

Screening, Brief Intervention, and Referral to Treatment (SBIRT): Toward a Public Health Approach to the Management of Substance Abuse

Thomas F. Babor, PhD, MPH

Bonnie G. McRee, MPH

Patricia A. Kassebaum, MA

Paul L. Grimaldi, PhD

Kazi Ahmed, PhD

Jeremy Bray, PhD

SUMMARY. Screening, Brief Intervention, and Referral to Treatment (SBIRT) is a comprehensive and integrated approach to the delivery of early intervention and treatment services through universal screening for persons with substance use disorders and those at risk. This paper describes research on the components of SBIRT conducted during the past 25 years, including the development of screening tests, clinical trials of brief interventions and implementation research. Beginning in the 1980s, concerted efforts were made in the US and at the World Health Organization to provide an evidence base for alcohol screening and brief intervention in primary health care settings. With the development of reliable and accurate screening tests for alcohol, more than a hundred clinical trials were conducted to evaluate the efficacy and cost effectiveness of alcohol screening and brief intervention in primary care, emergency departments and trauma centers. With the accumulation of positive evidence, implementation research on alcohol SBI was begun in the 1990s, followed by trials of similar methods for other substances (e.g., illicit drugs, tobacco, prescription drugs) and by national demonstration programs in the US and other countries. The results of these efforts demonstrate the cumulative benefit of translational research on health care delivery systems and substance abuse policy. That SBIRT yields short-term improvements in individuals' health is irrefutable; long-term effects on population health have not yet been demonstrated, but simulation models suggest that the benefits could be substantial. doi:10.1300/J465v28n03_03 [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2007 by The Haworth Press, Inc. All rights reserved.]

Thomas F. Babor and Bonnie G. McRee are affiliated with the University of Connecticut School of Medicine. Patricia A. Kassebaum, Paul L. Grimaldi, and Kazi Ahmed are affiliated with JBS International, Inc., Silver Spring, MD.

Jeremy Bray is affiliated with RTI International, Research Triangle Park, NC.

Address correspondence to: Thomas F. Babor, The University of Connecticut School of Medicine, 263 Farmington Avenue, Farmington, CT 06030 (E-mail: babor@nso.uchc.edu).

The writing of this paper was supported by the Center for Substance Abuse Treatment, Substance Abuse and Mental Health Services Administration [SBIRT Contract No. is 270-03-1000 and the Task Order No. is 270-03-1007].

[Haworth co-indexing entry note]: "Screening, Brief Intervention, and Referral to Treatment (SBIRT): Toward a Public Health Approach to the Management of Substance Abuse." Babor, Thomas F. et al. Co-published simultaneously in *Substance Abuse* (The Haworth Medical Press, an imprint of The Haworth Press, Inc.) Vol. 28, No. 3, 2007, pp. 7-30; and *Alcohol/Drug Screening and Brief Intervention: Advances in Evidence-Based Practice* (ed: Richard Saitz, and Marc Galanter) The Haworth Medical Press, an imprint of The Haworth Press, Inc., 2007, pp. 7-30. Single or multiple copies of this article are available for a fee from The Haworth Document Delivery Service [1-800-HAWORTH, 9:00 a.m. - 5:00 p.m. (EST). E-mail address: docdelivery@haworthpress.com].

Available online at <http://suba.haworthpress.com>

© 2007 by The Haworth Press, Inc. All rights reserved.

doi:10.1300/J465v28n03_03

KEYWORDS. Alcohol, screening, substance abuse, brief intervention, SBIRT, drugs

INTRODUCTION

Screening, Brief Intervention, and Referral to Treatment (SBIRT) is a comprehensive, integrated, public health approach to the delivery of early intervention and treatment services for persons with substance use disorders, as well as those who are at risk of developing them. SBIRT is based on public health principles and procedures, and is designed to reduce the burden of injury, disease and disability associated with the misuse of psychoactive substances, particularly alcohol, illicit drugs, tobacco products, and prescription medications with high abuse potential. The aims of this review are to summarize the research base and state of knowledge on SBIRT. For the purposes of this review, the following are considered core components of SBIRT:

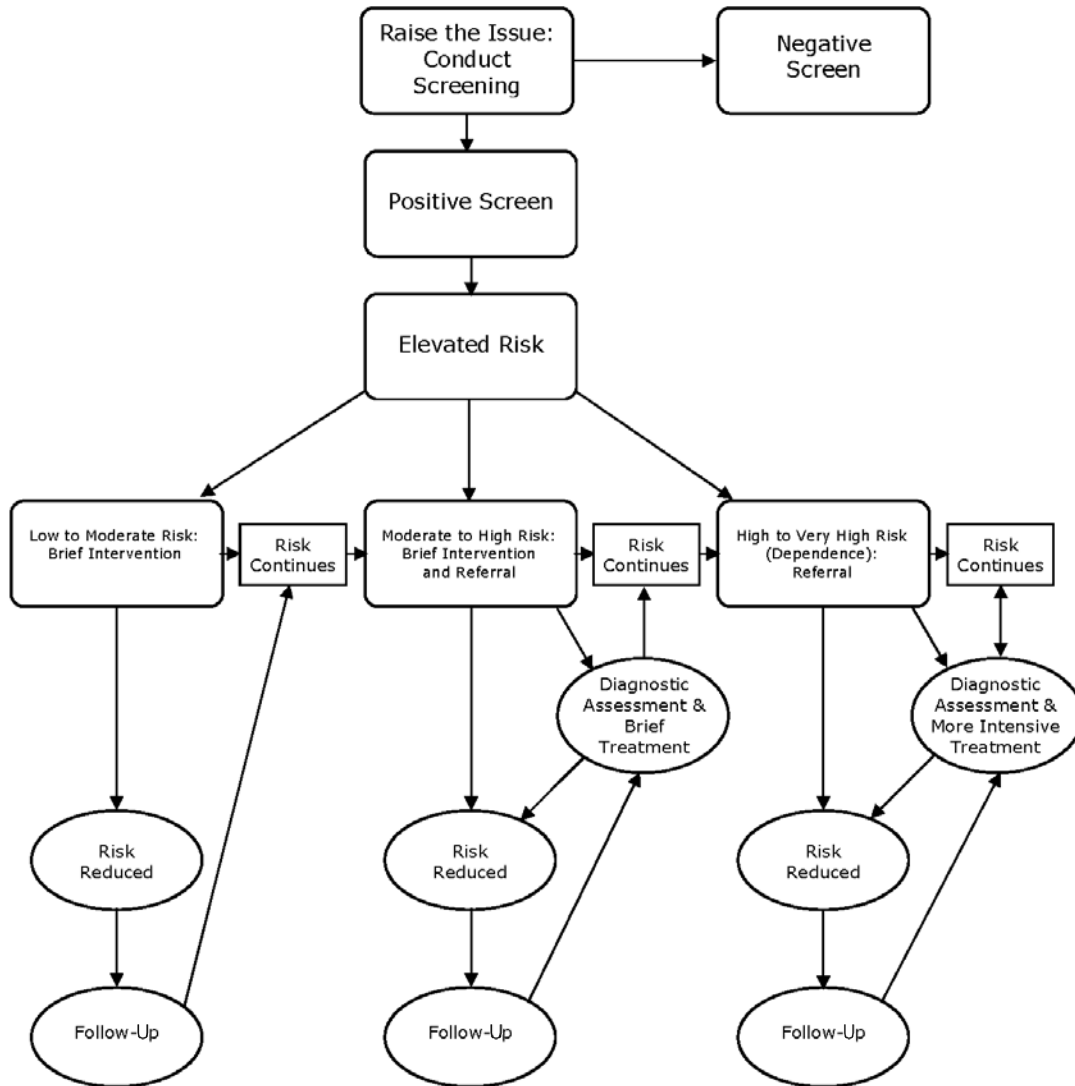
- *Screening:* SBIRT begins with the introduction of systematic screening into the normal routine at medical facilities and other community settings where persons with substance use disorders are likely to be found. Screening is by definition a preliminary procedure to evaluate the likelihood that an individual has a substance use disorder or is at risk of negative consequences from use of alcohol or other drugs. Whereas screening tests were initially developed to identify active cases of alcohol and drug dependence, in recent years the aim has been expanded to cover the full spectrum ranging from risky substance use to alcohol or drug dependence. Because the population of persons with risk factors is much larger than the population of dependence cases (1), SBIRT programs focusing on early intervention have generally adopted a broad definition of screening.
- *Brief intervention:* The term brief intervention refers to any time-limited effort (e.g., 1-2 conversations or meetings) to provide information or advice, increase motivation to avoid substance use, or to teach behavior change skills that will reduce substance use as well as the chances of negative consequences. Brief interven-

