to behavior change) such as attitudes, self-efficacy, and stage of change. Follow-up interviews in the SaFERteens randomized controlled trial (RCT) are ongoing, and future data collection will evaluate the intervention described here on behavioral outcomes (alcohol and violence) over 12 months.

METHODS

Study Design

This was an RCT. Study procedures were approved and conducted in compliance with the guidelines of the University of Michigan and Hurley Medical Center Institutional Review Boards (IRBs) for Human Subjects. An NIH Certificate of Confidentiality was obtained.

Study Setting and Population

The SaFERteens study took place at Hurley Medical Center ED in Flint, Michigan, a 540-bed teaching hospital and Level 1 trauma center. This site has a pediatric ED physically adjacent (across the hall) from an adult ED. The site has 75,000 total visits/year of which about 25,000 are pediatric (age 0–17 years).

Adolescent patients aged 14–18 years presenting to the ED for either medical illness or injury were eligible for the screening survey. Patients were excluded if they had a diagnosis of schizophrenia or abnormal vital signs or were being treated for sexual assault or acute suicidal ideation. All patients who had normal vital signs were initially approached, including trauma patients after initial stabilization.

Study Protocol

Recruitment took place from 12 noon to 11 PM, 7 days per week from September 2007 to November 2008, excluding major holidays. Patients were identified from electronic tracking logs and were approached by trained, bachelor's or master's level research assistants (RAs) in waiting rooms or treatment spaces. RAs approached patients and obtained assent for phase I screening (and guardian consent if under 18 years). Consenting participants self-administered a 15-minute audio computer-assisted self-interview (ACASI) on a tablet laptop computer, with touch screen and audio via headphones, in treatment spaces (room, hallways, bay) and received a \$1.00 gift (e.g., notebook, pens).

Study Eligibility. After completion of the screening survey, participants who endorsed past-year fighting (indicating any of the following violent behaviors in the past year: physical fighting, robbing, group fighting, pulling a knife or gun, shooting, or stabbing) and past-year alcohol use (i.e., drinking beer, wine, or liquor, not just a sip or taste of someone else's drink, more than two times in the past year) were eligible for the BI (see "Measures").

Intervention Procedures. Following phase II assent/consent for the longitudinal study, participants completed a computerized baseline assessment and were randomized to one of three conditions while in the ED: computer BI, therapist BI, or control. Randomization to intervention group was stratified by sex and age block (14–15 or 16–18 years). Patients assigned to the control condition were given a brochure containing information on alcohol and violence and phone numbers for relevant community organizations. Participants in either intervention condition completed a brief posttest. Participants were paid \$20 for the baseline interview.

Participants were informed that they were not compensated for the intervention but for the baseline interview. If participants chose to leave at any time after randomization occurred, including prior to completing the intervention, they understood via the consent form they would still be compensated.

Follow-up Interviews. Computerized in-person follow-up assessments were conducted at 3 months following the ED visit, either at the study ED or at a community location convenient for the participant (e.g., library, fast food restaurant). Participants in all three groups (including control group) were remunerated \$25 for the 3-month assessment at the time of assessment. Participants were informed that RA staff would not view their responses to the 3-month assessment at any time, including prior to compensation.

Measures

All assessments (screen, baseline, 3-month) and post-tests (for computer BI and therapist BI conditions) were administered by ACASI to ensure confidentiality, promote reporting of sometimes stigmatizing and illegal behaviors, allow for complex skip patterns, and decrease literacy burden.²⁷⁻²⁹ The measures were chosen with attention to prior research and validity and except where specifically noted were not changed, including the response scale, from the original cited format. Data were backed-up after each survey or intervention.

Demographics. Questions (i.e., age, race, ethnicity, sex, employment, grades, and receipt of public assistance) were collected using items from the National Study of Adolescent Health (Add Health).³⁰

Violent Behavior. Two items from Add Health³⁰ assessed how often the adolescents got into a "serious physical fight" or "took part in a fight where a group of my friends was against another group." Responses were dichotomized as yes or no. Current gang affiliation (yes or no) was assessed with one question.³¹

Weapon Carriage and Use. Weapon-related behaviors were assessed using questions adapted from the Youth Risk Behavior Surveillance System (YRBS),³² which has established reliability.^{33,34} Participants were asked during the past year how often they carried a knife or razor and how often they carried a gun.

Substance Use. Participants were asked to indicate whether they had consumed alcohol more than two or three times in the past year.³⁰ Frequency, quantity, and heavy alcohol consumption were assessed with three items from the Alcohol Use Disorders Identification Test (AUDIT-C).^{35,36} As recommended by Chung et al.³⁶ for application among adolescents, binge drinking quantity was lowered from the original "6 or more..." to "5 or more drinks on one occasion." Responses for binge drinking were dichotomized (yes/no) for analysis. Past-year cigarette³⁷ and illicit drug use (i.e., marijuana, cocaine, inhalants, hallucinogens)³² were assessed using

dichotomous measures indicating if the individual substance was used (yes or no). The six-item CRAFFT³⁸ questionnaire was used. Using a cutoff of 2 or higher, CRAFFT demonstrates both sensitivity (92%) and specificity (82%) in screening adolescents for substance-related problems.³⁹

Past-year Medical Service. Usage, including primary care visits, ED visits, and mental health or substance use counseling, was assessed with five questions from Add Health.³⁰

Injury. Past-year violent injury (related to fighting or weapon use) was assessed with the Adolescent Injury Checklist.⁴⁰ These were dichotomized as yes or no.

Attitudes. Alcohol use attitudes were assessed with five items (e.g., "Driving after drinking is safe as long as you pay attention"; "Most teens get drunk sometimes.").⁴¹ Violence attitudes were assessed with seven items (e.g., "If a person hits you, you should hit them back"; "It's okay to carry a gun or knife if you live in a rough neighborhood.").⁴² Response choices were a five-point Likert scale ranging from "strongly agree" to "strongly disagree."

