**Title:** Brief Emergency Department Interventions for Youth Who Use Alcohol and Other Drugs: A Systematic Review

**Authors:** Amanda S. Newton, PhD[1,2], Kathryn Dong, MD, MSc, FRCP(C)[3], Neelam Mabood, MD[1], Nicole Ata, MD[1], Samina Ali, MDCM, FRCP(C), FAAP[1], Rebecca Gokiert, PhD[4], Ben Vandermeer, MSc[5], Lisa Tjosvold, MLIS[5], Lisa Hartling, PhD[1,5], T. Cameron Wild, PhD[2,6]

[1] Department of Pediatrics, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada
[2] Department of Psychiatry, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada
[3] Department of Emergency Medicine, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada
[4] Community-University Partnership for the Study of Children, Youth, and Families, Faculty of Extension, University of Alberta, Edmonton, Alberta, Canada
[5] Alberta Research Centre for Health Evidence, Department of Pediatrics, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada
[6] School of Public Health, University of Alberta, Edmonton, Alberta, Canada

**Footnote:** Nicole Ata is currently with the School of Public Health, University of Alberta, Edmonton, Alberta, Canada; Lisa Tjosvold is currently with the John W. Scott Health Sciences Library, University of Alberta, Edmonton, Canada

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**Author Correspondence:**
Amanda S. Newton
Department of Pediatrics, University of Alberta
Edmonton Clinic Health Academy (ECHA)
11405 – 87 Avenue
Edmonton, Alberta, Canada T6G 1C9
Tel: +1-780-407-2018
E-mail: mandi.newton@ualberta.ca

**Short Title:** Brief Interventions for Youth Who Use Alcohol and Other Drugs

**List of Abbreviations**

| | |
|---|---|
| ADQ | Adolescent Drinking Questionnaire |
| AIC | Adolescent Injury Checklist |
| Amidx | Alcohol Misuse Index |
| AOD | alcohol and other drug |
| AUDIT-C | Alcohol Use Disorders Identification Test – Consumption subscale |
| BI | brief intervention |
| CI | confidence interval |
| DSM | Diagnostic and Statistical Manuals |
| ED | emergency department |
| MCII | minimal clinically important improvement |
| MI | motivational interviewing |
| POSIT | Problem Oriented Screening Instrument for Teenagers |
| RCT | randomized controlled trial |
| RR | risk ratio |
| OR | odds ratio |
| SBIRT | Screening, Brief Intervention, and Referral to Treatment |
| TLFB | Timeline Followback calendar |

**Contributors Statement**

Dr. Newton had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
*Study concept and design*: Newton, Ali, Dong, Wild, Hartling, Gokiert
*Acquisition of data*: Newton, Ata, Mabood
*Analysis and interpretation of data*: Vandermeer, Newton, Dong, Ali, Wild, Hartling, Gokiert
*Drafting of the manuscript*: Newton, Dong, Mabood, Ata, Ali
*Critical revision of the manuscript for important intellectual content*: Dong, Ali, Vandermeer, Hartling, Wild, Gokiert, Newton
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## Abstract

**Objective:** Brief intervention (BI) is recommended for use with youth who use alcohol and other drugs. Emergency departments (EDs) can provide BIs at a time directly linked to harmful and hazardous use. The objective of this systematic review was to determine the effectiveness of ED-based BIs.

**Methods:** We searched fourteen electronic databases, a clinical trial registry, conference proceedings, and study references. We included randomized controlled trials (RCTs) with youth ≤21 years old. Two reviewers independently selected studies and assessed methodological quality. One reviewer extracted, and a second verified, data. We summarized findings qualitatively.

**Results:** Two trials with low risk of bias, 2 trials with unclear risk of bias, and 5 trials with high risk of bias were included. Trials evaluated targeted BIs for alcohol-positive (n=3) and alcohol/other drug-positive youth (n=1) and universal BIs for youth reporting recent alcohol (n=4) or cannabis use (n=1). Few differences were found in favor of ED-based BIs and variation in outcome measurement and poor study quality precluded firm conclusions for many comparisons. Universal and targeted BIs did not significantly reduce alcohol use more than other care. In one targeted BI trial with high risk of bias, motivational interviewing (MI) that involved parents reduced drinking quantity per occasion and high volume alcohol use compared to MI that was delivered to youth only. Another trial with high risk of bias reported an increase in abstinence and reduction in physical altercations when youth received peer-delivered universal MI for cannabis use. In 2 trials with unclear risk of bias, MI reduced drinking and driving and alcohol-related injuries after the ED visit. Computer-based MI delivered universally in 1 trial with low risk of bias reduced alcohol-related consequences 6 months after the ED visit.

**Conclusions:** Clear benefits of using ED-based BI to reduce alcohol and other drug use and associated injuries or high-risk behaviours remain inconclusive because of variation in assessing outcomes and poor study quality.

## Introduction

Alcohol and other drug use typically initiates and escalates during adolescence and peaks during early adulthood.[1] Harmful and hazardous use by youth has become a worldwide public health problem. Problematic use occurs across a broad spectrum that includes hazardous (use that increases the risk of harmful consequences to the user) and harmful drinking (use that results in physical, social, or psychological harms).[2-4] By grade 12, up to 57% of North American youth report having consumed 5 or more drinks on one occasion with intoxication as a likely result.[5-6] Use of other drugs including cannabis, cocaine, amphetamines, and ecstasy are typically initiated between the ages of 13 and 14 years,[5] and may be used throughout adolescence.[6] It is well known harmful and hazardous use of alcohol and other drugs during childhood and adolescence can lead to adult substance use disorders[7-15] and persistent dysfunction.[16] While many youth will experiment with alcohol and other drugs during adolescence, stopping or using occasionally without significant problems, other youth have a higher risk profile for later abuse and dependence,[17-20] and can experience significant morbidity and mortality.[21-30]

