Alcohol, Tobacco, and Other Drugs: Future Directions for Screening and Intervention in the Emergency Department

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Abstract

This article is a product of a breakout session on injury prevention from the 2009 *Academic Emergency Medicine* consensus conference on ''Public Health in the ED: ***Screening, Surveillance, and Intervention.***'' The emergency department (ED) is an important entry portal into the medical care system. Given the epidemiology of substance use among ED patients, the delivery of effective brief interventions (BIs) for alcohol, drug, and tobacco use in the ED has the potential to have a large public health impact. To date, the results of randomized controlled trials of interventional studies in the ED setting for substance use have been mixed in regard to alcohol and understudied in the area of tobacco and other drugs. As a result, there are more questions remaining than answered. The work group developed the following research recommendations that are essential for the field of screening and BI for alcohol, tobacco, and other drugs in the ED. 1) Screening—develop and validate brief and practical screening instruments for ED patients and determine the optimal method for the administration of screening instruments. 2) Key components and delivery methods for intervention—conduct research on the effectiveness of screening, brief intervention, and referral to treatment (SBIRT) in the ED on outcomes (e.g., consumption, associated risk behaviors, and medical psychosocial consequences) including minimum dose needed, key components, optimal delivery method, interventions focused on multiple risk behaviors and tailored based on assessment, and strategies for addressing polysubstance use. 3) Effectiveness among patient subgroups—conduct research to determine which patients are most likely to benefit from a BI for substance use, including research on moderators and mediators of intervention effectiveness, and examine special populations using culturally and developmentally appropriate interventions. 4) Referral strategies—a) promote prospective effectiveness trials to test best strategies to facilitate referrals and access from the ED to preventive services, community resources, and substance abuse and mental health treatment; b) examine impact of available community services; c) examine the role of stigma of referral and follow-up; and d) examine alternatives to specialized treatment referral. 5) Translation—conduct translational and cost-effectiveness research of proven efficacious interventions, with attention to fidelity, to move ED SBIRT from research to practice.

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This paper is a product of a breakout session on screening and brief intervention (SBI) for alcohol, tobacco, and other drugs from the 2009 *Academic Emergency Medicine* consensus conference on ''Public Health in the ED: Screening, Surveillance, and Intervention.'' The U.S. Preventive Services Task Force (USPSTF) has given tobacco SBI a grade A recommendation[1] and strongly recommends that clinicians provide this service to eligible patients in primary care. They found good evidence that tobacco screening, brief intervention, and referral to treatment (SBIRT) improves important health outcomes and conclude that benefits substantially outweigh harms. The USPSTF found at least fair evidence that alcohol SBI improves important health outcomes. They conclude that benefits outweigh harms, giving it a grade B recommendation, but add that the evidence is insufficient to recommend for or against screening and behavioral counseling interventions to prevent or reduce alcohol misuse by adolescents in primary care settings.[2] Building on this knowledge, the current working group and breakout session participants developed recommendations and future research questions for alcohol, tobacco, and other drugs: screening and intervention in the emergency department (ED).

BACKGROUND

Over 2 million ED visits in 2006 (2.3%) were related to either the patient's use of alcohol, another person's use of alcohol, or both according to the National Hospital Ambulatory Medical Care Survey.[3] The Drug Abuse Warning Network[4] notes more specifically that among 1.7 million ED visits in 2006 related to drug misuse/abuse, illicit drugs accounted for 31%, and nonmedical use of prescription drugs accounted for another 28%; 7% were related to consumption of alcohol alone by a minor, and 34% were a combination of illicit drugs, alcohol, and/or nonmedical use of prescription drugs. ED patients are more likely than primary care patients or the general population to report misuse of alcohol,[5–7] drugs,[8] and tobacco.[9,10] Prior research notes at least 25% of all adult ED patients screen positive for hazardous or harmful drinking.[11,12] The prevalence of tobacco use among ED patients is as high as 48%.[9,10] In one study, 4.9% of all adult visits, 6.8% of all admissions, and 10.0% of all ED charges were smoking-attributable.[13,14] Rockett et al.[8] found that rates of current substance use disorders were 14.7%, and they are systematically underreported by patients. Overall, rates of substance use in the ED range from 4% to 47%, depending on the definitions and methodology used.[8,15]

Many patients seen in EDs have at-risk or problem alcohol use.[16,17] However, alcohol screening is limited, and even fewer patients undergoing routine care receive interventions to cut back or stop drinking.[8] Recently, in response to increased awareness and research on the ''teachable moment,''[18] the American College of Surgeons mandated alcohol screening among admitted trauma patients for Level 1 and 2 trauma centers.[19] Despite this progress, when screening does occur in routine clinical ED settings, it often consists of obtaining a biomarker, such as blood alcohol level, from a subset of patients based on clinical concern. However, blood alcohol concentrations and biomarkers fail to detect the majority of patients with alcohol problems.[20,21]

There is currently little or no routine screening for drug use in the ED setting, likely resulting from the lack of brief drug-screening tools available and a lack of evidence-based data regarding the efficacy of ED-based drug interventions.[22] In addition, despite strong evidence in favor of routine tobacco screening, rates of actual screening are low: from 32.5% to 56%.[23,24]

The ED is an important entry portal into the medical care system, especially for underinsured and uninsured patients who may have decreased access to other sources of medical care.[23,25] Given the epidemiology of substance use among ED patients, the delivery of effective brief interventions (BIs) for alcohol, drug, and tobacco use in the ED has the potential to have a large public health impact.

CURRENT STATE OF KNOWLEDGE: RESEARCH ON ED-BASED BIs FOR SUBSTANCE USE

Alcohol

To address the need to identify patients with unhealthy alcohol use, and to narrow the gap between patients in need of treatment and those actually receiving services, a comprehensive integrated public health approach for the delivery of alcohol BIs has been developed: SBIRT. This model has been recommended for use in EDs,[26] inpatient trauma units,[19] primary care settings,[27–30] and other health care settings.[27–31] It has been endorsed by the National Institute of Alcohol Abuse and Alcoholism (NIAAA), the Centers for Disease Control and Prevention (CDC), the National Highway Traffic Safety Administration, and the Committee on Trauma of the American College of Surgeons.[32] Since 2003, the Substance Abuse and Mental Health Service Administration (SAMHSA) has provided funding to 11 states, six residency training programs, and 12 campuses. The recommended BI consists of a short interactive session, ranging from 5 to 60 minutes, and incorporates feedback, advice, and motivational enhancement to assist the patient in reducing substance use to lower risk of future illness and injury. These interventions have been found to be feasible to perform in the ED setting by routine ED clinical staff.[33]