Self-efficacy. Self-efficacy for drinking alcohol was assessed using five items⁴³ regarding "How sure are you that you could say no to drinking alcohol if..." ("There were problems with your friends? There were problems with your family? Someone made fun of you for not drinking? All your friends were drinking? You were worried about a problem you had?"). The original response scale was expanded to a five-point Likert scale to be consistent with the rest of the measures. Self-efficacy for nonviolence was assessed with five items (e.g., "Staying out of fights"; "Calming down when mad").⁴⁴ Response choices included the original five-point Likert scale ranging from "not at all" to "extremely."

Readiness to Change. Piloting of the measures section found that participants had difficulty understanding standard readiness rulers.⁴⁵ Therefore, alcohol and violence readiness to change was each assessed instead using a five-point Likert item indicating precontemplation, contemplation, preparation, action, and maintenance (i.e., "Never think about my drinking; Sometimes I think about drinking less; I have decided to drink less; I am already trying to cut back on my drinking; My drinking has changed, I now drink less than before.") For violence, parallel response choices assessed readiness to change fighting.

Feasibility Measures. The computer recorded times for the start and end of the survey and intervention. RAs recorded if they provided assistance with the computer BI.

Visit Type. Current ED visit, medical illness (e.g., abdominal pain, asthma), or injury (International Classification of Diseases-9th revision, Clinical Modification Codes E800-E999), was abstracted from the medical

chart. Injury visits were classified as intentional (E950–E969) or unintentional (E800–E869, E880–E929). Chart reviews were audited regularly to maintain reliability in keeping with the criteria described by Gilbert and Lowenstein.⁴⁶

A posttest was administered to both the computer BI and the therapist BI groups, repeating the measures above for attitudes, self-efficacy, and readiness to change for alcohol and violence, as well as process questions. Based on a process measure used by Maio et al.,⁴⁷ a five-point Likert scale (ranging from “really didn’t like it” to “liked it a lot”) was used by participants to rate their received intervention condition. The helpfulness of individual intervention elements (i.e., “hearing how my fighting/ drinking fits in with other adolescents my age,” “reviewing the reasons to change,” “going through role plays,” and “receiving information on resources in my community”) was also assessed on a five-point scale (ranging from “not at all helpful” to “extremely helpful”) using a measure adapted from school-based alcohol intervention literature⁴⁸ to be specific to the elements of this intervention.

Description of SafERteens Intervention

Adapted motivational interviewing (AMI)-based BIs have traditionally been delivered by therapists alone, or using a structured workbook, and have been applied to alcohol but not to violence.^{9,49,50} AMI approaches mesh well with adolescent developmental issues, such as desire for autonomy and independence, resistance to authority, and lower tolerance for lengthy interventions. The framework for the SafERteens BI was based on principles of motivational interviewing,^{51,52} which focuses on enhancing motivation to change in a respectful, nonconfrontational, and nonjudgmental manner; emphasizing choice and responsibility; supporting self-efficacy; developing a discrepancy between current behavior and future goals and values; rolling with resistance; and increasing problem recognition, motivation, and self-efficacy for change. The SafERteens BI also involved normative resetting and a skills training component whereby therapists asked participants to role-play responses to scenarios, focusing on refusal skills for avoiding alcohol and alcohol-related risks, conflict resolution skills, and anger management skills.

This study examined two delivery modes of the BI (therapist and computer), designed to have the same content and organizational format, but with different modes of presentation (Table 1). They were developed specifically to be culturally relevant for inner-city youth, who at this study site are about 50% African American. Both delivery modes were developed and tested with focus groups composed of adolescents from the study ED (see Data Supplement S1, available as supporting information in the online version of this paper, for examples of intervention content).

Therapist BI. Research therapists were trained in motivational interviewing and skills training approaches at study onset, were monitored through monthly supervision, and participated in retraining workshops throughout the study. Therapists utilized a tablet laptop

computer to provide personalized feedback from the screening and baseline surveys (e.g., violence and alcohol use patterns and consequences, goals, attitudes about alcohol and violence) as well as age- and sex-specific normative information. Adolescents completed computerized checklists identifying reasons to stay away from drinking and fighting. Using a preprogrammed algorithm, the computer selected a set of role-play scenarios based on the participant’s risk behaviors, and the therapist guided the participant through them. For example, when participants reported weapon carriage, binge drinking, or dating violence, therapists presented scenarios on these specific topics. To ensure that therapists maintained acceptable performance, therapy sessions were audio taped and coded by independent raters according to predetermined fidelity criteria and measures of adherence and competence.

Computer BI. An interactive multimedia computer program was developed for the study and viewed on tablet laptops with touch screens and audio delivered through headphones, to ensure participant privacy. The program was in narrated cartoon style, in which participants could choose a sex-, race-, and age-appropriate “buddy” to “hang out” with throughout the session. The buddy guided participants through the intervention elements, including review of tailored feedback based on survey responses, identifying reasons to stay away from drinking and fighting, and role-play scenarios chosen by the computer based on reported risk behaviors (Table 1). During the scenarios, participants had to interact with peers and make behavioral choices. Feedback was provided about these behavioral choices by the buddy, with possible consequences highlighted and the best possible outcome demonstrated by the characters.

Data Analysis

Descriptive statistics were computed for demographic and behavioral characteristics of the sample. Analyses examined changes over time (baseline to 3-month follow-up) for each of the intervention conditions (therapist and computer BI), as well as for the combined intervention sample at baseline as compared to posttest on alcohol attitudes, violence attitudes, alcohol self-efficacy, violence self-efficacy, alcohol readiness to change, and violence readiness to change. The Wilcoxon signed rank nonparametric test for paired differences was used pre/post because of the skewed nature of the outcome measures. Because the alcohol and violence readiness to change variables were skewed, with nearly 40% of participants indicating precontemplation, this variable was recoded to a three-level variable: low (precontemplation), medium (contemplation, determination), and high (action/maintenance).