tions are typically delivered to those individuals at low to moderate risk. Among the most cost-effective and time efficient interventions are brief motivational conversations between a health care professional and a substance user.

- *Brief treatment:* Brief treatment refers to the delivery of time-limited, structured (or specific) therapy for a substance use disorder by a trained clinician and is typically delivered to those at higher risk or in the early stages of dependence. It generally involves 2-6 sessions of cognitive-behavioral or motivational enhancement therapy with clients who are seeking help. Brief treatment may also include the ongoing management of substance use disorders in primary care settings, especially with the use of new pharmaceutical agents.
- *Referral to treatment:* Screening often identifies those who already have a substance-related health condition or a suspected substance use disorder that warrants a formal diagnosis and possible referral to treatment. The referral process facilitates access to care (including brief treatment) for those individuals who have more serious signs of substance dependence and require a level of care outside the scope of brief services.
- *Integration and coordination activities:* In many communities screening and brief intervention services are nonexistent, diagnostic and referral services are fragmented and inconsistent, and specialized treatment services operate independently of the larger health care system. A key aspect of SBIRT is the integration and coordination of these four components into a system of services linking the specialized treatment programs in a community with a network of early intervention and referral activities that are conducted in medical and social service settings.

As shown in Figure 1, SBIRT can be described as a set of inter-related services linked by decision rules that determine the appropriate course of action for a given patient. When risk is

FIGURE 1. SBIRT logic model



elevated but in the low range, brief intervention is the recommended course. Evidence is lacking regarding an exact cutoff for moderate risk, but several screening tests such as the AUDIT (2) have defined a mid-range of risk scores where further assessment, monitoring and brief treatment are warranted. Conceptually, anyone with elevated risk is eligible to begin with brief intervention even if the intent of the clinician is to deliver a referral to treatment or provide brief treatment. And in some cases, screening can lead directly to referral without feedback and advice. For those at low/moderate risk, the initial clinical procedure is brief intervention. For

those at moderate or high risk, or with dependence, the goal would be a brief intervention that encourages entry into brief treatment or specialty treatment, respectively. Clearly many people at higher risk identified by screening will not receive specialty treatment. Follow-up ovals include arrows pointing back to the risk ovals in order to stress the need for continued monitoring and referral to further treatment if necessary.

The model for SBIRT is based in part on the Institute of Medicine (3) report that recommends the development of integrated service systems linking community-based screening

and brief intervention with assessment and referral activities. One important function of SBIRT is to fill the gap between primary prevention efforts and more intensive treatment for persons with serious substance use disorders. From a public health perspective, the goal of SBIRT is to improve the health of a community by reducing the prevalence of adverse consequences of substance misuse, including but not limited to diagnosable abuse or dependence, through the coordination of early intervention and referral to specialized treatment. When all components are functioning effectively in health care and social service agencies throughout a community, SBIRT programs should be capable of reaching a significant proportion of the population using psychoactive substances.

A BRIEF HISTORY OF SBIRT

Although some SBIRT components date back as far as the early 18th century (4), it was not until the development of effective screening tests for alcohol and drug use in the 1980s that SBIRT emerged as a viable public health approach to addressing substance misuse. Screening instruments such as the MAST, the CAGE and the DAST were first developed to identify active cases of alcohol and drug dependence for referral to treatment (5). In the 1980s a seminal study by Russell et al. (6) showed how brief physician advice was capable of motivating small but significant numbers of patients to stop smoking. Subsequent research in Malmo, Sweden (7) indicated that systematic screening combined with brief interventions delivered in primary care settings were capable of reaching large numbers of at-risk drinkers, many of whom reduced their alcohol consumption in response to the program. The public health implications of the Malmo study for the prevention of alcohol problems led the World Health Organization (WHO) to initiate a program of clinical and applied research on the development of an international screening test and the evaluation of brief interventions for at-risk drinkers (8). That program, begun in 1981, led to the development of the Alcohol Use Disorders Identification Test (9) as well as the first cross-national clinical

trial of the effectiveness of brief interventions in health care settings (10). The WHO program was expanded to include a consortium of researchers investigating ways to implement screening and brief intervention technologies in primary care settings, as well as the development of national plans to integrate SBIRT activities into the health care systems of both developed and developing countries (8). A related program was initiated in 1997 to develop a screening test and brief interventions for illicit drugs as well as alcohol and tobacco (11). These projects have been conducted during a 25-year period when there has been a dramatic increase in clinical and health services research on screening and brief intervention for alcohol and other substances. This research has been conducted primarily in the United States, Australia and European countries and has been accompanied by evaluations of training packages, implementation models, program costs and systems changes necessary to facilitate the adoption of SBIRT programs (2).

Perhaps the most significant development in this evidence-based movement to test and disseminate new screening and intervention technologies in the US is the Substance Abuse Mental Health Services Administration's SBIRT initiative, which consists of a variety of demonstration programs operating in 11 states. Other large scale programs have been implemented in Brazil, South Africa and the European Union. In the remainder of this review, we will critically evaluate the literature supporting the various components of SBIRT, summarizing this evidence in terms of its practical applications for program planners, administrators, and policymakers.