With these recommendations in place, SAMHSA has funded multiple state efforts to incorporate SBIRT for unhealthy alcohol use more widely into EDs and to develop practical protocols for best practices.[34] Despite the enthusiasm around SBIRT, evidence regarding the efficacy of BIs in the ED has been mixed.[35–42] Several studies demonstrated a beneficial effect on negative consequences.[35,38,42,43] While the Academic SBIRT trial, using a quasi-experimental methodology, found reduced consumption at 3 months,[12] effects on decreasing alcohol consumption have not been consistent in other studies.[35] Further confounding interpretation of the evidence is that the published studies include a wide variety of patient populations: some only young adults,[44] many only with injured patients.[45]

Tobacco

Few rigorously conducted randomized trials of ED-based tobacco control interventions have been published. A recent study of 543 smokers in an ED chest pain unit found that a tailored motivational interview (MI) with follow-up telephone BI sessions, coupled with initiation of nicotine replacement therapy (NRT) patch, found positive intervention effects on cessation rates at 1 month,[46] but no difference between groups at the primary 6-month end point. Bernstein et al.[23,47] found that an intervention consisting of a 1-hour lecture to providers, and placement of wallet cards in the ED promoting smokers' quit lines, increased screening rates from 32.5% to 46.0% ($p < 0.001$) at eight EDs among 1,168 patients treated by 207 physicians. Finally, a study of 90 patients at a single urban ED showed no difference in self-reported abstinence rates at 3 months, although the study was underpowered.[48]

Data from these studies suggest that even low-intensity SBIRT may prompt quit attempts, decreased cigarette use, and quitting, if offered routinely to ED smokers. Bernstein et al.[49] randomized 338 adult smokers being discharged from the ED to usual care or a multicomponent intervention consisting of a MI, 6 weeks of NRT, and a booster telephone call. Both arms showed similar cessation rates at 3 months, proportions of patients making a quit attempt, and decreases in daily cigarette use. In multivariate logistic modeling, factors associated with quitting included any tobacco-related ICD9 code for the ED visit or patient belief that the ED visit was tobacco-related. The negative primary end point reflected a higher-than-expected quit rate in the control group, perhaps because the control arm's assessment and brochure still provided a stronger intervention than what ED smokers normally receive.

Drugs

A number of studies recommend BIs for illicit drug use;[50–55] however, there are few published randomized controlled BI trials with illicit substance users in any clinical setting. Promising treatment results have been shown in studies investigating the effectiveness of BIs among cocaine, heroin, and amphetamine users in non–ED-based settings.[56–59] Stotts et al.[58] found positive results from a brief MI delivered to cocaine users in a BI outpatient detoxification treatment program. Bashir et al.[60] found positive results from a BI delivered by a primary care provider. Similarly, positive results have been reported from brief motivational interventions in cannabis-dependent adults.[54,61–63]

Bernstein et al.[64] reported that a BI for heroin and/or cocaine users recruited from several nonemergent clinics led to a reduction in heroin and cocaine use and an increased likelihood of abstinence from these drugs at the 6-month follow-up visit. The BI included a motivational intervention session delivered by trained peer educators and a subsequent BI booster call. The only ED-based study on drug BI,[57] which included an active referral process, resulted in a 45% reduction in severity of drug problems among patients who kept their follow-up treatment appointments. However, this study's conclusions are limited by the lack of a control group and a 22% follow-up rate.

It is important to understand the methodologic issues of both positive and negative studies of alcohol, tobacco, and drug SBIRT in the ED, as well as in other settings, to assist future researchers in developing efficacious interventions that can be optimally delivered and generalizable to all EDs. Many methodologic challenges remain in SBIRT research in the ED, such as assessment reactivity and the creation of procedures in obtaining credible and ethical control groups. Institutional review boards are becoming increasingly concerned regarding traditional ''standard care'' control groups, particularly for sensitive issues such as illicit drug use or with special populations, such as adolescents or pregnant women. Another workshop at the consensus conference dealt specifically with study designs for public health research.[65] In summary, to date, the results of randomized controlled trials of interventional studies in the ED setting for substance use have been mixed. As a result, there are more questions remaining than answered.

RECOMMENDATIONS AND UNANSWERED QUESTIONS FOR SBIRT IN THE ED

Recommendation 1: Screening

> Develop and validate brief and practical (feasible, efficient) screening instruments (particularly for illicit and prescription drug use, tobacco use, polysubstance use, and other risky health behaviors) for ED patients and determine the optimal method (technology-assisted; physician/nurse/social worker, peer educator, behavioral specialist, etc.) for administration of screening instruments.

A large body of literature exists on screening for alcohol misuse in the ED across many different populations.[66,67] Two tools have been validated in ED research settings: the 10-item Alcohol Use Disorders Identification Test (AUDIT),[68] which assesses alcohol consumption and presence of at-risk drinking, and the three-item AUDIT-C,[69,70] which assesses alcohol consumption only. Recent literature[71,72] supports the internal consistency, test–retest reliability, and validity of the AUDIT-C in identifying at-risk or hazardous alcohol use. Several studies suggest that it is the optimal instrument for medical settings,[69,73–75] but this is not without controversy in the literature.[69,76,77] Although there are a variety of efficacious screening instruments,[39,42,56,78,79] their effectiveness when implemented in the clinical setting varies, not only in light of their test characteristics, but also because of factors such as ease of administration in routine clinical care. For example, the AUDIT is long and needs to be scored. Therefore, its implementation is difficult when administered by clinical staff, but it has utility in the ED when self-administered via computer.[80,81] The NIAAA Physicians' Guide, developed for use by primary care physicians, recommends using the CAGE questions followed by questions concerning both quantity and frequency as a brief assessment for clinical use.[82] This screen also has been integrated into a tool kit on the American College of Emergency Physicians' website.[83]

There is no standard tool for screening for tobacco use in clinical settings. Current screening practices include simple queries such as, ''Do you smoke?,'' or ''How much do you smoke?,'' which may be adequate for the ED setting. In clinical trials, patients are often screened with two items from the CDC's Behavioral Risk Factor Surveillance System (http://www.cdc.gov/BRFSS/) and National Health Interview Survey (http://www.cdc.gov/nchs/nhis.htm) endorsing lifetime use of ≥100 cigarettes and being an every- or some-day smoker. Routine screening for tobacco use is not standard of care in the ED and can be improved.

No studies have adequately evaluated screening tools for drug use in an ED setting. Often a single question such as, ''Do you use illicit drugs?'' followed by a litany of specific drugs, is used. The National Survey on Drug Use and Health asks if one has used ''a prescription drug that was not prescribed for you or that you took only for the experience or feeling it caused?'' Recently, the World Health Organization sponsored a seven-country study that developed an eight-item screening instrument for at-risk use of psychoactive substances: the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST 3.0).[84] The ASSIST assesses substance-related problems for multiple substances. Although the ASSIST may have utility in ED substance use research, this is a multipage instrument requiring scoring, and it is not ideal for translation into the ED clinical practice setting. Recently, the National Institute on Drug Abuse (NIDA) has modified the ASSIST[85] for clinical applicability entitled NIDAMED. This shorter version integrates drug, tobacco, and the NIAAA alcohol quantity and frequency screen and needs to be evaluated in the ED.[85] Finally, there is a need to develop and validate a single instrument that assesses multiple risk behaviors that often co-occur, including polysubstance use.