Youth who engage in harmful and hazardous drinking respond favourably to treatment.[31] A recent meta-analysis of adult studies indicated that treatment for 1 drug (e.g., cannabis only) is more effective that treatment compared for polysubstance use.[32] This suggests that earlier intervention (when youth are only using 1 substance) is important. The public health approach to early identification and management of hazardous and harmful alcohol and other drug use with

SBIRT—Screening, Brief Intervention, and Referral to Treatment—is internationally advocated for all age groups.[33-34] In this intervention model, brief interventions (BIs) are time limited efforts (1 or 2 contacts) that follow screening for hazardous and harmful behaviors. The type of BI and setting for delivery for youth has received some discussion, but it is not extensive. In 2010, the American Academy of Pediatrics (AAP) recommended pediatricians use BIs with youth who use alcohol in a harmful or hazardous manner, but who do not meet criteria for immediate referral to treatment.[35] In their recommendation, the AAP stated that motivational interviewing (MI), one of the most promising BI approaches, was ideally placed for primary care in an office-based setting, and that more research was needed to further develop different BI approaches for youth.[35] A discussion of other potential settings for BI delivery by pediatricians was absent from the AAP recommendation. The general consensus regarding youth-oriented BIs is that while some studies have demonstrated a promising impact on reducing alcohol misuse and related morbidities, intervention efficacy has not been reliably established for alcohol use and broader evaluation with other drug use including cannabis is needed.[36-40] Where a BI is delivered, however, may be a critical factor for intervention effect.

Unanticipated treatment for morbidities associated with harmful and hazardous alcohol and other drug use is often sought by youth in emergency departments (EDs).[41-42]As many youth may not recognize their use as being problematic,[43] may not know where to seek assistance,[44] or may be embarrassed to ask for help,[45] the ED visit may offer a pivotal opportunity to provide a BI at a time directly coupled to the consequences of high risk behaviors (e.g., injury), which may enhance its effect. Further, ED-based BIs can fill a health care services gap for youth who do not have access to regular health care including a primary care physician where BIs are traditionally offered. This review synthesizes evidence of the effect of ED-based BI compared to standard or

other care in reducing harmful and hazardous alcohol and other drug use and associated morbidities in youth.

## Methods

We conducted this systematic review in accordance with the PRISMA Statement (www.prisma-statement.org) for reporting systematic reviews.

### Search Strategies

The original search was conducted in January 2008 and was last updated in April 2011. We implemented systematic search strategies using language (English and French) and year (database inception up to April 2011) restrictions. This review was part of a series of reviews aimed at examining available evidence for pediatric emergency mental health care;[46-48] therefore, we initially adopted a much broader search strategy to identify all relevant ED-based mental health studies for different review objectives. After the initial search, we employed more focused screening strategies to identify primary studies relevant for this review's objective. We searched 14 electronic databases: MEDLINE®, Ovid MEDLINE® In-Process & Other Non-Indexed Citations, EMBASE, Cochrane Central Register of Controlled Trials, OVID HealthStar, Cochrane Database of Systematic Reviews, Health Technology Assessment Database, Database of Abstracts of Reviews of Effects, ACP Journal Club, PsycINFO®, CINAHL®, SocIndex, ProQuest Theses and Dissertations, and Child Welfare Information Gateway. To identify unpublished studies and studies-in-progress, we searched ClinicalTrials.gov and contacted authors. We also reviewed reference lists, key journals (e.g., *Annals of Emergency Medicine*, *Pediatrics*), and conference proceedings (e.g., Society for Academic Emergency Medicine, American College of Emergency Physicians).

Because of diagnostic changes between the Diagnostic and Statistical Manuals (DSM) from 1980 (DSM-III) to 1987 (DSM-III-R) in classifying harmful and hazardous substance use (drug abuse, substance abuse, substance dependence), we made an *a priori* decision to exclude studies published prior to 1985. The final MEDLINE® strategy for the last search strategy update conducted April 8, 2011 is provided (Supplementary File); strategies for other databases are available from the corresponding author.

**Study Selection**

The search results were screened independently by 2 reviewers (NA, NM). The full manuscripts of potentially relevant studies were retrieved if screened as relevant by at least 1 of the reviewers; these manuscripts were later independently confirmed for inclusion or exclusion by 2 of 3 reviewers (NM, NA, ASN). We included studies if they were randomized controlled trials (RCTs) that assessed the effect of BIs aimed at improving outcomes related to harmful and hazardous alcohol and other drug use and associated morbidities in patients ≤19 years. We made a post-hoc decision to include studies that predominantly included our age range (indicated by reported mean age), but extended into early adulthood (up to 21 years), given that the study authors had deemed the intervention to be appropriate for younger and older youth. No restrictions were placed on comparison interventions (control groups), but studies had to report a main treatment outcome related to harmful and hazardous use (e.g., injuries or high-risk behavior, frequency of use).

**Assessment of Quality**

Methodological quality was assessed by 3 reviewers (NM, NA, MH). Disagreements were resolved through discussion and consensus with a fourth reviewer (ASN). For studies with multiple publications, the quality assessment was conducted for the publication reporting the

original trial or most complete data set. RCTs were assessed for risk of bias in 6 domains: sequence generation, allocation concealment, blinding, completeness of outcome data, outcome reporting, and other sources of bias.[49] An overall assessment of risk of bias was made for each study (high, low, or unclear risk of bias).

### Data Extraction

Data were extracted using a standardized form that assessed key study characteristics (e.g., language of publication, country), characteristics of the study population, intervention components, primary and secondary outcome measures, and results. Data were extracted by 1 reviewer (NM) and checked for accuracy and completeness by a second reviewer (ASN). Discrepancies were resolved by consensus.