SCREENING

An important prerequisite for the SBIRT approach is the accurate identification of people at risk as well as active cases of substance abuse and dependence. Screening for alcohol, tobacco and other drugs has been gaining popularity in health care settings because of new technologies, expert committee recommendations and encouraging research findings about the effectiveness of early intervention (5,12,13). Table 1 provides a compendium of 25 self-re-

port screening tests for alcohol and other substance use, abuse and dependence. The tests were identified in an extensive review of the literature published in peer reviewed journals covered in Index Medicus. For each screening test, the compendium lists the item content, target population, administration mode, number of items, scoring time, and the time frame of measurement. In this section, we update an evaluation of screening tests initially conducted by Babor and Kadden (5). Screening tests for alcohol and drugs are reviewed separately, and in both types of substances we further distinguish between self-report screening tests and biological tests that are conducted on samples of body fluids.

Alcohol screening tests: One of the first alcohol screening procedures, the Michigan Alcoholism Screening Test (MAST, 14), consists of 24 yes-no questions that list signs and symptoms of chronic alcoholism. The MAST has been criticized because of its length, its potential for falsification, and its focus on finding cases of alcohol dependence rather than early identification of risk factors. The shorter 12-item MAST (15) and the four-item CAGE screening test (16) increase the feasibility of screening but still maintain a focus on identifying active alcoholics. An added disadvantage of these screening tests is their use of questions measuring “lifetime” symptoms (“have you ever . . .”), which can produce false positives when the alcohol problems occurred in the past but have since remitted. A disguised screening test based on the patient’s history of traumatic injury (17) was developed to deal with the falsification problem, but this was done at the expense of sensitivity and specificity.

A number of alcohol screening tests have been developed for special populations, including women (18,19) and the elderly (20). The World Health Organization developed the Alcohol Use Disorders Identification Test (AUDIT) (9,2) in order to maximize cultural and linguistic generalizability of screening results. The AUDIT focuses on both hazardous drinking as well as alcohol use disorders. The AUDIT has been well validated across different cultural groups in a variety of countries, and several shorter adaptations have been developed, including the AUDIT-PC, the AUDIT-FAST, and the AUDIT-C, all of which focus

mainly on the quantity, frequency and pattern of drinking (21,22). Finally, several single item screening tests have been developed and validated. Williams and Vinson (23) found that a single question about the last episode of heavy drinking has good sensitivity and specificity in detecting hazardous drinking and alcohol use disorders. O’Brien et al. (24) found that by asking “How many days do you get drunk?” in a typical week, they could identify college students who are at higher risk of alcohol-related injury. To the extent that very short screening tests may motivate clinicians to screen more often, these tests may have value (see, for example, 25). Nevertheless, the value of longer tests is that the patient’s responses to questions about drinking and alcohol problems can be the immediate point of departure for a brief intervention, which typically begin with a discussion of specific screening results.

Although not recommended for routine screening, several biological markers have been useful adjuncts to alcohol screening in emergency medicine and criminal justice settings, such as the breath alcohol concentration (BAC), gamma-glutamyltransferase (GGT, a liver enzyme), and carbohydrate-deficient transferrin (CDT). BAC has a short half-life and does not provide information about risk behavior other than to estimate the extent of recent drinking. GGT and CDT have not been found to be sensitive or specific enough to detect heavy episodic drinking (26).

Other psychoactive substances: Given the different needs and substance use patterns of adults and adolescents, self-report drug screening tests have generally been designed and validated for one or the other of these populations. Two types of self-report tests have been developed for adults. The first, exemplified by the Drug Abuse Screening Test (DAST; 27), consists of direct obvious or face valid questions about drug use and related problems that yields a quantitative score reflecting the severity of drug abuse. A later version of the DAST reduced the number of items from 28 to 10 without compromising reliability (28). In contrast to screening tests that ask directly about substance use, several tests have been developed to measure risk factors that are associated with actual or potential substance use disorders. However, tests of this type tend to be quite long. For exam-

TABLE 1. Compendium of Alcohol and Drug Self-Report Screening Tests^a

Name/Citation^b	Content area^c	Target Population^d	Mode^e	No. Items^f	Admin. Time (minutes)	Scoring / interpret (minutes)	Time frame
AAIS Adolescent Alcohol Involvement Scale (135)	AP, AU, RF	adolescents	self	14	4	2 / minimal	Lifetime
ARPS Alcohol Related Problem Survey (136)	AP	elderly	self, interview	66	10	2 / also Computer	Past year
ASSIST Alcohol, Smoking, Substance Involvement Screening Test (11)	AP, AU, DP, DU	adults	interview	8	5	1 / minimal	Lifetime, past 90 days
AUDIT Alcohol Use Disorders Identification Test (2)	AP, AU	adults	self, interview	10	3/minimal	1 / minimal	Lifetime, past year
AUDIT - C	AP, AU	general	self, interview	3	1	1 / minimal	Past year
AUDIT - FAST	AP, AU	general	self, interview	4	2	1 / minimal	Past year
AUDIT - PC	AP, AU	general	self, interview	5	2	1 / minimal	Past year
CAGE Cut Down, Annoyed, Guilty, Eye-Opener (16)	AP	general, elderly	self, interview	4	1.	1 / minimal	Lifetime
CAGE - AID (40)	AP, DP	general	self	4	1	1	Lifetime
CRAFFT Car, Relax, Alone, Friends, Forget, Trouble (39)	AP, AU, DP, DU	adolescents, young adults	self, interview	6	2 / minimal	1 / minimal	Lifetime/Ever
CUGE Cut Down, Hurt Under Influence, Guilty, Eye-Opener (21)	AP, AU	college students	self	4	2	1 / minimal	Lifetime
DAST Drug Abuse Screening Test (28)	DP	general, Adolescents	self, Interview	28	5	1 / minimal	Lifetime
DUSI -R Drug Use Screening Inventory--revised (137)	AP, AU, DP, DU	adolescents, adults	self	159	20 - 40	15	Current, lifetime
FAST Fast Alcohol Screening Test (138)	AP, AU	general, emergency	interview	4	1	1	Past year
Five-Shot (139)	AP, AU	general, emergency	interview	5	5	5	Ever, current
MAST Michigan Alcoholism Screening Test (14)	AP	general	self, interview	25	5 / minimal	2 minimal	Lifetime

MSI-X Marijuana Screening Inventory (140)	DP, DU	Adults	self, interview	31	5	1 minimal	Lifetime, past year, past month
POSIT Problem Oriented Screening Instrument for Teenagers (30)	AP, AU, DP, DU, RF	adolescents	self, interview, computer	139	20-30	2- 5	Lifetime, current
RAPS Rapid Alcohol Problems Screen (141)	AP	Emergency patients	self, interview	5	2 minimal	1 minimal	Past year
RUFFT-Cut Riding, Unable to stop, Family & friends Trouble, Cut down (142)	AP, AU	adolescents, emergency	self, interview	5	1 minimal	1 minimal	Lifetime
SASSI Substance Abuse Subtle Screening Inventory (34)	AP, AU, DP, DU, RF	adults, adolescents	self, computer	93	15	5 also computer	Lifetime
SWAG Screening, Women, and Alcohol in Goteborg (143)	AP, AU	women	self	13	2 minimal	1 minimal	Ever
T-ACE Tolerance, Annoyed, Cut Down, Eye-Opener (144)	AP, AU	pregnant women	self, interview	4	2 minimal	1 minimal	Ever, current
Trauma Scale (27)	AP, RF	emergency	interview	4	1 minimal	1 minimal	Ever
TWEAK Tolerance, Worried, Eye-Opener, Amnesia, Cut down (19)	AU, AP	pregnant women	self, interview	5	2 minimal	1 minimal	Ever, current

^a This table is an expanded and updated version of one previously published by Babor and Kadden (2005).