Emergency department–based screening practices vary considerably in how they are delivered, including 1) ED clinical care provider performing screening during the course of routine duties (nurse, physician assistant, physician, etc.); 2) research staff; 3) paid or volunteer peer educator; or 4) computer. Which method is most effective at screening patients in the ED has not been determined. More information is needed on the barriers associated with these different methods, as well as their validity among special populations, including youth.

Recommendation 2: Key Components and Delivery Methods for Intervention

Conduct research on the effectiveness of SBIRT in the ED, including strategies for addressing polysubstance use, on outcomes such as consumption, associated risk behaviors, and medical and psychosocial consequences (criminal justice, education), including:

- Minimum effective dose (length of session, booster sessions);
- Key components (motivational interviewing, feedback, adjunct pharmacotherapy, role of parents/caregivers/significant others/spouse);
- Optimal delivery method (technology assisted; physician/nurse/social worker, peer educator, behavioral specialist, etc.), as well as measurement of fidelity of intervention;
- Interventions focused on multiple risk behaviors, as well as the effect of interventions tailored, based on assessment;
- Strategies for addressing polysubstance use.

Alcohol. While some recent ED-based alcohol BIs can be delivered in only 5 to 10 minutes,[42] others are as long as 30 to 45 minutes.[42,43] Some studies have utilized supplemental patient contact (booster sessions) in the hope of enhancing the intended effect.[26,36,38] For example, Longabaugh et al.[38] provided a booster session for participants ages 18 years and older within 7–10 days post–ED-based BI; 69% returned for the booster. Using an intent-to-treat analysis, the BI plus booster group significantly reduced their alcohol-related consequences compared to the control group. Post hoc analyses indicated that attendance at two sessions (compared to one) resulted in better outcomes and that therapists' emotional support increased compliance with the booster.[86] Among adult substance use treatment samples, findings for brief treatment (e.g., two to four sessions) compared to extended treatment (seven to eight sessions) show insignificant to very small effect sizes for extended treatment.[87]

Intervention deliveries that take place after (via telephone, computer, or in person) rather than during the target ED visit may not be taking advantage of the teachable moment, although it is unclear if the teachable moment can be extended to a post-ED intervention. Further, these booster BIs are limited by lack of compliance. Nonetheless, augmenting ED-based BIs with postdischarge additional brief treatments (e.g., case management) may be appropriate for patients with substance use disorders and/or concurrent mental health and social service needs and has shown promise.[88]

Tobacco. The dose of an intervention (number of sessions, efficacy of booster sessions, etc.) needed to prompt a quit attempt versus a successful quit is not clear. What is the expected efficacy of one-time ED interventions, particularly when a recent Cochrane review of tobacco treatment for hospitalized smokers determined that at least 1 month of outpatient booster intervention is needed to produce sustained quitting? The feasibility of NRT in the ED remains to be determined.

A better understanding of what key components of the BI are most efficacious in ED patients across all substances is needed. Recent theory and empirical findings have highlighted the mechanisms by which motivational interviewing–based interventions facilitate behavioral change.[89–93] Specifically, there is evidence that use of specific MI-adherent behaviors (e.g., Open-ended questions, Affirmations, Reflections, Summary statements [OARS]) tends to reduce resistance and increase participant change talk; that change talk leads to commitment talk (e.g., ''I'm going to reduce my

drinking''); and that commitment talk predicts clinical outcomes.[27–29] However, in their review of ED-based alcohol BI, Havard et al.[35] found that only 8 of 13 studies incorporated principles of motivational interviewing.

Finally, research and theories on mechanisms for behavior change in other settings illustrate that the likelihood of change can be enhanced by increasing motivation, coupled with elicitation of commitment/intentions to change and developing a specific behavioral change plan.[28,89] Consistent with these notions, provision of a ''full'' BI (those that incorporate MI-adherent behaviors) results in significantly greater reductions in average alcohol consumption and binge drinking compared to provision of feedback only.[93] Research on combining BI strategies with pharmacologic treatment to patients in the ED, or including parents/caregivers or significant others/spouse, in the BI have not been evaluated and may improve outcomes.

The optimal method of intervention delivery (face–face or technology assisted) as well as the most effective messenger type (physician, nurse, behavioral specialist, social worker), and whether effectiveness varies by patient subgroup, has yet to be determined and requires further study. With the exception of computer-based BIs, personnel have a variable level of baseline skill, training, belief in efficacy of BI, and interest in delivering all the components of BI. These inherent differences in operationalizing intervention delivery may contribute to mixed study results. Future research efforts must incorporate measures of fidelity to the intervention. Tools such as the use of workbooks[94,95] may foster content adherence and should be investigated for further use as an aid to maintaining fidelity.

In the past decade, growing time constraints in the ED have prompted integration of other communication technologies (telephones, computers) to facilitate ED SBIRT delivery.[80,96–98] Evidence supports the efficacy in some settings of computer-based motivational interventions for smoking cessation in adults[99] and for the prevention of alcohol and/or drug use in young adults.[100–108] Computers have the potential to bridge the gap between the evidence base for brief alcohol interventions and the widespread use of these best practices in clinical care. Computerized SBIRT may not only help relieve time and resource challenges, but may also facilitate SBIRT program fidelity and integrity. At the same time, computerized solutions will need to overcome obstacles such as securing personnel to oversee the hardware and preventing patients from subverting programs to use the Internet. Although it is not yet clear which SBIRT delivery method will yield the greatest effect, using computers, Web-based programs,[109] and other technology holds considerable promise in other settings and should be rapidly evaluated both for primary efficacy and as an aid for translation in the ED.

BIs are often developed to change a single behavior. However, risk-taking behaviors tend to cluster in predictable ways in an individual (e.g., substance misuse, lack of seatbelt use, violence).[110] Therefore, there is a need to develop, test, and implement ED-based BIs that focus on multiple risk behaviors. Furthermore, as ED-based BIs expand to include multiple risk behaviors such as polysubstance use, injury, sexually transmitted infections, and mental health screening, there is an increased need to look at cost-effective and theoretically sound approaches to tailoring intervention content to be the most salient for an individual patient or the most likely to improve health outcomes.

Recommendation 3: Effectiveness Among Patient Subgroups

1) Conduct research to determine which patients are most likely to benefit from a BI for substance use, including research on moderators and mediators of intervention effectiveness (e.g., age, sex, readiness to change, self-efficacy, level of substance use problem severity, how substance use was implicated in reason for ED visit, and factors related to resiliency). 2) Conduct SBIRT research among special populations: examine culturally and developmentally appropriate interventions (adolescents, college students and young adults, vulnerable racial/ethnic groups, pregnant women, and older adults).