Repeated-measures analyses compared the effects of the intervention conditions with the control condition on 3-month outcomes on alcohol attitudes, violence attitudes, alcohol and violence self-efficacy, and alcohol and violence readiness to change. An “intent-to-treat” approach was taken where all participants randomized to each condition were included regardless of whether

Table 1
Key Elements of SafERteens Interventions

Key Elements	Goal of Element	Computer (C) and Therapist (T) Specific Content or Both (B)
Introduction: agenda setting ~2 min	<ul style="list-style-type: none"> • Thank patient for participation. • Establish rapport. • Explain purpose of intervention to talk about alcohol and violence. 	<p>C: Participant selects buddy (Data Supplement S1, Image 1). T: Therapist introduction.</p>
Personal goals ~3–5 min	<ul style="list-style-type: none"> • Review and elaborate on goals and values. • Begin to develop discrepancy between goals/values and current behavior by exploring how drinking and fighting fit in with goals/values. 	<p>B: BI goals listed. C: Buddy reiterates goals. T: Brief discussion of goals.</p>
Personalized feedback: alcohol and violence ~3–5 min	<ul style="list-style-type: none"> • Review survey responses regarding alcohol, fighting, and weapon carriage. • Compare behaviors to norms for age and sex. • Raise concern by providing feedback on consequences of drinking and fighting. • Continue to develop discrepancy by exploring impact of behavior on goals/values currently and in future. • From a prevention perspective, if behavior is lower level, provide opportunity to think about future behaviors and begin to strengthen commitment to avoid involvement. 	<p>B: Sex/age appropriate graphs shown on screen. B: Reviewed (by T or C-Buddy) in a matter-of-fact, nonjudgmental manner. T: Discuss how this currently or in the future could impact goals. C: Ask if think affects goals, check response on screen; reflective summary statements provided by Buddy (Data Supplement S1, Image 2).</p>
Reasons to stay away from drinking and fighting ~3–5 min	<ul style="list-style-type: none"> • Elicit reasons to change (or maintain for prevention focus) by exploring reasons to stay away from drinking/fighting. • Tip the decisional balance in favor of change. • Elicit and affirm change talk. • Support self-efficacy for making changes. • Continue to develop discrepancy by exploring impact of current behavior on current and future goals/values. • Roll with resistance. • Emphasize participant responsibility for making choices. 	<p>B: Reasons for staying away from drinking and fighting presented on screen for participant to check. T: Use motivational interviewing strategies to make a connection between reasons to avoid these behaviors and goals. C: Buddy summarizes the reasons checked on the screen to help make a connection between behaviors and goals.</p>
Safer choices; five role-plays practicing risk reduction ~10–12 min	<p>Practice five scenarios that were selected by the computer, based on gender and risk profile (e.g., high or low risk for alcohol or violence) obtained from assessment.</p> <p>Role-plays focus on anger management, conflict resolution, avoiding drinking and violent situations, refusal skills for weapon carriage, drinking, binge drinking, and driving or riding under the influence.</p> <p>Each teen interacts with scenarios from these three categories: 1) violence, 2) violence while intoxicated, 3) alcohol.</p>	<p>T: Role-plays and options (parallel to those in C) are discussed. C: Animated video game style. Character situations viewed. Decision points where participant is given opportunity to choose the next action. Participants may “choose” a negative choice (drinking, fighting); these choices are not viewed. Instead, Buddy gives feedback on consequences and how might affect goals. Participant chooses a better option, which is then animated (Data Supplement S1, Images 3 and 4).</p>
Summarized session and closing ~3–5 min	<p>Provide participant with summary of goals, behaviors, reasons to stay away from drinking/fighting.</p> <p>Affirm change talk.</p> <p>Strengthen commitment to change.</p> <p>Support self-efficacy.</p> <p>Review appropriate resources (e.g., mentor, psychological/family services, leisure activities).</p> <p>Begin to think about change plan by identifying one next step in avoiding drinking, fighting, or weapon carriage.</p>	<p>T: Summary to reinforce change talk; support/advice to develop their “plan.” Review community resources with an emphasis on linkage addressing specific risk profile. C: Buddy summary of individual goals and reasons checked to stay away from drinking and fighting; encouraging follow-through with community resources handout.</p>
BI = brief intervention.		

the BI was received (over 95% of participants received their assigned intervention). These analyses used regression modeling using generalized estimating equations (GEE) due to the correlated structure of our data from repeated measures at baseline and 3-month

follow-up. The GEE methodology was introduced by Liang and Zeger⁵³ to properly estimate the regression coefficient and variance of the regression coefficient when correlated data are used in regression analyses (SAS Version 9, particularly PROC GENMOD; SAS

Institute Inc., Cary, NC). This analysis used all data available for participants, including those subjects lost to attrition. Appropriate distributions were used based on the nature and distribution of the response variable (e.g., negative binomial for alcohol self-efficacy, Poisson for other response variables).

Finally, Cohen's effect sizes were calculated for outcomes that were found to be significant as described by Hedges and Olkin.⁵⁴ Based on prior prevention literature, an intervention effect size of ≥ 0.10 was considered clinically meaningful.⁵⁵⁻⁶⁰ This article reports the preliminary findings from the SafERteen study. This larger study is powered on 200 per group to detect behavioral outcomes of self-reported violence and alcohol use at 12 months. The preliminary findings presented here are adequately, but not overpowered, to detect theoretically accepted precursors to behavior change, attitudes, and self-efficacy.