### Data Synthesis

Heterogeneity in study interventions, clinical populations, and outcomes as well as study quality (based on risk of bias assessment) precluded meta-analysis. We report effect estimates for study outcomes (unadjusted risk ratio [RR] or odds ratio [OR]) with a 95% confidence interval (CI) and present a qualitative summary of study findings. When study data were not available for independent calculations, we reported the published tests of significance from the original study.

## Results

### Description of Included Studies

Figure 1 describes the flow of studies through the selection process. The search strategies identified 2,359 individual studies for the review. Of these studies, 131 were identified as potentially relevant through abstract screening, with 9 RCTs[50-58] meeting our inclusion criteria after full-text review. Three trials had multiple publications[59-61] and data are presented from one publication.[60] Data from the other two publications were already captured the dataset from one

study[51,61] and were outside of the scope of the review.[59] Reviewer agreement on study inclusion after full-text review was substantial ($\kappa$=0.78).

General characteristics of the 9 RCTs are outlined in Table 1. The trials, published between 1999 and 2011, were conducted in the USA (n=8) and Australia (n=1). Study populations generally included comparable numbers of male and female participants (range, 34 to 67% male) and age ranged from 12 to 21 years. Two intervention approaches were represented across the studies: a targeted approach (BIs for alcohol-positive youth) was used by 4 studies,[50,55-56,58] and a universal approach (BIs for youth with a recent history of alcohol or other drug use) was used by 5 studies.[51-54,57]

**Methodological Quality**

As summarized in Table 1, the risk of bias was low for 2 RCTs,[51,54] unclear for 2 RCTs,[56,58] and high for 5 RCTs.[50,52-53,55,57] Studies with an unclear risk of bias were unclear in their reporting of sequence generation and allocation concealment,[56,58] and did not clearly address incomplete outcome data reporting.[58] Studies with a high risk of bias did not blind study personnel involved in data collection,[55] had missing outcome data,[50,52-53,55,57] were unclear in their use of selective outcome reporting,[57] and had other sources of bias.[52] One high risk study was unclear in its description of randomization procedures,[50] and 2 high risk studies were unclear in their description of blinding procedures.[52-53]

**Characteristics of ED-based Brief Interventions**

Table 2 illustrates the heterogeneity in the therapeutic approaches/principles that guided the BI content and delivery. Seven studies[50-53,56-58] used MI, which emphasizes developing a discrepancy between current behavior and future goals.[62-63] Across all studies, the majority included the following MI techniques: (1) a review of motivations for alcohol/other drug use,

related consequences, and personal responsibilities; (2) personalized normative assessment feedback (PAF) that targeted norm misperceptions (e.g., PAF summarized a youth's alcohol/drug use in comparison to the average male or female in the general population); (3) discussion of behavior change that considered ambivalence, readiness for future changes, and personal goal setting; (4) a decisional balance exercise that considered the pros and cons of intended decisions/goals; and (5) information on treatment programs and a referral for treatment. In these studies, MI was primarily delivered one-on-one (youth + intervention deliverer) with the exception of 1 trial that included parental involvement[50] and another that included computer delivery.[51] Intervention deliverers were study-employed therapists (3 studies[50-51,57]), computers (2 studies[51,54]) peer educators (2 studies[52-53]), and research team members (3 studies[55-56,58]). One study described using several MI techniques, but did not refer to BI as MI-based.[55] The final study[54] used social learning theory to guide a computer-based BI, which focused on learning within a social context with peers (i.e., that youth will learn from one another including behavior imitation and modeling).[64]

Comparison (control) groups varied between the studies. Three studies provided an information handout and list of community resources[52-53,58] while one study provided a handout on community resources only.[51] One study compared one-on-one MI (control group) to one-on-one MI followed by a family-based MI 'check-up' (intervention group).[50] Another study provided brief (5 minute) advice (termed standard care) to youth in the control group.[56] Other studies did not describe their comparison intervention beyond stating it was standard medical care.[54-55,57] Outcome measurement also varied substantially across studies. Intervention effects are presented according to outcome and BI approach (targeted or universal) in Tables 3 and 4.

**The Impact of ED-based Brief Interventions on Alcohol and Other Drug Use**

Targeted BIs had a mixed impact on alcohol and other drug use. Both MI and standard care in one trial with unclear risk of bias were favored at different time points across outcomes, but group differences were not statistically significant (Table 3).[56] In another trial with unclear risk of bias, youth who received MI reported greater reductions in alcohol use relative to youth who received a handout with a list of community services, but group differences were not statistically significant and data were unavailable for independent calculations.[58] In one trial with high risk of bias, data were combined for youth who received a BI and standard care depending on whether the youth attended a post-ED community service ('treated' group) or not ('untreated' group). 'Treated' youth reported a greater change in alcohol consumption from hazardous to 'safe' consumption levels and less injecting drug use, but group differences were not statistically significant. Report of any drug use (composite drug score) was significantly less for 'treated' youth (Table 3).[55] In a comparison of family- and youth-based MI, family-based MI significantly reduced the quantity of alcohol consumption after the ED visit up to 6 months, while high-volume drinking was found to be significantly reduced at 12 months post-ED for youth who received individual (youth-based) MI versus family-based MI (Table 3).[50] This trial had unclear risk of bias.