Alcohol. Research on potential moderators of alcohol BIs among ED patients is nearly absent in the literature. There is some evidence that age moderates BI effectiveness in non-ED settings.[29] A recent study determined that the motivational interviewing component of BI was more effective than personalized feedback only among young adults (ages 18–24 years) in the ED.[93] The outcome of ED-based BI may also vary by sex.[111]

Although readiness to change and self-efficacy have been conceptualized as important factors in predicting response to a BI,[90] few studies have focused on this issue. ED studies demonstrate a positive relationship between self-efficacy or stage of change and alcohol use over time.[80,112,113] When examined as moderators of outcome in ED-based studies, however, stage of change and self-efficacy have had little impact on the effectiveness of BIs.[44,114]

ED-based studies have included participants with a wide spectrum of baseline consumption, from presenting to the ED with an injury and a positive blood alcohol level, without other criteria for misuse, to dependent drinkers. Several studies have limited the inclusion criteria to patients with relatively low levels of consumption, excluding the most severe drinkers. The emphasis on lower-level consumption (i.e. at-risk/hazardous drinkers) may diminish the ability to detect intervention effects.[29] Some studies suggest that baseline drinking status may moderate the effect of an ED BI: those with greater quantity and frequency of alcohol consumption at baseline had larger reductions in their alcohol use at 12 months if they received a BI.[39,114,115] Heavy drinkers are those most likely to have experienced negative consequences and, as a result, represent a group that may be particularly responsive to BIs. Expert consensus groups have called for the inclusion of alcohol-dependent patients in the spectrum of future ED SBIRT research.[37] A key next step is determining the minimum, maximum, and moderating effects of the patient's consumption level.

Another potential moderator is the extent to which alcohol prompted the ED visit[116,117] and whether injury severity moderates intervention effectiveness. In one study among patients with a history of heavy or harmful drinking, drinking at the time of the current injury did not affect the effectiveness of the intervention.[38] The ED SBIRT research collaborative study did not show differential effects of the BI among those with and without injury.[56] Yet in another study, attributing the current injury to alcohol appeared to improve BI outcomes for those patients who related their ED visit to their alcohol use.[113] This finding is consistent with Barnett et al.,[116] who found that an alcohol-related incident was associated with greater motivation to change.

Tobacco. Should interventions be targeted toward patients presenting with a tobacco-related problem, like chest pain or asthma? Studies to date show that ED patients with negative consequences of tobacco use are more likely to be asked about their tobacco use than those presenting with non–tobacco-related problems.[23,24] There are some preliminary data to support the idea of targeting interventions toward smokers with negative consequences of smoking: a clinical trial found that patients with a tobacco-related ICD9 code or who believed that their ED visit was related to tobacco were more likely to quit.[49]

Drugs. To our knowledge, there is no research on moderators of drug BI among ED patients. Research is needed to identify if principles of BI can be applied successfully to drug use, which type of drugs, and how to address the issue of polysubstance use in intervention and outcome measurement.

Across all substances there is a need for *research among special populations.* Adolescence is a critical period for the initiation of alcohol use,[118–120] with earlier age of onset increasing the risk for development of an alcohol use disorder.[121,122] There is a need for research targeted at adolescents and young adults, as results of BI studies among adults should not be generalized to underage drinkers who have a unique developmental trajectory.[123] Although recent studies have validated measures for alcohol screening,[124] screening measures for illicit drug use among adolescents are needed. Studies also are needed to assess the interrelationship among problem behaviors (i.e., alcohol, illicit drug use, prescription drug use, violence, sexual risk behaviors) and how such multiple risk behaviors impact trajectories over key developmental transitions (e.g., entering high school, high school graduation rates, and the transition to college/work force). It is important to determine the optimal timing of BIs (ED visit only, ED visit plus postdischarge BI) to maximize effectiveness in terms of decreased alcohol use and improved health behaviors in adolescents and young adults.

There remain questions as to whether the positive effects noted in some studies with SBIRT will generalize effectively to EDs that treat predominantly vulnerable racial/ethnic groups. Currently, there is a paucity of ED SBIRT published work in this area. Finally, it can be assumed that the success of an SBIRT program will weigh heavily on the commitment of referral resources offered to follow ED-based activities. Therefore, for the full SBIRT model, including the referral component, to be efficacious culturally and linguistically sound, ED and community resources are needed.

Recommendation 4: Referral Strategies

> 1) Promote prospective cohort and comparative effectiveness trials to test best strategies to facilitate referrals and access from the ED to preventive services, community resources, and substance abuse and mental health treatment. 2) Examine the impact of available community services and whether they are culturally appropriate. 3) Examine the role of stigma of referral and follow-up. 4) Examine alternatives to specialized treatment referral (i.e., ED-based pharmacotherapy or multisession intervention strategies or colocating services in the ED, post–acute care).

Additional studies are needed to determine which intervention components and at which location (ED visit and/or post–ED visit) are most effective. As noted by Havard et al.,[35] among 13 ED studies reviewed, none fully tested all SBIRT components, and only one provided a second session. Another study found that rates of attendance to a post–ED BI were 69% when a BI was offered during the ED visit.[125] Research should focus on what strategies facilitate completion of linkage to post-ED services and how the availability of culturally appropriate community services, and the role of patient-perceived stigma, affect successful completion of the referral process. Finally, research is needed to determine possible effective alternatives to specialized treatment referral (i.e., ED-based pharmacotherapy multisession post-ED sessions, or colocating services in the ED with an addiction specialist post–acute care).

Recommendation 5: Translation

> Conduct translational and cost-effectiveness research of proven efficacious interventions, with attention to fidelity, barriers to successful implementation, additional training needed, and cost-effectiveness, to move ED SBIRT from research to practice.

In light of the promising results of BIs for alcohol and the critical need to address substance use in the ED, national organizations such as the American College of Emergency Physicians (ACEP) and the American Medical Association have called for routine screening and intervention for alcohol problems among ED patients. To encourage this, in 2008 the Centers for Medicare and Medicaid Services created new reimbursement codes for substance use SBIs for Medicaid and Medicare recipients. This will enhance the potential for more widespread use of SBIRT techniques in the future, particularly in high-volume ED settings. Despite this laudable progress and incentive structure, as well as research demonstrating that it is feasible for ED practitioners to perform BI during the course of the ED visit,[33] SBI among ED patients during routine clinical care is still far from widespread. More research is needed to understand possible barriers to widespread

implementation, such as multiple demands on the time of providers and lack of skilled providers available. If clinical providers (physicians, physician assistants, nurse practitioners) are unwilling or unable to deliver SBIRT in a feasible manner, there is a need to identify and to train other personnel to deliver the intervention, such as nurses, social workers, etc.