RESULTS

Of the 4,756 patients who presented during the recruitment period, 1,524 were excluded. Of the 3,232 eligible for the study, 86% ($n = 2787$) were approached and 14% ($n = 445$) were missed (Figure 1). The median screen time was 12 minutes (interquartile range [IQR] = 8.8 to 17.6). Only 180 (8%) of the 2,423 adolescents who agreed to be screened required assistance with the computerized screening survey. Comparisons between the screening sample and refusals indicated the groups were similar by sex ($\chi^2 = 2.09$, $p = 0.15$) and race ($\chi^2 = 1.27$, $p = 0.54$). Among the baseline sample (those eligible for randomization to study condition; $n = 533$), 42% were male, 55% were African American, and 6.2% self-identified as Hispanic ethnicity (Table 2), consistent with the city population and pilot work at the site. No adolescents were excluded for being non-English-speaking. The median time for completion of

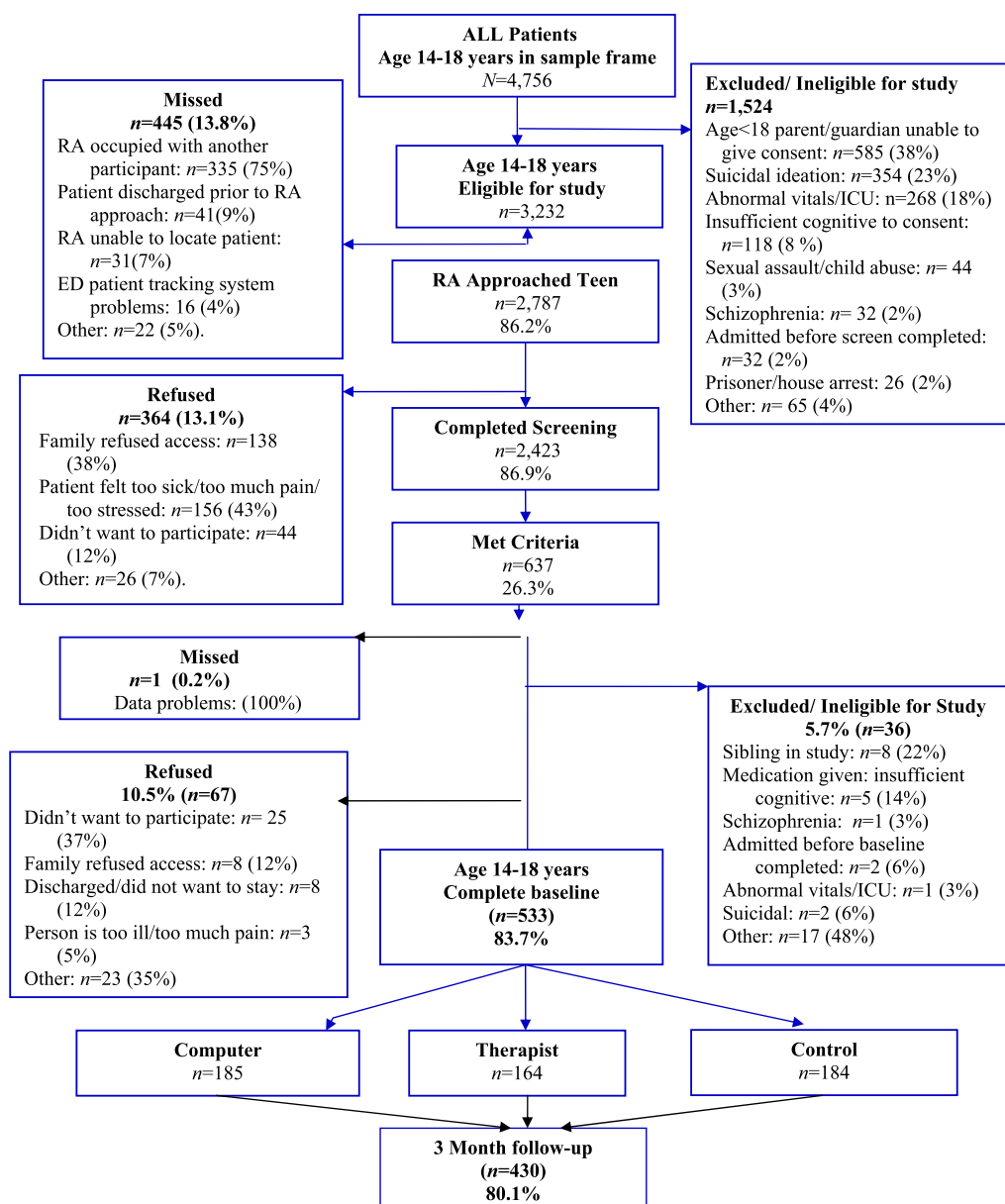


Figure 1. Patient flowchart September 2006 to November 2008. ICU = intensive care unit; RA = research assistant.

Table 2
Baseline Violence and Substance Use Characteristics

Background Characteristics	n (%)
Demographics	
Male	223 (41.8)
African American	293 (55.0)
Caucasian	198 (37.2)
Other race	42 (7.8)
Hispanic ethnicity	33 (6.2)
Mean age, yr (\pm SD)	16.7 (\pm 1.3)
Family receipt of public assistance (yes)	304 (57.0)
Failing grades (some Ds and Fs)*	104 (27.6)
Dropped out of school	52 (9.8)
Live with parent	440 (82.7)
ED characteristics	
Chief complaint injury	161 (30.2)
Chief complaint intentional injury	37 (7.0)
Past-year any ED visit	396 (74.3)
Past-year ED visit for injury	294 (55.1)
Discharged from ED on day of recruitment	508 (95.4)
Pain rating at ED visit \geq 6 (range = 1–10)	351 (65.9)
Past-year substance use characteristics	
Binge drinking (five or more drinks)	280 (52.5)
Screen positive for alcohol misuse CRAFT \geq 2	261 (49.0)
Illicit drug use (yes)	358 (67.2)
Past-year violence/delinquency	
Jail/juvenile detention	79 (14.8)
Serious physical fight	329 (61.7)
Group fighting	199 (37.3)
Gang affiliation (yes)	34 (6.4)
Weapon carriage	258 (48.4)
Violent injury	201 (37.7)
<i>n</i> = 533.	
*Among those in school, <i>n</i> = 377.	

the baseline survey was 31 minutes (IQR = 24.3 to 40.6 minutes).