Universal BIs had a mixed impact on alcohol and cannabis use. MI, standard medical care, and handouts were favored at different time points across outcomes,[51-54,57] but group differences were not statistically significant (Table 3). One trial with high risk of bias reported a higher likelihood of abstaining from cannabis, for youth with a history of use, when they received MI that included a treatment referral and follow-up phone call, compared to youth who received an handout with list of community-based services (RR at 3 months=1.12; 95% CI, 0.41–3.09; RR at 6 months=2.05; 95% CI, 1.13–3.70).[53]

Subgroup analyses comparing high-risk youth (those who reported alcohol misuse at baseline) to youth not meeting a clinical standard of problematic use were published for several studies. Trends were observed in the high-risk groups with treatment favored for reducing the frequency of drinking,[56] high-volume drinking days,[56] and the maximum number of alcohol-based drinks per day.[52] Conversely, in 1 study with high risk of bias, youth identified as low-risk were more likely to attempt to cut back or try to quit drinking.[52] Maio *et al.* suggested that a universal BI may have an effect on alcohol misuse and binge drinking among a small subset of patients who reported previous drinking and driving behaviors.[54]

**The Impact of ED-based Brief Interventions on Consequences Related to Alcohol and Drug Use**

Targeted MI in two trials with unclear risk of bias significantly reduced alcohol-related injuries up to 6 months following the ED visit, compared to brief advice[56] or handout[58] (Table 4). One of the trials also reported a greater reduction in drinking and driving up to 6 months post-ED discharge[58] (Table 4).

Compared to youth who received standard care or a handout, youth who received a universal BI generally reported greater reductions in alcohol- and cannabis-related consequences including injury, driving after drinking, riding with an impaired driver, and unplanned intercourse, but the differences were not statistically significant (Table 4). Youth who received a handout in one universal study with a high risk of bias reported a greater reduction in unprotected intercourse and driving after drinking compared to those youth who received MI,[52] but group differences were not statistically significant. In a trial with low risk of bias, the likelihood of a consequence related to alcohol was significantly reduced up to 6 months after ED discharge for youth who received universally-indicated MI consisting of a computer or computer

plus therapist compared to youth who received a handout of community-based services (computer OR=0.57; 95% CI, 0.34–0.95; computer plus therapist OR=0.56; 95% CI, 0.34–0.91).[51] In one trial with a high risk of bias, youth who received universally-indicated MI for cannabis misuse reported fewer physical altercations 12 months following the ED visit than those who received a handout with list of community-based services (OR=0.26; 95% CI, 0.08–0.81)[53] (Table 4).

**The Impact of Brief Interventions on Health Care Use**

One targeted BI study with high risk of bias reported positive BI effects on youth adherence with post-ED discharge follow-up services[55] and time to alcohol and other drug-related hospital events.[60] Tait *et al.* reported an increased likelihood of post-ED treatment adherence with youth who received a targeted BI that included a 'wrap-around service' with referral to and appointments made with a community-based treatment agency (RR=8.37; 95% CI, 2.00–35.13), when compared to standard ED care. They also reported a longer time to an alcohol and other drug-related hospital event following discharge, although the difference was not statistically significant.[60]

## Discussion

Current evidence regarding the use of BIs with youth who visit the ED for alcohol and other drug related events is mixed and limited by variation in outcome reporting and study quality. Of the nine trials included in this review, only one with a low risk of study bias reported that universal MI delivered by a computer with or without one-on-one support from a social worker reduced alcohol-related consequences at 6 months following an ED visit.[51] This effect, however, was not observed 3 months after the visit and further clarification is needed as to whether this latent effect is solely due to ED-based MI and not, for example, an unidentified co-

invention in the period following the ED (e.g., peer influence, school-based program, etc.). The positive effects of targeted and universal MI reported in lower quality studies (unclear or high risk of study bias) included increased abstinence from cannabis and reduced alcohol-related sequelae including injury, drinking and driving, and physical altercations, in the period that followed an ED visit. While these findings provide initial support for ED-based BI for consequences related to high-risk behaviors, higher quality studies are needed to confirm these results, and further investigation is required to understand whether there is a clear advantage to using targeted or universal BIs. Given the different cost implications for both approaches (training and staffing), such investigations are essential.

Across all studies in this review, most youth reduced alcohol use, regardless of the form of care. While greater reductions for at least one form of use (e.g., frequency of use, amount of binge drinking) were shown for universal and targeted BIs, differences compared to control groups were not statistically significant. A number of study design elements identified by this review, however, potentially confound this body of statistically non-significant findings and make firm conclusions difficult to establish. For example, studies used active comparison groups, thereby reducing the likelihood of observing a significant difference between groups. Only 2 studies evaluated the control group participants' reactivity to research processes,[52-53] a measure that helps account for changes in control group conditions.[65-67] The wide range of statistical uncertainty in reported confidence intervals suggests that studies may have been inadequately powered to detect small differences in behavior change. One study reported intention-to-treat analysis,[51] which should be a necessity for future studies; the majority of studies in this review reported data with greater than 10% drop-out rates. Because it is unclear whether those youth lost to follow-up were more or less likely to consume alcohol or other

drugs, these studies might have had substantially different results had all participants been accounted for. Despite these methodological limitations, the possibility of reduction in harmful and hazardous alcohol and other drug use after BI represents an essential issue for this field of study.

Whether the observed reductions in alcohol and other drug use after a brief universal or targeted intervention should be considered clinically significant cannot be determined at this time. A minimal clinically important improvement (MCII) has not been proposed for ED-based BIs, thus limiting the interpretation and application of the alcohol and other drug use change scores in the trials. The MCII represents the minimum change that would be considered meaningful from the clinician's perspective such that he/she would consider a BI worthwhile to provide in the ED compared to standard practice.[69] With the establishment of this value, the findings from this review may take on new meaning; conclusions based on whether statistically significant differences exist between the intervention and comparison groups may shift to include whether clinically meaningful differences exist between the groups to justify further evaluation of BIs in the ED.