^b Acronym or popular name is given first, followed by full name of test and primary source citation.

^c The following content areas are coded where relevant: AU, alcohol use; DU, drug use; AP, alcohol problems; DP, drug problems; RF, risk factors.

^d The primary target group for which the screening test was developed.

^e Three modes of administration are coded: (1) self-report questionnaire (self); (2) interview; and (3) computer administration in the form of a self-report questionnaire.

^f The number of items for three screening tests (DUSI, SASSI, POSIT) includes direct questions about substance abuse as well as scales measuring related risk factors.

ple, some of these tests are embedded in the Minnesota Multiphasic Personality Inventory, which contains over 500 items, and thus may not be appropriate to use in health care settings where there is limited time to administer and score the screening test (29).

Recognizing the need for a comprehensive screening and referral test for adolescents, the National Institute on Drug Abuse (NIDA) developed the Problem-Oriented Screening Instrument for Teenagers (POSIT) (30). The POSIT consists of 139 items that generate scores indicating problems in ten functional areas that are related directly or indirectly to substance use disorders: Substance Use/Abuse, Mental Health Status, Physical Health Status, Aggressive Behavior/Delinquency, Social Skills, Family Relations, Educational Status, Vocational Status, Peer Relations and Leisure and Recreation. The test has demonstrated good reliability and validity in adolescents referred to an assessment service for evaluation of substance use problems (31), but is too long to serve as a brief screening test. One option is to use only the Substance Use/Abuse part of the test, which would make it more efficient for screening in general health care settings.

In addition to the multidimensional screening approach used in the POSIT, several shorter instruments have been developed to screen specifically for substance use among adolescents. The Personal Experience Screening Questionnaire (PESQ) (32) focuses primarily on drug use and related problems, but also collects information on other areas of concern, such as psychopathology. Reliability and validity of this 38-item test have been demonstrated in the detection of individuals with different histories of substance use (33). Another adolescent screening test that has been used at adolescent treatment programs is the Substance Abuse Subtle Screening Inventory (SASSI, 34), a 78-item self-report instrument that classifies adolescents as chemically dependent. Although the SASSI was designed to prevent deliberate falsification by using indirect questions, it has not been found to be very accurate (35,36). Other screening tests have been designed for more specific populations, such as the 42-item Drug and Alcohol Problem (DAP) Quick Screen, which was developed for use by pediatricians (37). Validity data have been re-

ported for the 30-item revision of this test (38). Finally, the CRAFFT (Car, Relax, Alone, Friends, Forget, Trouble) is brief (6 items) and has been validated with adolescents in primary care settings (39). Because of its brevity, it is more likely to be used than the longer instruments described above.

Combined screening tests: Despite advances in the development of self-report screening tests for specific types of psychoactive substances, there has been considerably less attention to instruments that screen for multiple substances. To address this deficiency, the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST; 11) was developed to screen for at-risk use of psychoactive substances as well as related problems. The test uses a common format to screen for 11 psychoactive substances as well as injection drug use. The scoring procedure estimates the relative importance of these different risk behaviors for the purpose of prioritizing counseling interventions. Although the ASSIST is not able to identify people who exceed risky drinking limits based on quantities of alcohol consumed, these questions can easily be added to obtain country-specific alcohol risk levels.

A major challenge to combined screening for specific substances is provider burden, which refers to the skills and time demanded of the screening agent. A relatively simple procedure that addresses this problem is the CAGE test adapted to include drugs (CAGE-AID). The CAGE-AID was found to be more sensitive but less specific than the CAGE (40). This easy-to-use four-item test nevertheless requires further questioning if the patient scores positive. Thus, efficiency comes at the price of specificity, and screening questions using a lifetime (ever) approach can result in high numbers of false positives.

Biological Screening Methods for Drugs: A variety of biological procedures have been developed to detect recent drug use through urinalysis, hair testing, and saliva tests. These methods are not capable of detecting substance-related problems or even substance use beyond a narrow time window (41). Urine screening tends to be the preferred method because it is less invasive than blood testing and the drugs or their metabolites are present in relatively high concentrations in urine. A recent

innovation that facilitates biological screening is the commercial availability of self-contained urine testing kits. These tests are easy to use and provide rapid access to test results, but they can only indicate drug use over the previous few days. Other problems include a risk of false positives by passive drug exposure or ingestion of foodstuffs, and false negatives due to the use of adulterants.

Summary: There are a number of important issues associated with screening instruments that should be taken into account in the design of an integrated SBIRT program intended to serve the needs of a defined population. First, the accuracy of most of the self-report tests has been evaluated under research conditions, which tend to maximize the likelihood of good performance. Although most screening tests have been found to be valid, performance is likely to diminish in routine clinical settings. A major concern is the extent to which the results of a self-report test can be deliberately faked or distorted in an attempt by the patient to preserve a respectable self-image in the health care or social service setting. Although self-report measures of substance use tend to be valid and reliable in the aggregate under most circumstances, accuracy in clinical settings depends on the degree of perceived threat in the data gathering situation, the cognitive processes (such as memory) that are required to produce answers to the questions, and the motivation and other personal characteristics of the respondent (42). A second consideration is cost and efficiency. Self-report tests are free or inexpensive, and they can be administered and scored quickly. Nevertheless, medical staff sometimes view even a small addition to their routine as an unnecessary burden. Although some screening tests are relatively brief (e.g., CAGE and AUDIT-C) and can be administered in one or two minutes, others require more time and administration skills. Biological tests can be costly to use on a routine basis and require even more time to administer and score. Nevertheless, they are often seen as being more consistent with routine medical practice, and this may affect their acceptability to both patients and staff. A third issue is cultural sensitivity. Although research has not been extensive, there is no evidence to suggest that the reliability or validity of self-report tests varies across different

ethnic groups (9,11). A final issue is the target group of the screening program. Many of the adult screening tests described in Table 1 have been designed for finding active cases of alcohol or drug dependence, not to identify risk factors for drug or alcohol abuse. These tests (e.g., the DAST) typically avoid direct questions about use of specific drugs, focusing instead on the problems associated with any substance use in the past. Subtle or disguised screening tests (e.g., the SASSI) do not appear to be sufficiently sensitive or specific to identify active cases, but may be useful in screening for risk factors. Comprehensive screening tests like the POSIT and ASSIST are capable of identifying both “caseness” and risk factors, but they take more time to administer and score. Even single item or very brief screening tests like the AUDIT-C require further questioning once the patient screens positive, so screening tests with skip-out instructions like the AUDIT and ASSIST may save considerable time because most patients need not be screened further after negative responses to the first few questions.