What is the best way to train these skills? Do health care workers providing substance use interventions need formal training in motivational interviewing? If so, how should this be accomplished? Research is needed on the feasibility of integrating motivational interviewing/brief negotiated interview techniques for alcohol use problems and other medical conditions in the core curriculum of emergency medicine residencies or in the undergraduate medical education curriculum. Training in motivational interviewing skills around substance use interventions may have beneficial value to other patient–physician discussions (e.g., explaining the need for taking meds, lifestyle modification following discharge instructions). Will incorporating other uses for motivational interviewing increase the acceptability of SBIRT by health care workers?

Recent cost–benefit studies show that the average ED alcohol screening plus BI costs $632 per patient,[126] with the majority of the cost attributed to the personnel needed to complete the screening process ($497), and identify those in need of intervention. Alcohol SBIs have the potential to reduce costs associated with injury and other alcohol-related health consequences, resulting in a savings of $3.81 for every $1 spent in trauma settings,[127] with similar findings for primary care samples ($4.30 for every $1 spent[128]). Unlike data regarding potential cost savings from alcohol SBIRT, approaches for illicit drug use and psychoactive prescription drug use are lacking, given the early phase of drug-related SBIRT. More research on drug SBIRT in the ED is needed prior to the cost analysis research that will be needed to guide future drug SBIRT implementation. Despite extensive data of the cost-effectiveness of tobacco dependence treatment in non-ED settings,[129] cost-effectiveness of ED-initiated tobacco dependence treatment needs to be evaluated.

CONCLUSIONS

Despite laudable progress over the past decades in ED-based substance use screening and intervention, studies show modest efficacy with some heterogeneity of results. Research in screening, brief intervention, and referral to treatment in the ED has advanced most quickly in the area of alcohol and tobacco, with recent increase in momentum in application to drug misuse and abuse. Additional challenges remain in elucidating the most effective timing, intensity, and delivery of BIs to ED patients with substance use disorders. There remains considerable opportunity not only to move relevant research efforts and activities forward, but also to translate findings in a manner that could positively influence the public's health in an intentional and meaningful way.

References

1. U.S. Preventive Services Task Force. Counseling to Prevent Tobacco Use and Tobacco-Related Diseases: Recommendation Statement. U.S. Department of Health and Human Services. Available at: http://www.ahrq.gov/clinic/3rduspstf/tobacccoun/tobcounrs.htm. Accessed Jun 1, 2009.
2. U.S. Preventive Services Task Force. Screening and Behavioral Counseling Interventions in Primary Care to Reduce Alcohol Misuse, Topic Page. U.S. Department of Health and Human Services. Available at: http://www.ahrq.gov/clinic/uspstf/uspsdrin.htm. Accessed Jun 01, 2009.
3. McCaig LF, Burt CW. National Hospital Ambulatory Medical Care Survey: 2001 emergency department summary. Adv Data. 2003; 335:1–29.
4. Substance Abuse and Mental Health Services Administration. Drug Abuse Warning Network, 2005: National Estimates of Drug-Related Emergency Department Visits. Rockville, MD: Office of Applied Studies, Department of Health and Human Services, 2007, SMA 07-4256.
5. Cherpitel CJ. Emergency room and primary care services utilization and associated alcohol and drug use in the United States general population. Alcohol Alcohol. 1999; 34:581–9.
6. Borges G, Cherpitel CJ, Medina-Mora ME, Mondragon L, Casanova L. Alcohol consumption in emergency room patients and the general population: a population-based study. Alcohol Clin Exp Res. 1998; 22:1986–91.
7. Cherpitel CJ. Alcohol and violence-related injuries: an emergency room study. Addiction. 1993; 88:79–88.
8. Rockett IR, Putnam SL, Jia H, Smith GS. Assessing substance abuse treatment need: a statewide hospital emergency department study. Ann Emerg Med. 2003; 41:802–13.
9. Lowenstein SR, Koziol-McLain J, Thompson M, et al. Behavioral risk factors in emergency department patients: a multisite survey. Acad Emerg Med. 1998; 5:781–7.
10. Lowenstein SR, Tomlinson D, Koziol-McLain J, Prochazka A. Smoking habits of emergency department patients: an opportunity for disease prevention. Acad Emerg Med. 1995; 2:165–71.
11. Aseltine RH Jr, DeMartino R. An outcome evaluation of the SOS Suicide Prevention Program. Am J Public Health. 2004; 94:446–51.
12. Academic ED SBIRT Research Collaborative. The impact of screening, brief intervention, and referral for treatment on emergency department patients' alcohol use. Ann Emerg Med. 2007; 50:699–710.
13. Bernstein SL. The impact of smoking-related illness in the ED: an attributable risk model. Am J Emerg Med. 2002; 20:161–4.
14. Tengs TO, Adams ME, Pliskin JS, et al. Five-hundred life-saving interventions and their cost-effectiveness. Risk Anal. 1995; 15:369–90.
15. el-Guebaly N, Armstrong SJ, Hodgins DC. Substance abuse and the emergency room: programmatic implications. J Addict Dis. 1998; 17:21–40.