In this review, MI (either targeted or universal) that used, at minimum, goal setting, PAF, and treatment referrals increased cannabis abstinence and reduced alcohol-related injury, drinking and driving, and physical altercations.[51,53,56,58] To enable stronger clinical conclusions, systematic research across multiple settings is necessary to identify for whom ED-based MI works best, which intervention components have the most positive influence on behavior change, and which outcome measures are most clinically relevant. This will involve: (1) minimizing the design biases identified in this review to ensure main effects are not obscured by confounds, (2)

clarifying the elements of MI to be provided in the ED and appropriate outcomes that should result, and (3) standardizing outcome measurement and measurement time points.

We identified several other methodological issues that pervaded the studies reporting significant findings; these issues can be avoided in future study designs and published reports. Biases introduced by inadequate allocation concealment or unclear blinding procedures are easily addressed, and can reduce the chance of inaccurately estimating BI impact. Ensuring that data for all study outcomes are reported and missing outcome data are accounted for will reduce similar biases in future studies and ensures trials are in accordance with the CONSORT Statement.[69]

Given the variations in treatment effect across studies and time-points, future studies should also conceptualize how and for whom universal and/or targeted MI is effective. Vulnerability and exposure to peer behaviors and personal alcohol and other drug use changes throughout adolescence and young adulthood.[52] Studies appropriately powered to test the impact of these variables may help to explain effect differences across treatment approaches and patient subgroups as well as intervention attrition rates observed in this review. The question also arises as to whether younger youth are developmentally capable of benefiting from specific motivational techniques such as PAF or goal setting compared to middle and older youth. While Tevyaw and Monti[37] have suggested that benefits can be realized by younger youth, this position requires more investigation. Additional ED studies to address methodological flaws in current studies and 'process evaluations' to determine the effectiveness of individual MI elements (such as the impact of PAF or goal setting) and delivery methods (e.g., computer, peer educator) are necessary before firm conclusions on the impact of MI can be drawn. For example, studies with large enough samples to stratify by age group may reveal that goal setting is less effective with

younger and middle youth. Further, studies may find that older youth respond better to peer educators *versus* adult health care providers, or those youth who still rely on parents for decision-making find difficulty in implementing youth-oriented goals (e.g., "reduce my drinking to Saturday only" versus "abstinence from drinking").

The lack of consistency in studies' outcomes suggests that consensus is required on which outcomes are appropriate for youth, and how and when these variables should be measured. A single measure of alcohol misuse is unlikely to satisfy all research objectives,[70] but consensus on which outcomes are the most validly and reliably reported by youth is important. A review of instrument performance to determine which measures yield valid and reliable data will improve standardization across studies, promoting inter-study comparisons and meta-analytic work. Bernstein's recent report of significant differences between treatment groups on efforts to change (i.e., quit attempts), but not for reductions in alcohol consumption or associated high-risk behaviors,[52] highlights a need to reconsider which clinical outcomes are appropriate for ED-based care. 'Attempts to change' may precede sustained behavior change and may be a more appropriate outcome post-ED discharge (at 1 and 3 months) whereas sustained behavior changes (outcomes measured beyond 3 months) may be best evaluated by community-based interventions that follow ED care for AOD misuse. In trials that are measuring outcomes up to 1 year post-ED discharge, it is likely that co-intervention bias (e.g., repeat ED visits, community- or school-based supports) is present, which calls into question whether the studies are reporting true intervention effects.

## Limitations of the Study

The limitations of this systematic review stem from the included studies. Heterogeneity in study participants, interventions, methods of outcome assessment, and active comparison groups

limited comprehensive between-study comparisons. A coordinated research effort to standardize these components is needed. Multiple forms of bias present in the included studies (lack of intention to treat analyses, selective outcome reporting and unclear patient allocation) may have significantly affected the reported results and thus this meta-analysis. The studies in this review also relied on youth self-report of alcohol and other drug use and associated consequences. While a recent study concluded that self-report of use is a valid measurement approach for ED patients,[71] one that is preferred to objective measures such as blood tests and not moderated by patient age, measurement well after the ED visit may introduce recall bias.

## Conclusions

Based on current evidence, clear benefits of using ED-based targeted or universal BI to reduce alcohol and other drug use and associated injuries or high-risk behaviours remain inconclusive. Targeted and universally-indicated MI that used goal setting and personalized normative assessment feedback showed early promise for increasing cannabis abstinence and reducing alcohol-related sequelae including injury, drinking and driving, and physical altercations, in the period that follows an ED visit, but trials with higher quality designs are needed to confirm their impact. To derive meaningful conclusions for clinical practice, further study of these interventions is also necessary to explore variations in treatment effect, standardize outcome measurement, and clarify which MI components are most effective with youth.

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**Figure 1.** Selection of studies