BRIEF INTERVENTIONS

A key component of the SBIRT approach is the linking of screening results with appropriate early intervention services or referral to treatment. If intervention does not exist or is not feasible or effective, it is not useful to conduct screening. Among the least expensive interventions are brief motivational conversations between the substance user and a concerned physician, a nurse, a physician assistant or a social worker. In this section we review efficacy studies of brief interventions for excessive alcohol or drug use. Given the volume of research literature on this topic for alcohol, we will focus primarily on key studies and the results of meta-analyses of the cumulative literature. Brief interventions for drug use and abuse have been studied considerably less, so this literature is reviewed in terms of its preliminary findings and its deficiencies.

Brief interventions for alcohol abuse and at-risk drinking: In the first systematic review of research on this subject, Bien et al. (43) evaluated 32 controlled studies involving over 6000 patients studied prior to 1992. Brief interven-

tions with problem drinkers were often found to be as effective as more extensive treatments. It was concluded that the course of harmful alcohol use can be effectively altered by relatively brief contacts in contexts such as primary health care settings and employee assistance programs. Kahan et al. (44) reviewed 11 trials of physician-based brief intervention in medical settings and concluded that brief alcohol interventions are effective, and their public health impact is potentially enormous. Twelve randomized controlled trials were reviewed by Wilk et al. (45), who concluded that brief intervention is a low-cost, effective preventive measure for heavy drinkers in outpatient settings. Additional support for these conclusions, based on new analyses of many of the same studies summarized in previous reviews, has been reported by Ballesteros et al. (46). Moyer et al. (47) reviewed studies comparing brief intervention both to untreated control groups and to more extended treatments. They found "further positive evidence" for the effectiveness of brief interventions, especially among patients with less severe problems. In an extensive review of the literature for the U.S. Preventive Services Task Force, Whitlock et al. (13) concluded that behavioral counseling interventions for alcohol misuse among nondependent primary care patients identified by screening are feasible and potentially effective components of an overall public health approach to reducing alcohol misuse.

Most of the studies cited in these reviews were conducted in primary care settings, where the prevalence of alcohol abuse and dependence tends to be lower than what is found in emergency and trauma centers. Emergency departments and trauma centers have been identified as high-yield settings for alcohol screening (12,48,49). A large randomized trial of brief interventions in a trauma center (50) found that a brief motivational intervention was associated with decreased alcohol consumption and a reduced risk of trauma recidivism.

In the course of investigating the efficacy of brief interventions with at-risk drinkers, research has also evaluated the extent to which behavior change is related to individual differences among drinkers, the professional training, ethnicity and gender of the intervention provider, and the nature of the intervention it-

self (13). In general, behavior change is not dependent on provider training or characteristics, but the dependence severity of the drinker does seem to be an important correlate of low response to brief intervention. Regarding the nature of the intervention, skills training, simple advice, and motivational approaches seem to be equally effective. In addition, the interventions seem to be equally effective with adolescents, adults, older adults, and pregnant women.

Despite the general preponderance of positive findings, some studies have shown no differences between intervention and control groups, and many studies report significant reductions in control group drinking that are comparable to those of the intervention group (51). One explanation for this phenomenon is that the screening procedure itself has a motivational effect, although one study found no evidence that assessment alone was responsible for changes in the control group (51). The other explanation is "regression to the mean," which describes a statistical tendency for extreme values such as heavy drinking to return to the group average over time.

Brief intervention for drug use and abuse: In contrast to the alcohol literature, there have been few studies of brief interventions for drug abuse. Bernstein et al. (52) found that brief intervention in a clinical setting can reduce cocaine and heroin use. Brief intervention appeared to facilitate abstinence at 6 months, even in the absence of meaningful contact with the treatment system. Baker et al. (53) found that both the provision of a self-help booklet and a single session of motivational interviewing were associated with reduced amphetamine consumption among regular users. Two studies (54,55) have found that general practitioners can reduce excessive benzodiazepine use in their patients using brief interventions such as letters or consultations. Despite these promising findings from controlled studies, and similar positive results from research described below under Brief Treatment, several investigators have reported negative findings from brief interventions with drug users. Marsden et al. (56) evaluated the effect of a stimulant-focused brief motivational interview (relative to the provision of health risk information about stimulants) among adolescent and young adult stimulant users. No significant differences be-

tween groups were found for ecstasy, powder cocaine, crack or alcohol. Other research (53) with psychiatric inpatients showed similar lack of effectiveness.

Summary: Research on brief interventions for alcohol and other substance users has accumulated rapidly during the past two decades. Not only are the procedures generally effective with a variety of population groups, they can be delivered with equal effect by a variety of health care providers. Less evidence is available regarding the brief interventions for drug users, but several studies show positive effects. An important question that requires further research is the extent to which brief interventions can be made more effective when combined with stepped care strategies that increase the intensity of the intervention for patients who do not respond initially. Among the options are brief treatment and referral to specialized programs serving persons with alcohol or drug dependence.

BRIEF TREATMENT

Brief treatment (BT) refers to the provision of as few as two sessions of therapy by a trained counselor, social worker, psychologist or psychiatrist. While brief interventions focus on motivating clients to change their substance use, brief treatment helps clients develop the skills and resources to change. BTs are often based on motivational approaches (e.g., Motivational Enhancement Therapy) or behavioral approaches (e.g., Cognitive-Behavioral Therapy) or a combination of the two. BT typically includes a standardized assessment procedure, goal-setting, and rapid implementation of change strategies. BT should be characterized as a self-contained modality, rather than fewer sessions of longer term or traditional therapy, or as more sessions of BI. The goals of BT differ from those of both longer term, traditional therapy and of BI. BT tends to focus on the present situation and emphasizes the use of effective therapeutic tools to make specific behavioral changes in a shorter period of time.

Studies have compared BT to more intensive, traditional treatment approaches and to BI approaches. Many have incorporated wait-listed control groups in the experimental de-

sign. Stephens, Roffman and Curtin (57) compared a brief, two-session individual treatment with 14 sessions of cognitive behavioral skills training. Both treatments produced substantial reductions in marijuana use relative to the delayed treatment control condition with treatment gains maintained at 16-month follow-up. The Marijuana Treatment Project (MTP) compared two treatment therapies with a delayed treatment control condition (58). One of the therapies consisted of nine individual counseling sessions delivered over a 12-week period. The other consisted of two motivational enhancement therapy sessions delivered over a one-month period. The nine-session intervention produced significantly greater reductions in marijuana use and associated consequences than the two-session intervention, and at each follow-up point over a 12-month period both treatments produced outcomes superior to the four-month delayed treatment control condition. The results indicate that even a brief two-session treatment is associated with substantial reductions in marijuana use and related problems in chronic marijuana users.

Several studies have demonstrated promising evidence that BT is often as effective as longer term, traditional therapies for substance use disorders (59-61). Moyer et al. (47) found positive evidence for the effectiveness of brief therapies, especially among patients with less severe problems. For clients with greater problem severity, Berglund et al. (62) noted that better results were observed with more treatment. Although studies show that patients who receive more outpatient mental health care tend to have better short-term substance use outcomes (63-65), there is growing evidence that duration and continuity of care is more important than the amount or intensity of care (66-69). The finding that duration of treatment (rather than amount of treatment) for alcohol and drug use disorders is more closely related to outcome suggests that more resources should be devoted to interventions such as brief treatments that are linked to other continuity of care options (70).