16. Maio RF, Waller PF, Blow FC, Hill EM, Singer KM. Alcohol abuse/dependence in motor vehicle crash victims presenting to the emergency department. Acad Emerg Med. 1997; 4:256–62.
17. Cherpitel CJ, Ye Y, Bond J. Attributable risk of injury associated with alcohol use: cross-national data from the emergency room collaborative alcohol analysis project. Am J Public Health. 2005; 95:266–72.
18. Becker B, Woolard R, Nirenberg TD, Minugh A, Longabaugh R, Clifford PR. Alcohol use among subcritically injured emergency department patients. Acad Emerg Med. 1995; 2:784–90.
19. American College of Surgeons. Resources for Optimal Care for the Injured Patient. Chicago, IL: American College of Surgeons, 2006.
20. Cherpitel CJ. Analysis of cut points for screening instruments for alcohol problems in the emergency room. J Stud Alcohol. 1995; 56:695–700.
21. Yates DW, Hadfield JM, Peters K. The detection of problem drinkers in the accident & emergency department. Br J Addict. 1987; 82:163–7.
22. Polen MR. Evidence Synthesis No. 58 Part 1. Screening in Primary Care Settings for Illicit Drug Use: Staged Systematic Review for the United States Preventive Services Task Force. Rockville, MD: Agency for Health Care Research and Quality, U.S. Department of Health and Human Services, 2008, AHRQ Publication No. 08-05108-EF-1.
23. Bernstein SL, Boudreaux ED, Cabral L. Efficacy of a brief intervention to improve emergency physicians' smoking cessation counseling skills, knowledge, and attitudes. Subst Abus. 2009; 30:158–81.
24. Vokes NI, Bailey JM, Rhodes KV. ''Should I give you my smoking lecture now or later?'' Characterizing emergency physician smoking discussions and cessation counseling. Ann Emerg Med. 2006; 48:406–14.
25. Pitts SR, Niska RW, Xu J. National Hospital Ambulatory Medical Care Survey: 2006 Emergency Department Summary. Hyattsville, MD: National Center for Health Statistics, 2008.
26. Babor TF, McRee BG, Kassebaum PA, Grimaldi PL, Ahmed K, Bray J. Screening, brief intervention, and referral to treatment (SBIRT): toward a public health approach to the management of substance abuse. Subst Abus. 2007; 28:7–30.
27. Dunn C, Deroo L, Rivara FP. The use of brief interventions adapted from motivational interviewing across behavioral domains: a systematic review. Addiction. 2001; 96:1725–42.
28. Hettema J, Steele J, Miller WR. Motivational interviewing. Annu Rev Clin Psychol. 2005; 1:91–111.
29. Vasilaki EI, Hosier SG, Cox WM. The efficacy of motivational interviewing as a brief intervention for excessive drinking: a meta-analytic review. Alcohol Alcohol. 2006; 41:328–35.
30. Whitlock EP, Polen MR, Green CA, Orleans T, Klein J, U.S. Preventive Services Task Force. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: a summary of the evidence for the U.S. Preventive Services Task Force. Ann Intern Med. 2004; 140:557–68.
31. Bien TH, Miller WR, Tonigan JS. Brief interventions for alcohol problems: a review. Addiction. 1993; 88:315–35.
32. Substance Abuse and Mental Health Services Administration. Alcohol Screening and Brief Intervention for Trauma Patients. Washington, DC: SAMHSA, 2007.
33. D'Onofrio G, Pantalon MV, Degutis LC, Fiellin DA, O'Connor PG. Development and implementation of an emergency practitioner-performed brief intervention for hazardous and harmful drinkers in the emergency department. Acad Emerg Med. 2005; 12:249–56.
34. Substance Abuse and Mental Health Services Administration. Screening, Brief Intervention, and Referral to Treatment website. U.S. Department of Health and Human Services, Center for Substance Abuse Treatment. Available at: http://sbirt.samhsa.gov/index.htm. Accessed May 11, 2009.
35. Havard A, Shakeshaft A, Sanson-Fisher R. Systematic review and meta-analyses of strategies targeting alcohol problems in emergency departments: interventions reduce alcohol-related injuries. Addiction. 2008; 103:368–76.
36. Crawford MJ, Patton R, Touquet R, et al. Screening and referral for brief intervention of alcohol-misusing patients in an emergency department: a pragmatic randomised controlled trial. Lancet. 2004; 364:1334–9.
37. Hungerford DW, Pollock DA. Alcohol Problems among Emergency Department Patients. Proceedings of a Research Conference on Identification and Intervention. Paper presented at: National Center for Injury Prevention and Control, 2002, Atlanta, GA.
38. Longabaugh R, Woolard RE, Nirenberg TD, et al. Evaluating the effects of a brief motivational intervention for injured drinkers in the emergency department. J Stud Alcohol. 2001; 62:806–16.
39. Daeppen JB, Gaume J, Bady P, et al. Brief alcohol intervention and alcohol assessment do not influence alcohol use in injured patients treated in the emergency department: a randomized controlled clinical trial. Addiction. 2007; 102:1224–33.
40. Rodriguez-Martos A, Santamarina E, Torralba L, Escayola M, Marti J, Plasencia A. [Short-term effectiveness of brief interventions in alcohol-positive traffic casualties] [in Spanish]. Gac Sanit. 2005; 19:45–9.
41. Dauer AR, Rubio ES, Coris ME, Valls JM. Brief intervention in alcohol-positive traffic casualties: is it worth the effort? Alcohol Alcohol. 2006; 41:76–83.
42. D'Onofrio G, Pantalon MV, Degutis LC, et al. Brief intervention for hazardous and harmful drinkers in the emergency department. Ann Emerg Med. 2008; 51:742–50.
43. Monti PM, Colby SM, Barnett NP, et al. Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. J Consult Clin Psychol. 1999; 67:989–94.

44. Monti PM, Barnett NP, Colby SM, et al. Motivational enhancement of alcohol-involved adolescents. In: Monti PM, Colby SM, O'Leary TA (eds). Adolescents, Alcohol and Substance Abuse: Reaching Teens Through Brief Interventions. New York, NY: The Guilford Press, 2001, pp 145–82.
45. Nilsen P, Baird J, Mello MJ, et al. A systematic review of emergency care brief alcohol interventions for injury patients. J Subst Abuse Treat. 2008; 35:184–201.
46. Bock BC, Becker BM, Niaura RS, Partridge R, Fava JL, Trask P. Smoking cessation among patients in an emergency chest pain observation unit: outcomes of the Chest Pain Smoking Study (CPSS). Nicotine Tob Res. 2008; 10:1523–31.
47. Centers for Disease Control. State-specific prevalence and trends in adult cigarette smoking–United States, 1998–2007. Morb Mortal Wkly Rep. 2009; 58:221–6.
48. Boudreaux ED, Baumann BM, Perry J, et al. Emergency department initiated treatments for tobacco (EDITT): a pilot study. Ann Behav Med. 2008; 36:314–25.
49. Bernstein SL, Cooperman N, Bijur PE, et al. Efficacy of a multicomponent intervention for smoking cessation in adult ED patients [abstract]. Acad Emerg Med. 2008; 15:S35–36.
50. Compton P, Monahan G, Simmons-Cody H. Motivational interviewing: an effective brief intervention for alcohol and drug abuse patients. Nurse Pract. 1999; 24:27–8.
51. Weaver MF, Jarvis MA, Schnoll SH. Role of the primary care physician in problems of substance abuse. Arch Intern Med. 1999; 159:913–24.
52. Dunn CW, Ries R. Linking substance abuse services with general medical care: integrated, brief interventions with hospitalized patients. Am J Drug Alcohol Abuse. 1997; 23:1–13.
53. Greber RA, Allen KM, Soeken KL, Solounias BL. Outcome of trauma patients after brief intervention by a substance abuse consultation service. Am J Addict. 1997; 6:38–47.
54. Copeland J, Swift W, Roffman R, Stephens R. A randomized controlled trial of brief cognitive-behavioral interventions for cannabis use disorder. J Subst Abuse Treat. 2001; 21:55–64.
55. Lang E, Afilalo M, Vandal AC, et al. Impact of an electronic link between the emergency department and family physicians: a randomized controlled trial. Can Med Assoc J. 2006; 174:313–8.
56. Bernstein E, Bernstein J, Feldman J, et al. An evidence based alcohol screening, brief intervention and referral to treatment (SBIRT) curriculum for emergency department (ED) providers improves skills and utilization. Subst Abus. 2007; 28:79–92.
57. Bernstein E, Bernstein J, Levenson S. Project ASSERT: an ED-based intervention to increase access to primary care, preventive services, and the substance abuse treatment system. Ann Emerg Med. 1997; 30:181–9.
58. Stotts AL, Schmitz JM, Rhoades HM, Grabowski J. Motivational interviewing with cocaine-dependent patients: a pilot study. J Consult Clin Psychol. 2001; 69:858–62.
59. Tait RJ, Hulse GK, Robertson SI, Sprivulis PC. Emergency department-based intervention with adolescent substance users: 12-month outcomes. Drug Alcohol Depend. 2005; 79:359–63.
60. Bashir K, King M, Ashworth M. Controlled evaluation of brief intervention by general practitioners to reduce chronic use of benzodiazepines. Br J Gen Pract. 1994; 44:408–12.
61. Stephens RS, Roffman RA, Curtin L. Comparison of extended versus brief treatments for marijuana use. J Consult Clin Psychol. 2000; 68:898–908.
62. Marijuana Treatment Project Research Group. Brief treatments for cannabis dependence: findings from a randomized multisite trial. J Consult Clin Psychol. 2004; 72:455–66.
63. Lang E, Engelander M, Brooke T. Report of an integrated brief intervention with self-defined problem cannabis users. J Subst Abuse Treat. 2000; 19:111–6.
64. Bernstein J, Bernstein E, Tassiopoulos K, Heeren T, Levenson S, Hingson R. Brief motivational intervention at a clinic visit reduces cocaine and heroin use. Drug Alcohol Depend. 2005; 77:49–59.
65. Broderick KB, Ranney ML, Vaca FE, et al. Study designs and evaluation models for emergency department public health research. Acad Emerg Med. 2009; 16:1124–31.
66. Cherpitel CJ, Borges G. Performance of screening instruments for alcohol problems in the ER: a comparison of Mexican-Americans and Mexicans in Mexico. Am J Drug Alcohol Abuse. 2000; 26:683–702.
67. Cherpitel CJ. Alcohol and injuries: a review of international emergency room studies since 1995. Drug and Alcohol Review. 2007; 26:201–4.
68. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders identification Test (AUDIT):WHO collaborative project on early detection of persons with harmful alcohol consumption-II. Addiction. 1993; 88:791–804.
69. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. Arch Intern Med. 1998; 158:1789–95.
70. Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a brief screen for alcohol misuse in primary care. Alcohol Clin Exp Res. 2007; 31:1208–17.
71. Reinert DF, Allen JP. The alcohol use disorders identification test: an update of research findings. Alcohol Clin Exp Res. 2007; 31:185–99.
72. Dawson DA, Grant BF, Stinson FS, Zhou Y. Effectiveness of the derived Alcohol Use Disorders Identification Test (AUDIT-C) in screening for alcohol use disorders and risk drinking in the US general population. Alcohol Clin Exp Res. 2005; 29:844–54.