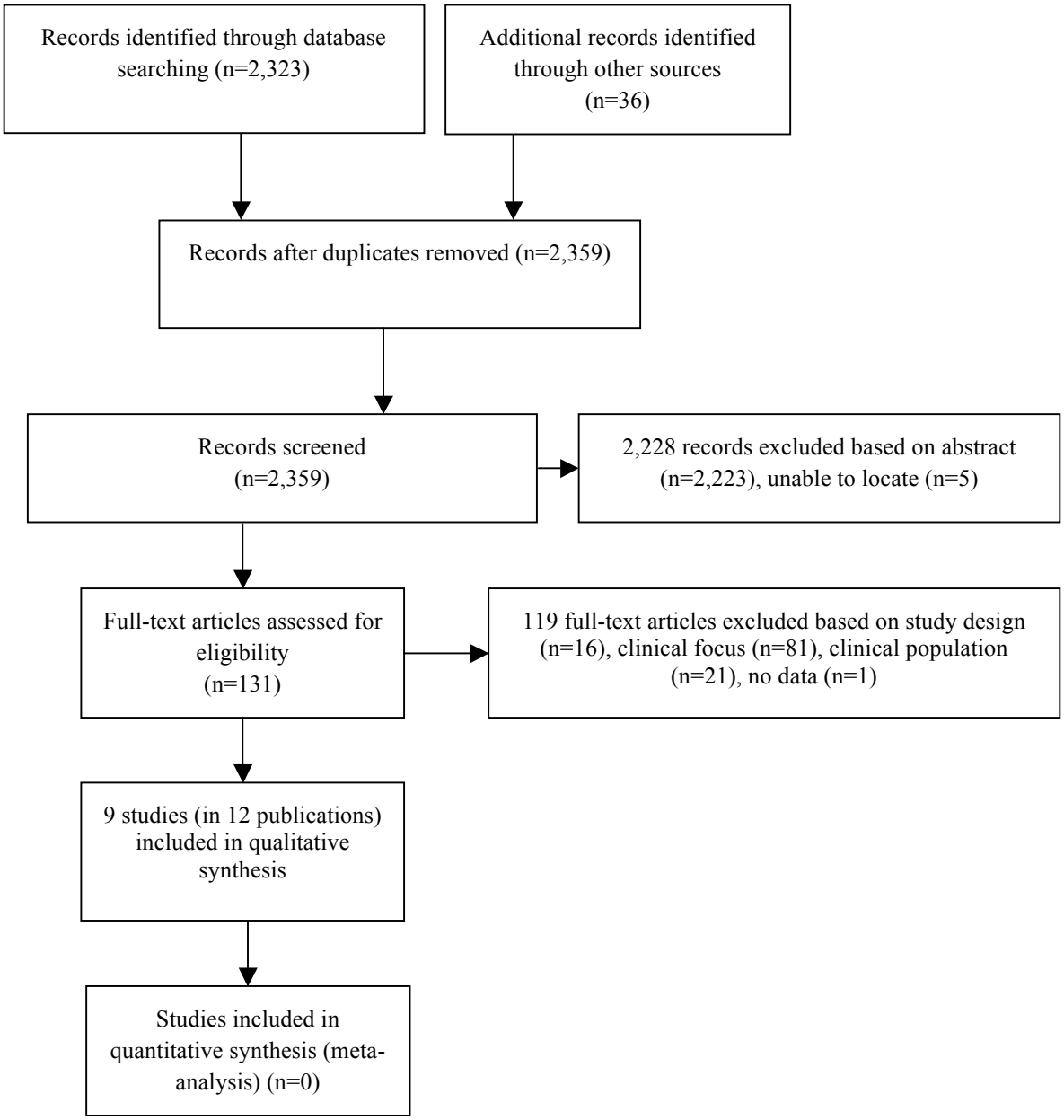

**Table 1.** Study characteristics

| | | | | Participants | |
|---|---|---|---|---|---|
| **Study** | **Risk of Bias** | **Sample (% male)** | **Study Setting(s)** | **Age range, years (mean)** | **Inclusion Criteria / Participant Description** |
| **Targeted BI studies** | | | | | |
| Spirito (USA, 2011)[50] | High | 125 (46%) | Urban, level 1 ED | 13–17 (15) | Positive BAC or self-report of alcohol use 6 hours before the ED visit |
| Tait (Australia, 2004)[55] | High | 127 (55%) | Urban, pediatric (n=1) and general (n=2) ED Outer metropolitan, general ED (n=1) | 12–19 (17) | Visit related to alcohol (53%), alcohol plus other drug (24%), other drug (23%) |
| Spirito (USA, 2004)[56] | Unclear | 152 (64%) | Urban, level 1 ED | 13–17 (16) | Positive BAC or self-report of alcohol use 6 hours before the ED visit |
| Monti (USA, 1999)[58] | Unclear | 94 (64%) | NR | 18–19 (18) | Positive BAC or ED visit related to alcohol use |
| **Universal BI studies** | | | | | |
| Walton (USA, 2010)[51] | Low | 726 (43%) | Urban, level 1 ED | 14–18 (17) | Injuries or illness with past year reported history of alcohol use and aggression related to peer or dating violence, weapon carriage/use |
| Maio (USA, 2005)[54] | Low | 655 (67%) | Urban, level 1 ED (n=2) | 14–18 (16) | Minor injuries including those associated with alcohol use (4.2%) |
| Bernstein (USA, 2010)[52] | High | 853 (45%) | Urban, pediatric, level 1 ED | 14–21 (NR) | Any visit with a reported history of past harmful/hazardous alcohol use or high-risk behaviors in conjunction with alcohol use (unplanned or unprotected intercourse, driving or riding with a drunk driver, injury, fighting, car crash, or an arrest) |
| Bernstein (USA, 2009)[53] | High | 210 (34%) | Urban, pediatric, level 1 ED | 14–21 (NR) | Any visit with a reported history of past cannabis use or high-risk behaviors in conjunction with cannabis use (unplanned or unprotected intercourse, driving or riding with a driver who smoked cannabis)[a] |
| Johnston (USA, 2002)[57] | High | 630 (65%) | Urban, pediatric, level 1 ED | 12–20 (16) | Minor injuries including those associated with alcohol use (14.0% of sample had an injury attributable to 6 different risk behaviors, one of which was binge drinking) |

BAC=Blood Alcohol Concentration; BI=brief intervention; ED=emergency department; NR=not reported

[a]Excluding youth who reported 'at-risk alcohol use'