Summary: BT models are consistent with a public health approach in which large numbers of individuals at risk of developing serious alcohol or other drug problems may be identified through primary care screening or through

court-mandated treatment (e.g., stemming from DUI arrests). The BT target population has traditionally been those individuals with less severe substance use disorders. However, there is a growing body of evidence to suggest that brief treatments are effective with a wide range of clients, including persons with mild to moderate alcohol dependence and regular marijuana users. BT may also be appropriate for some patients when previous attempts using traditional treatment approaches have failed, when there are insufficient resources (e.g., client time or insurance coverage) available for longer-term therapy, or when there are long waiting lists for specialized treatment. There is no question that BT is more effective than being on a waiting list and could benefit large numbers of clients who are seeking and waiting for longer term care (71).

MEDICATION-ASSISTED TREATMENT IN HEALTHCARE SETTINGS

Recent advances in pharmacological treatment for alcohol and opioid dependence provide significant opportunities to integrate the management of substance use disorders into primary health care. After screening and brief intervention, pharmacotherapy can be initiated in health care settings to assist patients undergoing BT or to facilitate the transition to traditional substance abuse treatment.

Medications for alcohol disorders: Four FDA-approved medications are available that physicians can prescribe to dampen craving, reduce heavy drinking, and/or promote abstinence. These are: naltrexone, a μ (mu)-opiate receptor antagonist; depot naltrexone, an extended-release form of naltrexone that is injected monthly; acamprosate calcium delayed-release tablets; and disulfiram (under supervised administration). These medications can be helpful to patients who are struggling to maintain sobriety and for preventing relapse after referral to treatment.

Of particular interest to SBIRT, one recent study looked at whether general internists and primary care physicians could treat alcohol-dependent patients as effectively as addiction specialists, using naltrexone (72). Results indicated that primary care counseling with

naltrexone pharmacotherapy is a promising approach that can be effective in selected patients. In addition, the long acting, injectable form of naltrexone that is now available may enhance its use in primary care settings (73).

With the newer medications now available, there is increasing interest in whether alcohol-dependent individuals can be treated successfully with FDA-approved medications by their primary care physicians in routine medical practice. The comprehensive COMBINE clinical trial at 11 sites with nearly 1,400 patients explored a variety of treatment methods—alone and in combination—within the context of medical management (74). Alcohol consumption decreased by 80 percent over a 4-month treatment period, which suggests that medical management by primary physicians in routine practice can be of benefit in treating alcohol dependence (75). However, the medical management used in the COMBINE trial was relatively intensive (nine 20-minute sessions), so the minimal level of contact with primary care physicians necessary to manage alcohol-dependent patients has not yet been determined.

The COMBINE Study also found that naltrexone in combination with a brief behavioral therapy delivered by licensed health care professionals is more effective than more intensive behavioral therapy delivered by licensed behavioral health specialists (74).

Medications for drug dependence: The Drug Addiction Treatment Act of 2000 established a new paradigm for the medication-assisted treatment of opioid dependence. Qualifying physicians in a medical office or other appropriate settings may now apply to the Substance Abuse and Mental Health Services Administration (SAMHSA) to prescribe and/or dispense opioid medications for treating opioid addiction. Two sublingual formulations of buprenorphine, a long-acting partial agonist of mu-opioid receptors, have been approved by the FDA for this purpose.

The decision to allow office based treatment of buprenorphine was based on a large body of clinical experience from other countries and the United States (76-78). A Cochrane Review meta-analysis of 13 randomized clinical trials concluded that buprenorphine is an effective intervention for use in the maintenance treatment of heroin dependence (79).

REFERRAL TO ASSESSMENT AND SPECIALIZED SUBSTANCE ABUSE TREATMENT

Research suggests that brief intervention alone may not be sufficient therapy for severely dependent drinkers (80). Because many brief intervention trials specifically exclude people dependent on alcohol or drugs, it is not known whether this population may be helped by brief interventions alone. Thus, for patients with severe conditions, SBIRT programs need to make referrals to more intensive treatment and to mutual support groups such as Alcoholics Anonymous (AA), Narcotics Anonymous (NA), and Cocaine Anonymous (CA).

Research demonstrates that hospital patients identified as substance dependent during medical screening (most of whom are not seeking treatment) can be effectively referred and engaged in specialized treatment at rates much greater than controls (81-85). In these individual program studies, brief interventions have increased the percent of patients who show up for their first clinic appointment from 5 percent among controls to from 50 to 65 percent, with as many as 50 percent of patients reporting that they continue to be involved in some kind of substance abuse treatment or 12-step meetings on follow-up (81-83).

Information is limited about the prognosis for alcohol- and drug-dependent patients seen and referred in other medical settings, where patients are highly heterogeneous in terms of type, stage, and severity of substance problems, with many of these patients not motivated to start treatment (86). Prognosis appears to be strongly related to the patient's motivation to enter treatment, as well as to change drinking or drug-using behavior (85).

The literature provides little information about the specific referral processes used by various SBIRT programs. However, existing evidence suggests that brief motivational interventions have positive benefit on patients' participation in substance abuse treatment and retention in treatment. For example, when one hospital replaced staff referrals with motivational interview techniques done by alcohol specialists, the percent of referred patients who completed treatment increased from 40 to 88 percent (85). In another study, 65 percent of pa-

tients who received a brief motivational intervention kept their initial interview at an alcohol clinic, compared to 5.4 percent of the control group (83).

These findings indicate that SBIRT referral methods need to address the patient's motivation to be treated, with the added intention of reducing the risk of drop-out and assisting the patient's adherence to treatment. Based on the available literature, it is not possible to say which brief intervention approaches, in which settings, and with which patients will be most effective for promoting entry and engagement into specialized alcohol or drug treatment. The research shows that the earlier substance-dependent patients engage in treatment or mutual-help groups, the better the outcomes (87,88).

IMPLEMENTATION, INTEGRATION AND COORDINATION ACTIVITIES

A major challenge to the public health impact of SBIRT is the difficulties involved in integrating its components into relevant parts of the health care system.

Screening: As noted above, progress has been made in the development of a variety of effective screening procedures. Nevertheless, a number of practical and logistical issues need to be resolved before a screening program can be implemented. These issues relate not only to who does the screening, but when, where, how often and who pays for it. Given the simplicity of most self-report screening tests, they are capable of being administered in variety of different settings and modalities, such as interview, questionnaire, and computer. Dyches et al. (89) describe an interactive telephone technology for screening with primary care patients. Both patients and practitioners had rated the procedure positively. Under some circumstances, impersonal procedures, such as paper and pencil questionnaires and computer-assisted telephone interviews, may be more effective than face-to-face interviews with physicians. Saitz et al. (90) report 50,000 visits a year for screening at an internet web site where positive cases received advice and information, suggesting that an accessible web site can attract high risk drinkers for screening and brief intervention.