Among the 349 randomized to interventions, 95% (331) completed the full intervention, and 94% (329) completed the posttest in the ED. Only 22 adolescents (6%) required assistance with the intervention. The median time for the computer BI intervention was 29 minutes (IQR = 26.2 to 34.8 minutes) and for the therapist BI was 37 minutes (IQR = 30.9 to 49.8 minutes). RA staff did not note any negative comments from participants, parents or guardians, or ED staff with regard to the intervention delaying or interfering with routine clinical care. There was no damage by participants, family members, or visitors to the seven laptops used by participants for screening and intervention conditions, nor were there any attempted thefts.

Three-month follow-up assessments were completed with 81% (*n* = 430) of adolescents. Of the 103 patients (19.3% of randomized baseline sample) who did not complete a 3-month follow-up interview, 99 were located and alive but were noncompliant with repeated attempts to complete the 3-month interview. One participant was incarcerated (and we did not have initial IRB approval to conduct interviews with incarcerated participants or have information on alcohol involvement in reason for incarceration), and one patient was involved in a fatal motorcycle crash. Both participants were in the therapist BI group. It is unknown if the participant involved in the crash was intoxicated; however, family report notes that the driver of the other vehicle

in the crash was intoxicated. Two participants were not located at all post-ED visits. Although their status is unknown, a search of the public online death registry databases did not identify them.

Process Measures of Acceptability of Intervention

Immediate posttest evaluation completed by adolescents randomized to the computer or therapist BIs found that 97% of adolescents self-reported that at least one section of the intervention was helpful, and about 80% reported at least one section was "very helpful." The two most well-liked elements of the interventions were reviewing the reasons to change drinking and fighting and role-plays; 30% of adolescents rated these sections "extremely helpful." Half of adolescents participating in the therapist BI condition gave it the highest rating ("liked it a lot"), one-third "liked" it, and 16% rated it "OK." In contrast, one-third (32%) of adolescents participating in the computer BI condition reported that they "liked it a lot," one-third "liked it" (34%), and 30% rated it "OK." Fisher's exact test comparing adolescents' self-report ratings of the intervention found a larger proportion of adolescents in the therapist BI group rated the intervention as "liked it" (score of 4 or more) than the adolescents in the computer BI group ($p < 0.01$).

Pretest and Posttest for Computer and Therapist BIs: Attitudes, Self-Efficacy, and Readiness to Change Alcohol Use and Violence

Paired comparisons between pretest and posttest ratings of attitudes, self-efficacy, and readiness to change for alcohol use and violence were conducted for the computer and therapist BIs. Results showed that both the BIs successfully affected alcohol attitudes ($p < 0.001$) and violence attitudes ($p < 0.001$), including weapon carriage (Table 3). In addition, increased self-efficacy scores related to avoiding fighting ($p < 0.001$) and staying away from alcohol use ($p < 0.001$) were observed in both computer BI and therapist BI conditions. Readiness to change for alcohol and violence were not significant in either BI between pretest and posttest.

Baseline and 3-month RCT Outcomes: Attitudes, Self-efficacy, and Readiness to Change for Alcohol and Violence

Repeated-measures analyses (GEE models) were conducted comparing baseline and 3-month follow-up measures of attitudes, self-efficacy, and readiness to change alcohol use and violence for the BIs (therapist or computerized) compared to the control group. The overall group-by-time interaction effect was significant for alcohol attitudes ($p < 0.001$), violence attitudes ($p < 0.01$) including weapon carriage, and violence self-efficacy ($p < 0.01$; Table 4). Specific group-by-time interaction effects for computer and therapist BIs were also significant for these variables. Those in the computerized BI and therapist BI groups significantly changed their attitudes for alcohol use and violence compared to those in the control group (Table 4, Figures 2 and 3). Further, the therapist and computerized BI groups showed marked increases in self-efficacy for avoiding violence compared to the controls (Figure 4). Although

Table 3
Pretest and Posttest Attitudes, Self-efficacy, and Readiness to Change

Follow-up	Both BIs (<i>n</i> = 329)*	Therapist BI (<i>n</i> = 152)	Computer BI (<i>n</i> = 177)
Alcohol attitudes			
Baseline mean (SD)	2.89 (0.63)	2.90 (0.64)	2.88 (0.62)
Posttest mean (SD)	2.51 (0.66)	2.63 (0.62)	2.40 (0.68)
Difference in mean (SD)	0.38 (0.68)	0.27 (0.60)	0.48 (0.73)
% Change in mean	13.15 [†]	9.31 [‡]	16.67 [§]
Violence attitudes			
Baseline mean (SD)	2.96 (0.79)	3.02 (0.79)	2.94 (0.82)
Posttest mean (SD)	2.40 (0.82)	2.42 (0.79)	2.39 (0.84)
Difference in mean (SD)	0.56 (0.73)	0.60 (0.68)	0.55 (0.77)
% Change in mean	18.92 [§]	19.87 [§]	18.71 [§]
Self-efficacy for alcohol			
Baseline mean (SD)	2.24 (1.21)	2.14 (1.18)	2.25 (1.22)
Posttest mean (SD)	2.47 (1.12)	2.46 (1.16)	2.47 (1.07)
Difference in mean	0.23 (1.04)	0.28 (0.99)	0.18 (1.11)
% Change in mean	10.27 [†]	13.08 [†]	8.00 [‡]
Self-efficacy of fighting			
Baseline mean (SD)	2.37 (0.83)	2.24 (0.79)	2.41 (0.84)
Posttest mean (SD)	2.68 (0.87)	2.65 (0.81)	2.70 (0.92)
Difference in mean	0.31 (0.71)	0.41 (0.70)	0.29 (0.72)
% Change in mean	13.08 [§]	18.30 [§]	12.03 [†]
Readiness for change			
Alcohol			
Baseline mean (SD)	0.91 (0.87)	0.88 (0.87)	0.95 (0.87)
Posttest mean (SD)	0.90 (0.82)	0.99 (0.78)	0.91 (0.84)
Difference in mean (SD)	0.01 (0.79)	0.11 (0.52)	0.04 (0.40)
% Change in mean	1.10	12.5	4.21
Fighting			
Baseline mean (SD)	1.04 (0.86)	1.01 (0.86)	1.03 (0.87)
Posttest mean (SD)	0.95 (0.84)	0.80 (0.80)	0.96 (0.87)
Difference in mean (SD)	0.09 (0.89)	0.09 (0.89)	0.07 (0.88)
% Change in mean	8.65	8.91	6.60

BI = brief intervention.
 *Twenty of 349 (6%) of participants in the intervention groups (computer or therapist) did not complete posttest.
[†]*p* ≤ 0.01
[‡]*p* ≤ 0.05.
[§]*p* < 0.001.

the overall group-by-time interaction effect was not significant for alcohol self-efficacy (*p* = 0.11), the specific therapist BI group by time interaction effect was *p* = 0.05, and the computer BI effect was *p* = 0.08. The therapist BI showed greater increases in alcohol self-efficacy than the control group (Figure 5). Finally, analyses for readiness to change for alcohol and violence were not significant.