**Table 2.** Summary of BI features evaluated in the ED, stratified by intervention type/conceptual model

| | BI Features | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Study** | **parental involvement** | **review barriers to behavior change** | **decisional balance exercise** | **goal setting** | **role play** | **PAF** | **pamphlet / referral** | **follow-up phone call** | **Length (min)** | **Deliverer** |
| **Motivational Interviewing** | | | | | | | | | | |
| Spirito (2011)[50] | √ | √ | √ | √ | | √ | | | 105–120 | 'interventionist' |
| | | √ | √ | √ | | √ | | | 45–60 | |
| Walton (2010)[51] | | | √ | √ | √ | √ | √ | | 35 | social worker +/- computer |
| Bernstein (2010, 2009)[52-53] | | √ | √ | √ | | √ | √ | 10 days | 20–30 | peer educator (≤25 years) |
| Spirito (2004)[56] | | √ | | √ | | √ | √ | | 35–45 | research staff |
| Johnston (2002)[57] | | | √ | | | | | | 20 | social worker |
| Monti (1999)[58] | | | | √ | | √ | √ | | NP | research staff |
| **Social learning** | | | | | | | | | | |
| Maio (2005)[54] | | | | | √ | √ | | | 25 | computer |
| **None described** | | | | | | | | | | |
| Tait (2004)[55] | | √ | √ | | | | √ | 4 months | NR | researcher |

BI=brief intervention; ED=emergency department; NR=not reported; PAF=Personalized Normative Assessment Feedback

**Table 3.** Summary table of the impact on alcohol and other drug use using targeted and universal BIs in the ED

| Study | Outcome (Measure) | Summary of Findings |
|---|---|---|
| **Targeted BIs** | | |
| Spirito (2011)[51] | Frequency, days per month (ADQ) | With the exception of quantity, favored youth-based MI, but not statistically significant. |
| | Quantity, per occasion (ADQ) | |
| | High volume drinking, frequency days per month (ADQ) | |
| | High volume alcohol use (ADQ), number of youth | Initially favored family-based MI, but not statistically significant. |
| Spirito (2004)[57] | Frequency, days per month (ADQ) | With the exception of quantity, favored MI, but not statistically significant. |
| | Quantity, per occasion (ADQ) | |
| | High volume drinking, frequency days per month (ADQ) | |
| Tait (2004)[56] | Change from hazardous to 'safer' alcohol consumption (AUDIT-C) | Favored BI, but not statistically significant. |
| Monti (1999)[59] | Alcohol use (ADQ total score) | Study reported no group differences. |
| **Universal BIs** | | |
| Walton (2010)[52] | Alcohol misuse (≥ 3 on AUDIT-C) | Favored computer and computer-plus-therapist, but not statistically significant. |
| | Binge drinking (AUDIT-C item) | Mixed impact with favoring of control group, but not statistically significant. |
| Bernstein (2010)[53] | Drinking days per month (TLFB) | Favored MI, but not statistically significant. |
| | Maximum drinks per day (TLFB) | |
| | Number of drinks per week, mean (TLFB) | |
| | Quantity per drinking day, mean (TLFB) | Initially favored control group, but not statistically significant. |
| Bernstein (2009)[54] | Cannabis abstinence (TLFB) | Favored MI. |
| | Cannabis use, number of days per month (TLFB) | Favored MI, but not statistically significant. |
| Maio (2005)[55] | Alcohol use (Alcohol Frequency/Quantity Index) | Favored computer BI, but not statistically significant. |
| | Alcohol misuse (Amidx) | |

| | | |
|---|---|---|
| | Binge drinking (Amidx item) | |
| Johnston (2002)[58] | Improvement in binge drinking, past 30 days | Favored BI, but not statistically significant. |

ADQ=Adolescent Drinking Questionnaire; Amidx=Alcohol Misuse Index; AOD=Alcohol and Other Drug; AUDIT-C=Alcohol Use Disorders Identification Test consumption subscale; BI=brief intervention; ED=emergency department; MI=motivational interviewing; TLFB=Timeline Followback calendar

**Table 4.** Summary table of the impact of ED-based targeted and universal BIs on consequences related to alcohol and other drug use.

| Study | Outcome (Measure) | Post-Intervention Point Estimate (95% CI) Treatment [T] vs. Control [C] | Summary of Findings |
|---|---|---|---|
| **Targeted BIs** | | | |
| Spirito (2004)[56] | Alcohol-related injury (AIC) | 3 months: RR 0.32 (0.11, 0.94)<br>6 months: RR 0.88 (0.43, 1.79)<br>12 months: RR 0.67 (0.34, 1.30) | Favored MI with statistically significant differences at 3 months. |
| | Drinking and driving (Young Adult Drinking and Driving Questionnaire) | 3 months: RR 0.36 (0.17, 0.76)<br>6 months: RR 0.75 (0.47, 1.18)<br>12 months: RR 0.84 (0.53, 1.33) | |
| Monti (1999)[58] | Alcohol-related injury (AIC) | 6 months: RR 0.42 (0.23, 0.76) | Favored MI. |
| | Drinking and driving (Young Adult Drinking and Driving Questionnaire) | 6 months: RR 0.72 (0.56, 0.92) | |
| **Universal BIs** | | | |
| Walton (2010)[51] | Alcohol consequences (≥ 2 consequences using POSIT)<br>$T_1$ vs. C; $T_2$ vs. C | 3 months: OR 0.78 (0.49, 1.26); OR 0.67 (0.42, 1.05)<br>6 months: OR 0.57 (0.34, 0.95); OR 0.56 (0.34, 0.91) | Favored both MI versions with statistically significant differences at 6 months. |
| Bernstein (2010)[52] | Unplanned intercourse after drinking, frequency past 30 days (TLFB) | 3 months: OR 0.82 (0.51, 1.33)<br>12 months: OR 0.82 (0.49, 1.38) | Favored MI, but not statistically significant. |
| | Unprotected intercourse after drinking, frequency past 30 days (TLFB) | 3 months: OR 1.06 (0.64, 1.77)<br>12 months: OR 1.02 (0.59, 1.78) | Favored handout, but not statistically significant. |
| | Injured after drinking, frequency past 30 days (TLFB) | 3 months: OR 0.75 (0.27, 2.06)<br>12 months: OR 0.56 (0.23, 1.36) | Favored MI, but not statistically significant. |
| | Rode with impaired driver, frequency past 30 days (TLFB) | 3 months: OR 0.89 (0.59, 1.34)<br>12 months: OR 1.17 (0.77, 1.79) | Favored MI at 3 months and handout at 6 months, but statistically significant. |
| | Got into a fight after AOD use, frequency past 30 days (TLFB) | 3 months: OR 0.73 (0.39, 1.37)<br>12 months: OR 0.72 (0.35, 1.47) | Favored MI, but not statistically significant. |
| | Driving after drinking, frequency past 30 days (TLFB) | 3 months: OR 1.11 (0.66, 1.85)<br>12 months: OR 1.06 (0.62, 1.81) | Favored handout, but not statistically significant. |