73. Forsberg L, Ekman S, Halldin J, Ronnberg S. Brief interventions for risk consumption of alcohol at an emergency surgical ward. Addict Behav. 2000; 25:471–5.
74. Bradley KA, Bush KR, Epler AJ, et al. Two brief alcohol-screening tests From the Alcohol Use Disorders Identification Test (AUDIT): validation in a female Veterans Affairs patient population. Arch Intern Med. 2003; 163:821–9.
75. Wallace P. Patients with alcohol problems–simple questioning is the key to effective identification and management. Br J Gen Pract. 2001; 51:172–3.
76. Nordqvist C, Johansson K, Bendtsen P. Routine screening for risky alcohol consumption at an emergency department using the AUDIT-C questionnaire. Drug Alcohol Depend. 2004; 74:71–5.
77. Gordon AJ, Maisto SA, McNeil M, et al. Three questions can detect hazardous drinkers. J Fam Pract. 2001; 50:313–20.
78. Canagasaby A, Vinson DC. Screening for hazardous or harmful drinking using one or two quantity-frequency questions. Alcohol Alcohol. 2005; 40:208–13.
79. Cherpitel CJ. A brief screening instrument for problem drinking in the emergency room: the RAPS4. Rapid Alcohol Problems Screen. J Stud Alcohol. 2000; 61:447–9.
80. Neumann T, Neuner B, Weiss-Gerlach E, et al. The effect of computerized tailored brief advice on at-risk drinking in subcritically injured trauma patients. J Trauma. 2006; 61:805–14.
81. Walton MA, Cunningham R, Goldstein AL, et al. Rates and correlates of violent behaviors among adolescents treated in an urban ED. J Adolesc Health. 2009; 45:77–83.
82. National Institute on Alcohol Abuse and Alcoholism. Helping Patients Who Drink Too Much: A Clinician's Guide. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism, 2005, NIH publication No. 05-3769.
83. D'Onofrio G, Bernstein E, Bernstein J, et al. Patients with alcohol problems in the emergency department, part 1: improving detection. SAEM Substance Abuse Task Force. Society for Academic Emergency Medicine. Acad Emerg Med. 1998; 5:1200–9.
84. WHO ASSIST Working Group. The alcohol, smoking and substance involvement screening test (ASSIST): development, reliability and feasibility. Addiction. 2002; 97:1183–94.
85. National Institute on Drug Abuse. NIDA-Modified ASSIST-Prescreen V1.0. National Institute of Health. Available at: http://www.drugabuse.gov/nidamed/screening/nmassist.pdf. Accessed Jun 10, 2009.
86. Longabaugh R. The search for mechanisms of change in behavioral treatments for alcohol use disorders: a commentary. Alcohol Clin Exp Res. 2007; 31(10 Suppl):21s–32s.
87. Moyer A, Finney JW, Swearingen CE, Vergun P. Brief interventions for alcohol problems: a meta-analytic review of controlled investigations in treatment-seeking and non-treatment-seeking populations. Addiction. 2002; 97:279–92.
88. Touquet R, Brown A. PAT (2009)-revisions to the Paddington Alcohol Test for early identification of alcohol misuse and brief advice to reduce emergency department re-attendance. Alcohol Alcohol. 2009; 44:284–6.
89. Amrhein PC, Miller WR, Yahne CE, Palmer M, Fulcher L. Client commitment language during motivational interviewing predicts drug use outcomes. J Consult Clin Psychol. 2003; 71:862–78.
90. Miller WR, Rollnick S. Motivational Interviewing: Preparing People for Change, 2nd ed. New York, NY: The Guilford Press, 2002.
91. Moyers TB, Martin T. Therapist influence on client language during motivational interviewing sessions. J Subst Abuse Treat. 2006; 30:245–51.
92. Moyers TB, Martin T, Christopher PJ, Houck JM, Tonigan JS, Amrhein PC. Client language as a mediator of motivational interviewing efficacy: where is the evidence? Alcohol Clin Exp Res. 2007; 31(10 Suppl):s40–7.
93. Monti PM, Barnett NP, Colby SM, et al. Motivational interviewing versus feedback only in emergency care for young adult problem drinking. Addiction. 2007; 102:1234–43.
94. Barry KL. Brief Interventions and Brief Therapies for Substance Abuse. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment, 1999.
95. Bernstein SL, Bernstein E, Boudreaux ED, et al. Public health considerations in knowledge translation in the emergency department. Acad Emerg Med. 2007; 14:1036–41.
96. Rhodes KV, Lauderdale DS, Stocking CB, Howes DS, Roizen MF, Levinson W. Better health while you wait: a controlled trial of a computer-based intervention for screening and health promotion in the emergency department. Ann Emerg Med. 2001; 37:284–91.
97. Maio RF, Shope JT, Blow FC, et al. A randomized controlled trial of an emergency department-based interactive computer program to prevent alcohol misuse among injured adolescents. Ann Emerg Med. 2005; 45:420–9.
98. Mello MJ, Longabaugh R, Baird J, Nirenberg T, Woolard R. DIAL: a telephone brief intervention for high-risk alcohol use with injured emergency department patients. Ann Emerg Med. 2008; 51:755–64.
99. Walters ST, Wright JA, Shegog R. A review of computer and Internet-based interventions for smoking behavior. Addict Behav. 2006; 31:264–77.
100. Schinke SP, Schwinn TM, Ozanian AJ. Alcohol abuse prevention among high-risk youth: computer-based intervention. J Prev Interv Community. 2005; 29:117–30.
101. Carey KB, Henson JM, Carey MP, Maisto SA. Computer versus in-person intervention for students violating campus alcohol policy. J Consult Clin Psychol. 2009; 77:74–87.
102. Carey KB, Scott-Sheldon LA, Carey MP, DeMartini KS. Individual-level interventions to reduce college