In the absence of routine screening with standardized instruments, physicians do not systematically apply NIAAA guidelines regarding hazardous drinking levels (91) and may be selective in whom they screen. One study (92) found that physicians were least likely to initiate discussions about drinking with patients who are white, female and widows. A Danish study of screening by general practitioners (93) reported that physicians did not think all patients should be screened. The major barriers were lack of time and financial incentives, and skepticism that patients wanted to be screened.

Some investigators (94) have argued that primary health care is not an effective or efficient place to conduct alcohol screening. Others have suggested alternative sites for screening and professionals who can conduct it. Anderson et al. (95) identified the clergy as potential providers of screening and brief intervention. Hungerford et al. (96) report that screening in an emergency department can produce high rates of acceptance of counseling about alcohol use. In a rural university emergency department (12), only 3% of the patients screened or counseled were uncooperative; 70% thought the emergency department was a good place to help patients with alcohol problems. Another potential setting for screening programs is trauma centers. Schermer et al. (97) found that 70% of trauma patients were successfully screened, with less than 1% refusing. Nevertheless, a survey (98) of 50 insurance commissioners indicated 38 states where there are concerns about the possibility that screening will affect insurance payments, which can be denied in many states if the patient has been drinking.

Brief intervention: According to Roche and Freeman (99), physician-based secondary prevention efforts based on brief interventions for hazardous drinking have failed at the implementation stage. Barriers to implementation include lack of time, poor diagnostic skills, negative attitudes, and perceptions of role incompatibility (100). In a survey of 711 trauma surgeons (97), 83% agreed that the trauma center was an appropriate setting but only 25% used formal screening questionnaires and less than one half of problem patients are addressed in their hospital stay. Barriers included cost,

time, confidentiality and threats to insurance coverage.

To overcome some of these barriers, other delivery agents (e.g., nurses) have been considered. D'Onofrio and Degutis (101) describe the use of non-physician health promotion advocates (HPAs) to do SBI and referrals in the emergency department.

Another way to expand the use of brief interventions is through internet applications. A review of the small number of web-based interventions (102) found that a demand does seem to exist for this kind of service and the potential impact could be considerable. As noted above, Saitz et al. (90) recorded 50,000 screening visits a year at an internet web site. Positive cases received advice and information, suggesting that an accessible web site can attract high-risk drinkers for brief interventions.

Another barrier to brief intervention is competition for the provider's time once a patient screens positive. Saitz et al. (103) showed that the very act of screening can prompt physicians to increase discussions and provide advice. Brady et al. (104) found that prompting of providers using other means doubled the rate of brief intervention. In a study by Kaner et al. (105), patient and practitioner characteristics predicted who got a brief intervention after screening: males, the unemployed, and technically trained workers were more likely to receive an intervention than females and employed persons. In addition, practitioners with more training and longer practice experience were more likely to deliver interventions. Babor et al. (106,107) compared two different implementation strategies for Cutting Back, a primary care alcohol screening and brief intervention program for hazardous and harmful drinkers. In one model, medical providers were responsible for delivering interventions. In another model mid-level professionals (usually nurses) acted as the clinic specialists to provide that service. In a sample of 10 health clinics, the mid-level professionals screened a higher percentage of patients than did the medical providers during the best month of program operation (50% vs. 44%) and over all months of operation (24% vs. 19%). Of those patients who screened positive, more patients screened by the mid-level professionals received an intervention than in the provider model (73.1% vs. 57.1%).

The ability of clinics to conduct SBI was significantly correlated with both staffing characteristics and organizational factors (e.g., prior experience, organizational stability, number of clinicians trained and the quality of the coordinator's work). Lack of time, staff turnover and competing priorities correlated negatively with SBIRT implementation.

In summary, the primary obstacles to the use of SBIRT in applied settings are: (1) lack of time for overburdened health care workers; (2) training and motivation of professionals to administer screening and intervention to at-risk drinkers; and (3) organizational factors including administrative support and competing priorities. Successful implementation of the technology tends to occur at those sites where clinicians are reimbursed for their services and are well trained for the task. In addition, the extent to which a given delivery model is likely to work best within a managed care organization depends on complex provider and organizational characteristics.

Brief treatment: Although there are insufficient data to determine which populations might benefit most from Brief Treatment, a growing literature suggests that BT is effective with a wide range of substance abusing clients. Further, the majority of clients receiving substance abuse treatment stay in therapy for relatively short periods of time (between 6 and 20 one-hour sessions). Although this statistic argues for a greater use of structured BT approaches in current clinical practice, DHHS (71) found that many therapists trained in traditional approaches were resistant to using structured BT models. A related problem is that brief treatment is typically developed, evaluated and delivered in an individual therapy format, whereas traditional treatment tends to be offered in group format because of cost considerations.

The demonstration of several efficacious brief treatment interventions, especially for marijuana dependence, raises questions about how best to engage chronic marijuana users in treatment and how best to maintain improvements following treatment. Unfortunately, very little research has been conducted in these areas. A pilot study was conducted to evaluate a program designed to offer a guided self-assessment (but not treatment) to persons interested in changing their marijuana use. It successfully

used a variety of recruitment strategies to attract participants, including posters, radio and newspaper ads, and outreach at various community events (108). The check-up program offered a useful method for reaching non-treatment-seeking heavy marijuana users, and at follow-up program participants reported a significant reduction in the frequency of marijuana use when compared to those who just got information. These results suggest that stand-alone programs that provide discrete treatment to regular marijuana users may be feasible and can reach large numbers of clients if they are properly designed and advertised.

Training and technology transfer: Training in how to conduct screening and brief interventions is clearly a vital component in assuring effective implementation of SBIRT components. Introducing new screening and prevention activities into primary care practices and other settings presents significant challenges to professional training and continuing education. Medical schools and residency programs devote limited faculty resources and curriculum time to substance abuse (109-111) and many professionals feel inadequately trained when faced with patients who have substance-related problems (112,113). Barriers to adequate coverage of alcohol and drug-related problems in both medical schools and continuing professional education include traditional attitudes about the moral culpability of chronic alcoholics, confusion as to whether problem drinking is a medical or psychiatric concern, lack of faculty role models, lack of training materials, and role ambiguity regarding who is responsible for screening and intervention (114,115). Research on medical education has shown that training can be effective in improving students' and physicians' knowledge and skills in addressing alcohol issues (106, 116-118), but changes in knowledge may be easier to produce than changes in attitudes and behavior (119). A review of the components and outcomes of medical education in substance-related disorders concluded that the selection of a combined didactic and interactive educational strategy may be the most cost-effective learning strategy, but there is little empirical evidence to support this approach (119).