DISCUSSION

Intentional injury is the leading cause of death among adolescents seeking care in inner-city EDs. Alcohol use is associated with intentional injury, as well as the other leading causes of death among adolescents (e.g., unintentional injury, suicide).¹² Although adolescents in this study presented to the ED for many reasons, rates of risk behaviors (i.e., 53% binge drinking, 62% serious physical fighting, and 48% carrying a weapon) were elevated compared to national samples, where 26% of adolescents report binge drinking (five or more drinks) in the past month, 36% report being in a physical fight, and 19% report carrying a weapon.⁶¹ This risk profile, along with high rates of injury (37% past-year violent injury) and ED utilization (74% past-year ED visit), in

concert with the reduced likelihood that these teens will receive prevention messages in school settings (38% have dropped out or report failing grades), supports the importance of the ED visit as an opportunity for prevention efforts regardless of reason for visit. Despite this exacerbated risk, the adolescents in this study do not appear to be as far along the problem behavior spectrum as those in other ED-based efforts focusing on assault-injured adolescents,^{7,8,62} and therefore may be responsive to a single BI.

In contrast to research among adult ED samples (for reviews see Havard et al.⁶³ and Nilsen et al.⁶⁴), few studies have examined therapist-delivered BIs for at-risk adolescents in the ED. Adolescents' drinking behaviors and patterns differ from those of adults, which is important in determining BI content.^{50,65} Among older adolescents (>16 years of age) presenting to the ED for alcohol-related reasons, therapist-delivered BIs are feasible and are effective at changing alcohol-related injuries and problems⁹ or alcohol consumption among problem drinkers.⁶⁶ Only one study has examined a computerized delivery of an alcohol prevention program for adolescents in the ED;⁶⁷ this prevention study showed promise among high-risk older adolescents, but was not based on the principles

of motivational interviewing.⁶⁸ Many, but not all, BIs in ED settings have incorporated or adapted principles of motivational interviewing; these approaches are partic-

ularly well suited to adolescents because they emphasize autonomy in making decisions to change and are based on harm reduction principles.^{50,69} BIs^{68,70-75} aim to change attitudes, self-efficacy, and readiness to change, as these variables have been identified as precursors to behavior change.

To date, interventions for youth violence that are brief and limited to the ED visit are lacking and are untested in any format (computer or therapist). Instead, ED or hospital-initiated violence interventions have focused exclusively on adolescents presenting with an assault-related injury, and thus likely further along the problem severity continuum; these interventions have generally been multisession and involved case management.^{7,8,62} Although some researchers have suggested that the ED is not an appropriate setting for youth violence interventions,⁷⁶ it is unknown how screening and BI would be received by adolescents, parents, and medical staff during an ED visit. Finally, there has been no BI for alcohol or violence that involved universal screening regardless of chief complaint.

Our study addresses the issue of the acceptability of ED-based interventions for alcohol and violence among inner city adolescents, regardless of their reasons for seeking ED care. To the best of our knowledge, no prior work has demonstrated that high-risk teens during an ED stay would engage and complete an intervention on the combined topic of alcohol and violence, on the computer or with a therapist. The high participation rates, as well as the data on completion of the intervention, we feel suggest that this type of intervention with both delivery modes is possible in this setting. Although adolescents responded most positively to the therapist BI, the computer BI was also well received. Screening and interventions were feasible, with most adolescents completing the computerized screening and intervention without RA assistance and prior to ED discharge, with little or no impact on clinical care. Taken together, these data support the acceptability and feasibility of universal computerized screening, as well as the concept that interventions that focus on more than one risk factor (i.e., both alcohol and violence), are possible in an inner-city ED.

Table 4
Baseline and 3-month Follow-up Changes in Attitudes, Self-Efficacy, and Stage of Change for Intervention Conditions Compared to Control

	Baseline, Mean (SD)	3 Months, Mean (SD)	Time-by-group Interaction Effect (p-value)	Effect Size*
Alcohol attitudes				
Therapist	2.90 (0.64)	2.69 (0.63)	0.002	0.39
Computer	2.88 (0.62)	2.68 (0.63)	0.0001	0.39
Control	2.89 (0.62)	2.93 (0.69)		
Violence attitudes				
Therapist	3.02 (0.79)	2.80 (0.91)	0.012	0.25
Computer	2.94 (0.82)	2.74 (0.86)	0.007	0.22
Control	2.93 (0.76)	2.89 (0.77)		
Self-efficacy for alcohol				
Therapist	2.14 (1.18)	2.51 (1.32)	0.050	0.20
Computer	2.25 (1.22)	2.49 (1.35)	0.083	
Control	2.32 (1.21)	2.38 (1.34)		
Self-efficacy for fighting				
Therapist	2.24 (0.79)	2.51 (0.87)	0.041	0.22
Computer	2.41 (0.84)	2.73 (0.83)	0.002	0.31
Control	2.44 (0.85)	2.53 (0.84)		
Readiness to change				
Alcohol				
Therapist	1.88 (0.87)	1.89 (0.89)	0.4945	
Computer	1.95 (0.89)	1.83 (0.86)	0.6843	
Control	1.92 (0.86)	1.87 (0.92)		
Fighting				
Therapist	1.01 (0.86)	1.03 (0.93)	0.5803	
Computer	1.03 (0.87)	0.91 (0.89)	0.5798	
Control	1.07 (0.87)	1.01 (0.88)		

n = 409. The group-by-time interaction effect is presented, which tests the significance of change over time in scores, accounting for potential baseline group differences. Attitudes = decreased mean represents successful change in attitudes; self-efficacy = improved mean score represents increased confidence in avoiding fights and avoiding drinking.
*Noted only for outcomes with significant change.