student drinking: a meta-analytic review. Addict Behav. 2007; 32:2469–94.
103. Dimeff LA, McNeely M. Computer-enhanced primary care practitioner advice for high-risk college drinkers in a student primary health-care setting. Cog Behav Pract. 2000; 7:82–100.
104. Chiauzzi E, Green TC, Lord S, Thum C, Goldstein M. My student body: a high-risk drinking prevention web site for college students. J Am Coll Health. 2005; 53:263–74.
105. Saunders JB, Kypri K, Walters ST, Laforge RG, Larimer ME. Approaches to brief intervention for hazardous drinking in young people. Alcohol Clin Exp Res. 2004; 28:322–9.
106. Marlatt GA, Baer JS, Kivlahan DR, et al. Screening and brief intervention for high-risk college student drinkers: results from a 2-year follow-up assessment. J Consult Clin Psychol. 1998; 66:604–15.
107. Skinner HA. Promoting Health through Organizational Change. San Francisco, CA: Benjamin Cummings, 2001.
108. Butler SF, Chiauzzi E, Bromberg JI, et al. Computer-assisted screening and intervention for alcohol problems in primary care. J Tech Human Serv. 2003; 21:1–19.
109. Copeland J, Martin G. Web-based interventions for substance use disorders: a qualitative review. J Subst Abuse Treat. 2004; 26:109–16.
110. Jessor R. Risk behavior in adolescence: a psychosocial framework for understanding and action. J Adolesc Health. 1991; 12:597–605.
111. Blow FC, Barry KL, Walton MA, et al. The efficacy of two brief intervention strategies among injured, at-risk drinkers in the emergency department: impact of tailored messaging and brief advice. J Stud Alcohol. 2006; 67:568–78.
112. Leontieva L, Horn K, Haque A, Helmkamp J, Ehrlich P, Williams J. Readiness to change problematic drinking assessed in the emergency department as a predictor of change. J Crit Care. 2005; 20:251–6.
113. Walton MA, Cunningham RM, Chermack ST, Maio R, Blow FC, Weber J. Correlates of violence history among injured patients in an urban emergency department: gender, substance use, and depression. J Addict Dis. 2007; 26:61–75.
114. Bazargan-Hejazi S, Bing E, Bazargan M, et al. Evaluation of a brief intervention in an inner-city emergency department. Ann Emerg Med. 2005; 46:67–76.
115. Walton M, Goldstein AL, Chermack S, et al. Brief alcohol intervention in the emergency department: moderators of effectiveness. J Stud Alcohol. 2008; 69:550–60.
116. Barnett NP, Goldstein AL, Murphy JG, Colby SM, Monti PM. ''I'll never drink like that again'': characteristics of alcohol-related incidents and predictors of motivation to change in college students. J Stud Alcohol. 2006; 67:754–63.
117. Cherpitel CJ, Ye Y, Bond J, et al. The effect of alcohol consumption on emergency department services use among injured patients: a cross-national emergency room study. J Stud Alcohol. 2006; 67:890–7.
118. Johnston LD, O'Malley PM, Bachman PM, Schulenberg JE. Monitoring the Future: National Results on Adolescent Drug Use: Overview of Key Findings, 2003. Bethesda, MD: National Institute on Drug Abuse; 2004, NIH Publication No. 04-5506.
119. Scheier LM. Etiologic studies of adolescent drug use: a compendium of data resources and their implications for prevention. J Prim Prev. 2001; 22:125–68.
120. Schulenberg JE, Maggs JL. A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. J Stud Alcohol Suppl. 2002; 14:54–70.
121. Grant BF. Prevalence and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. J Stud Alcohol. 1997; 58:464–73.
122. Wells JE, Horwood LJ, Fergusson DM. Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood. Addiction. 2004; 99:1529–41.
123. Warner LA, White HR, Johnson V. Alcohol initiation experiences and family history of alcoholism as predictors of problem-drinking trajectories. J Stud Alcohol Drugs. 2007; 68:56–65.
124. Chung T, Colby SM, Barnett NP, Rohsenow DJ, Spirito A, Monti PM. Screening adolescents for problem drinking: performance of brief screens against DSM-IV alcohol diagnoses. J Stud Alcohol. 2000; 61:579–87.
125. Baird J, Longabaugh R, Lee CS, et al. Treatment completion in a brief motivational intervention in the emergency department: the effect of multiple interventions and therapists' behavior. Alcohol Clin Exp Res. 2007; 31(10 Suppl):71s–75s.
126. Kunz FM Jr, French MT, Bazargan-Hejazi S. Cost-effectiveness analysis of a brief intervention delivered to problem drinkers presenting at an inner-city hospital emergency department. J Stud Alcohol. 2004; 65:363–70.
127. Gentilello LM. Alcohol interventions in trauma centers: the opportunity and the challenge. J Trauma. 2005; 3(Suppl):S18–20.
128. Fleming MF, Mundt MP, French MT, Manwell LB, Stauffacher EA, Barry KL. Brief physician advice for problem drinkers: long-term efficacy and benefit-cost analysis. Alcohol Clin Exp Res. 2002; 26:36–43.
129. Fiore M, Jaen CR, Baker TB, et al. Treating Tobacco Use and Dependence: 2008 Update Clinical Practice Guideline. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, 2008.