**Table 4 continued.** Summary table of the impact of ED-based targeted and universal BIs on consequences related to alcohol and other drug use.

| Study | Outcome (Measure) | Post-Intervention Point Estimate (95% CI) Treatment [T] vs. Control [C] | Summary of Findings |
|---|---|---|---|
| **Universal BIs** | | | |
| Bernstein (2009)[53] | Got into a fight after AOD use, frequency past 30 days (TLFB) | 3 months: OR 0.88 (0.32, 2.38)<br>12 months: OR 0.26 (0.08, 0.81) | Favored MI with statistically significant differences at 12 months. |
| | Rode with impaired driver, frequency past 30 days (TLFB) | 3 months: OR 1.01 (0.39, 2.62)<br>12 months: OR 0.81 (0.31, 2.10) | Favored handout at 3 months and MI at 12 months, but not statistically significant. |
| | Driving after cannabis use, frequency past 30 days (TLFB) | 3 months: OR 0.82 (0.24, 2.76)<br>12 months: OR 0.60 (0.21, 1.75) | Favored MI, but not statistically significant. |
| Maio (2005)[54] | Driving after drinking / rode with impaired driver, frequency past 3 months | 3 months: MD 0.00 (−0.19, 0.19)<br>12 months: MD −0.10 (−0.29, 0.09) | Favored computer-based BI at 12 months, but not statistically significant. |
| Johnston (2002)[57] | Driving after drinking, frequency past 30 days | 3 months: RR 0.89 (0.35, 2.27)<br>12 months: RR 1.47 (0.48, 4.44) | Favored BI at 3 months and standard care at 12 months, but not statistically significant. |
| | Rode with impaired driver, frequency past 30 days | 3 months: RR 0.63 (0.37, 1.09)<br>12 months: RR 0.77 (0.46, 1.30) | Favored BI, but not statistically significant. |

AIC=Adolescent Injury Checklist; BI=brief intervention; CI=confidence interval; MD=mean difference; MI=motivational interviewing; OR=odds ratio; POSIT=Problem Oriented Screening Instrument for Teenagers; RR=risk ratio; TLFB=Timeline Followback calendar

Search Strategy - Medline (1950 to April 2011)

1. suicide/
2. "self-injurious behavior"/
3. alcoholism/di, pc
4. Alcohol drinking/pc
5. exp "substance related disorders"/di, pc, rh
6. (substance abuse adj (detection or education or counsel$)).mp.
7. exp substance abuse detection/
8. crisis intervention/ or "crisis care".ti,ab.
9. "mental health triage".mp.
10. exp Mental Disorders/di, pc, rh, th
11. (motivational interview* or brief intervention or brief motivational interview).ti,ab.
12. (crafft or audit or raps).ti,ab.
13. "alcohol use disorders identification test".ti,ab.
14. "rapid alcohol problems screen".ti,ab.
15. agression.mp.
16. (restraint or restraining).ti,ab.
17. hallucinat*.ti,ab.
18. or/1-7,10-17
19. Suicide Attempted/
20. exp Mental Disorders/
21. ("alcohol or other drugs" or "alcohol use disorder").ti,ab.
22. (aud or aod).ti,ab.
23. exp Domestic Violence/
24. or/19-23
25. Mass Screening/ or Survival Analysis/ or Risk/ or Incidence/ or Risk Factors/ or "Social Work Department, Hosptial"/ or "social services".mp.
26. "Referral and Consultation"/ or exp Counseling/ or "Behavior Therapy"/
27. di.fs.
28. exp Screeing test/ or (marker* or detect* or assess* or probability or likelihood or accuracy or diagnos*).mp.
29. (sensitivity or specificity).mp.
30. or/27-29
31. 24 and 30
32. 18 or 31
33. exp Emergency Service, Hospital/
34. emergency medical services/
35. exp emergencies/
36. "HOSPITAL EMERGENCY SERVICE".mp.
37. (ED or PED or emergenc*).tw.
38. (EDs and (emergency or emergencies)).mp.
39. ((emergenc$ or trauma) adj5 (departmen$ or ward$ or service$ or unit$ or room$ or hospital$ or care or patient$ or physician$ or doctor$ or medicine or treatment$)).mp.
40. (emergency or emergencies or trauma).jn.
41. exp Emergency Medicine/
42. or/33-41
43. 32 and 42
44. emergency services, psychiatric/ or behavioral emergency.ti,ab.
45. or/43-44
46. limit 45 to (clinical trial, all or comparative study or controlled clinical trial or evaluation studies or guideline or journal article or meta analysis or multicenter study or practice guideline or randomized controlled trial or "review" or "scientific integrity review" or technical report or twin study or validation studies)
47. limit 46 to (english or french)
48. limit 47 to "all child (0 to 18 years)"