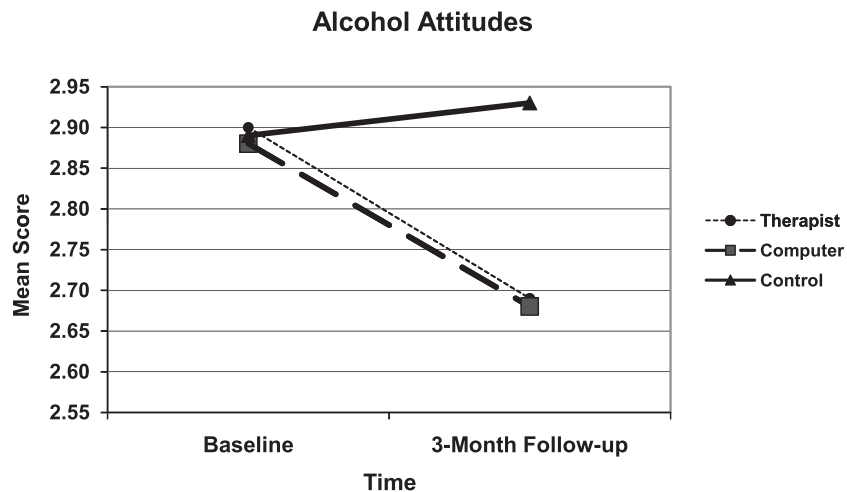


Figure 2. Change in mean scores for alcohol attitudes from baseline to 3 months. Decreased mean represents successful change in attitudes.

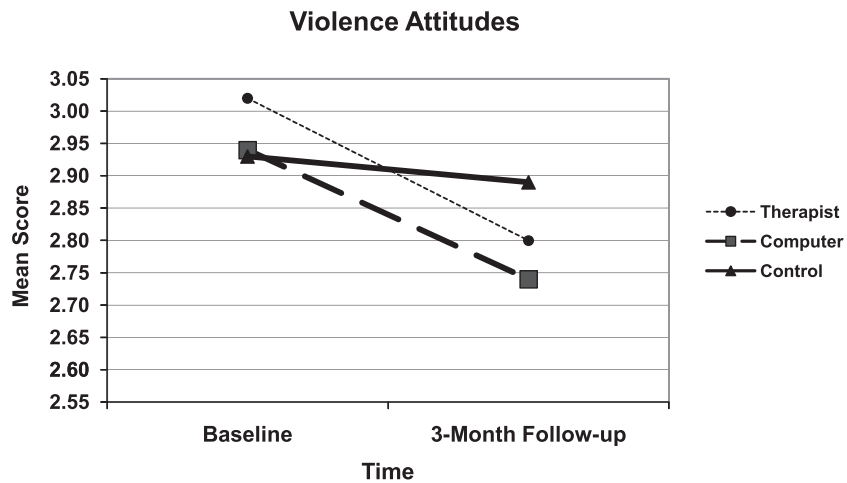


Figure 3. Change in mean scores for violence attitudes from baseline to 3 months. Decreased mean represents successful change in attitudes.

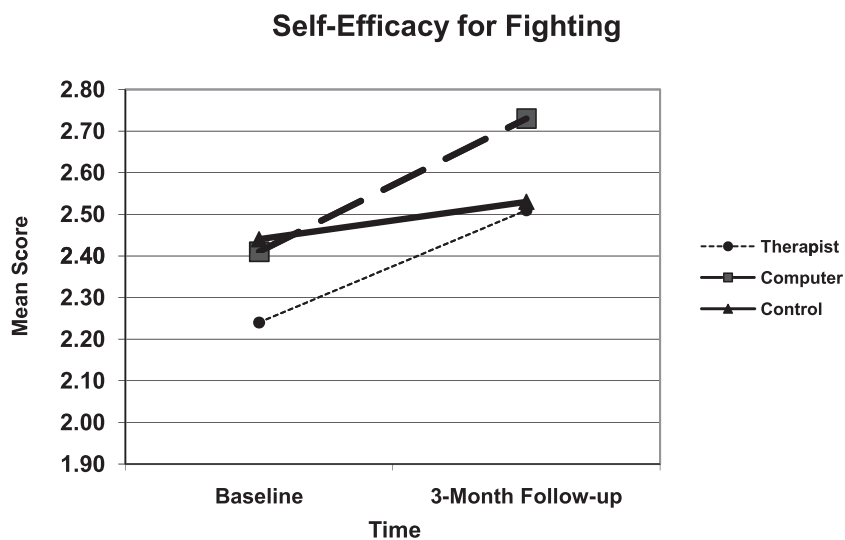


Figure 4. Change in mean scores for self-efficacy regarding fighting from baseline to 3 months. Increased mean score represents increased confidence in avoiding fights.



Figure 5. Change in mean scores for self-efficacy regarding alcohol use from baseline to 3 months. Increased mean score represents increased confidence in avoiding drinking.

Understanding the appeal that BIs have developmentally with adolescents, it should be noted that the sections “Reviewing the reasons to change drinking and fighting” and “Role-plays” were the most well “liked” elements of the interventions, with 30% of adolescents rating both these sections “extremely helpful.” A recent study determined that the motivational interviewing component (i.e., decisional balance—an examination of costs of staying the same and the benefits/reasons for change) of an alcohol BI was more effective than personalized feedback alone among young adults (ages 18–24 years) in the ED.⁷⁷

Given the lack of current knowledge of BI for multiple risk behaviors among adolescents, particularly for behaviors as seemingly complex as alcohol and violence, initial outcomes of the SafERteens intervention, a motivational interviewing based BI, show promise. Analyses comparing therapist BI and computer BI groups with the control group show significant positive changes in alcohol and violence attitudes and self-efficacy for avoiding fighting at 3-month follow-up. In addition, improved self-efficacy for avoiding alcohol use was observed in the therapist BI. Although modest, the effect size demonstrated by these single session BIs is comparable to the range noted in recent prevention literature for both attitudes and behavioral outcomes (effect size 0.10–0.36)^{55–60,73} and to that noted in a prior ED-based alcohol BI study of adolescents for alcohol-related problems (effect size 0.23).⁹ Although the present study focused on attitudes and self-efficacy as primary outcomes, prior ED studies demonstrate that alcohol self-efficacy is associated with drinking levels over time.^{70,79,80} Similarly, school-based studies^{47,81} show that alcohol attitudes and self-efficacy are related to future alcohol use and that violence attitudes and self-efficacy are related to violent behavior.⁸²

Although theoretically BIs should increase readiness to change related to alcohol use,⁶⁸ research demonstrating the moderating impact of BIs on readiness to change is generally lacking in the literature,^{79,80,83} particularly for adolescents.⁷⁰ In our study, the null findings for readiness to change may be explained by the study’s prevention focus, which was reflected in the low level of alcohol consumption required for study eligibility or by the single Likert item used to assess this concept. For instance, many participants reporting drinking no alcohol during 3-month follow-up indicated that they were in the “precontemplation” stage of change (i.e., never think about my drinking). To our knowledge, no prior studies have examined the construct of readiness to change for violence. Thus, our lack of findings may reflect inappropriate application of the readiness to change concept toward violence or reflect potential limitations in our single assessment item.

The intervention results presented here are novel for several reasons. First, the intervention addressed two related but distinct behaviors, alcohol use and violence, with initial positive findings for attitudes and self-efficacy of both behaviors. The novelty of delivering BIs targeting multiple risk behaviors is analogous to where research on BIs for alcohol problems was 20 years ago. Previously, selective prevention for adolescents’ risky

drinking was noticeably lacking in the alcohol field, mostly consisting of school-based multisession prevention programs or community-based health promotion campaigns. It was often assumed that intervention effectiveness was directly related to dose. BIs for reducing alcohol use and consequences among adults have been found to be as effective as more extensive multisession treatment.^{84–87} This study is also the first to evaluate the effect of a single session BI for violence in the ED. Prior ED-based BIs, using nonmotivational interviewing approaches for violence, have provided adolescents with tours of ED trauma units^{88,89} or taped interviews with victims of violence.⁹⁰ One potential advantage of individual over group approaches is that interventions designed to reduce delinquency and other problem behaviors can actually increase these problems when at-risk adolescents are grouped together.⁹¹

Data from this study demonstrating initial positive findings for the computer intervention are novel. In addition, the findings presented here were very similar for both therapist and computer conditions. If future analyses demonstrate effectiveness at changing behaviors, computerized BIs could have enormous potential for widespread dissemination with minimal ED staff or therapist time. Only one prior study has examined an alcohol intervention delivered completely by a computer in the ED.⁶⁷ Further, in the present study, the therapist condition utilized a computer in a novel, interactive way, adding structure and standardizing the therapist condition to inherently increase fidelity, without fully scripting the therapist intervention. Although others have recommended the use of highly structured BIs, using workbooks and/or other means (e.g., computers) to standardize content and delivery and prompt trained staff,^{84,92} few ED trials have used these methods. Using a computer to standardize the structure of a therapist BI is a feasible delivery strategy that could be applied to ED-based BIs for other content areas and age ranges.

LIMITATIONS

Although attitudes, self-efficacy, and readiness to change are important markers of initial and immediate intervention effects, the more compelling test of intervention effectiveness on behavior change will be evaluated upon completion of the SafERteens RCT, including 12-month outcomes. This evaluation of the intervention has been conducted within the parameters of a research protocol, and further research will be needed to understand if and how to best translate findings to clinical practice without the research protocol framework, if ongoing evaluations are positive. Because adolescents presenting with acute suicidal ideation, attempt, and sexual assault, and those seeking care on the overnight shift were excluded from the study, findings do not generalize to these patients. In addition, our sample reflected the composition of the study ED; future studies are needed to examine effects with other samples, including Hispanic adolescents. Although behaviors assessed in this study were obtained via self-report, recent reviews have concluded that self-report of risk behaviors (e.g., alcohol, tobacco, drug use, and

violence) among adolescents and young adults demonstrate good reliability and validity,⁹³⁻⁹⁷ and adolescents and young adults are more likely to report risky behaviors using computerized surveys and when privacy/confidentiality is assured, as was done in this study, which had an NIH Certificate of Confidentiality.^{28,97-100} Replication is required given that our full assessment contained questions from several separate previously validated instruments. Finally, although a strength of this study is its focus on an inner-city ED, a logical focus for violence prevention initiatives, the findings may not generalize to suburban or rural EDs.

CONCLUSIONS

This study demonstrates that computerized screening and delivery of a single session brief intervention for alcohol and violence to adolescents in the ED is feasible and well received, regardless of delivery mechanism (therapist or computer). The SafERteens interventions utilized technology to tailor the interventions to the specific risk factors of the adolescent and found significant effects at posttest and 3 months following the ED visit in attitudes and self-efficacy related to alcohol and violence, with effect sizes comparable to prior successful interventions. These preliminary results of the SafERteens intervention, in both the computer and the therapist situations, show the potential of technology to aid in the cost-effective delivery of health interventions in busy clinical settings. Future analyses will evaluate the effectiveness of the SafERteen intervention on behavior change at 3, 6, and 12 months.

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Supporting Information

The following supporting information is available in the online version of this paper:

Data Supplement S1. Examples of intervention content.

The document is in PDF format.

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