Although some progress has been made in the development of SBIRT for medical practi-

tioners, medical students, and health care organizations (1,120,121), a necessary step toward dissemination is the development of successful training packages that include program implementation procedures. Babor et al. (106) found that following a relatively short (3-hour) workshop and subsequent supervision, physicians experienced an increased sense of confidence in performing screening procedures. In addition, non-physician clinicians perceived fewer obstacles to screening patients after receiving the training. When delivered in the context of a comprehensive SBIRT implementation program, training was effective in changing providers' knowledge, attitudes, self-efficacy and practice of screening and brief interventions for at-risk drinking. The results are consistent with other studies of provider behavior (116,122, 123) which show that health care providers trained to deliver a brief alcohol intervention will counsel their at-risk patients when cued to do so and when supported by a primary care office system. Adams et al. (123) found that a 2.5-hour training doubled the rate of alcohol interventions in high-risk primary care patients. Wilk and Jensen (124) used standardized patients (i.e., actors who play the role of symptomatic patients) to train residents to use SBI. After training more residents conducted screening and brief interventions. Gomel et al. (125) compared three strategies to market and train primary care physicians. Tele-marketing was more cost-effective than academic detailing and direct mail in promoting uptake of an SBI package. Roche et al. (117) compared two educational programs to train medical students; interactive training was no more effective than traditional didactic lectures in developing knowledge and skills. These studies suggest that SBIRT training can be effective in providing skills, increasing self-efficacy, and changing provider behavior.

In summary, training programs have been developed and adapted to specialty settings (e.g., physicians in primary care clinics). Educational materials for use with problem drinkers have also been developed. Manuals, pamphlets, and books have been written to help train professionals in the process of SBI. Research on all of these training packages suggests that they increase knowledge about drug misuse, but they vary in their ability to change provider

behavior. More research is needed on how increased knowledge translates into behavior changes and what factors help to sustain those behavior changes.

ECONOMIC CONSIDERATIONS

There are several important economic issues to consider in relation to implementing SBIRT. Providers, financial managers, and decision makers need accurate information about the costs of screening and brief interventions and estimates of the revenue potential. Decision makers also need to know the cost-effectiveness of various SBIRT models in order to choose between lower cost/less effective models and higher cost/more effective models. Cost benefit estimates are needed to assess the net costs to health plans or to society of diverting resources to SBIRT activities. In this section we summarize research on each of these issues.

Cost: SBIRT costs will vary, depending on the perspective from which costs are calculated, e.g., the provider's, the payer's, the patient's, or society's perspective. For financial management purposes, the total costs of SBIRT services can be broken down into their components, e.g., screenings, information packets, counseling sessions, and case management. From the *provider's perspective* the cost of brief interventions depends primarily on the nature and severity of the client's alcohol or drug problems, the number of sessions that comprise the interventions, the personnel delivering brief interventions, the resources to produce and deliver interventions (and treatments) and the settings in which brief interventions are provided. Providers must also consider the one-time costs of developing and starting the service plus any on-going continuing costs such as continuing education of staff. From the *client's perspective*, the cost of SBIRT includes the amount the client pays for the intervention beyond the premiums for health insurance, as well as time and transportation costs to the site where interventions are furnished. From a *payer's perspective*, the cost of brief interventions might be defined as the amount paid for the service minus any financial benefit that may accrue from the reduction of future costs resulting from the service. From *society's perspective*, the cost of

brief interventions is expressed in terms of the market value of the best alternative use to which labor, capital, and other resources may be put (i.e., economic or opportunity costs).

Given the various perspectives that could be used, it is not surprising that published estimates of the costs of SBIRT vary considerably. For example, Zarkin et al. (126) estimated screening costs at \$0.42 per patient for a 2-minute screen versus \$16 per patient by Gentilello et al. (127) and \$497 per patient by Kunz et al. (128). Given the fact that fewer than 30 percent of patients screened are referred for brief interventions, efforts to reduce the initial screening costs can significantly reduce the overall cost of providing alcohol SBI. There is also broad variability in the costing methodology used in the literature. For example, brief intervention costs have been reported at \$2.59 per patient (126), \$135 per brief intervention session (128), and \$0.59 median per member per month (insurance premium cost) (129). Obviously, the underlying variability of the SBI programs is a primary cause for the variation in cost estimates, but the lack of a consistent costing methodology contributes to the variability and limits the usefulness of cross-program comparisons.

Furthermore, current SBI cost-effectiveness and cost-benefit research often presents cost results without a detailed description of the costing methods used. Many of these studies do not adequately address how and what was actually costed (e.g., 130). Authors often take national wage averages and estimate the amount of time for services (e.g., 127). The most thorough cost estimate comes from the Cutting Back study (126), which used activity-based costing to separate start-up costs from ongoing implementation costs, a distinction overlooked by previous studies. Cutting Back is the only study to compare costs across providers and is also the first to cost different models of implementation. However, the SBI models studied by Zarkin et al. (126) were implemented exclusively for the Cutting Back research project, and therefore the authors were forced to make judgments as to which costs would likely be retained in a non-research setting.

Cost effectiveness analysis: Cost effectiveness analysis (CEA) enables decision makers to compare the economic merits of alternative types of service, such as brief interventions and

standard care, which represents the care that clients would ordinarily receive. Kunz et al. (128) found cost-effectiveness ratios for brief interventions administered in a hospital emergency department of \$258 for a one unit reduction in the follow-up AUDIT score, \$219 for a decrease of one drink per week, and \$61 for a one percentage point decline in the follow-up probability of heavy drinking. In a study that applied estimates from published studies to Australia, Wutzke et al. (130) found that brief physician advice to at-risk drinkers resulted in additional years of life from fewer accidents. Dividing the cost of the intervention by the number of life-years saved yielded a cost of approximately Aus \$1,873 per life-year saved. CEA does not, however, provide definitive recommendations on which program should be adopted. Rather, it provides decision makers with evidence on the relative benefits and costs of one program compared to another. For this reason, CEA alone is often not enough to justify adoption of a new program.

Cost benefit analysis: Unlike CEA, CBA places a dollar value on all outcomes and directly compares to the dollar value of a program's outcomes to the dollar value of its costs. As a result, CBA often provides definitive answers on which programs should be adopted. The program with the largest dollar benefit after accounting for costs should unambiguously be adopted. There are various methods with which to compare the benefits of a program to its costs, including: net benefit measures in which costs are subtracted from benefits; return on investment in which the benefits are expressed as a percentage return to the investment represented by the program costs; and the benefit cost ratio in which benefits are expressed as a ratio of the costs. The choice of CBA measure is largely determined by the audience, with return on investment often appealing more to business or corporate audiences and net benefit or benefit-cost ratios appealing more to academic audiences.

The CBA evidence on SBIRT is generally very favorable. In a randomized trial of brief interventions administered in physician offices, Fleming and colleagues (131) found that a group receiving a brief intervention not only had significant reductions in alcohol use, they also had fewer hospital days and fewer emer-

gency department visits. The intervention cost \$205 per person (\$166 from the clinic perspective and \$39 from the client's perspective) and saved \$712 in health care costs. The benefit cost ratio of 4.3 suggests a \$43,000 savings in future health care costs for every \$10,000 spent for early intervention. The benefit cost ratio increased to 39:1 after factoring fewer motor vehicle and legal events into the analysis.

In a CBA using published sources, Gentilello et al. (127) estimated that the screening and brief alcohol interventions provided to injured patients treated in an emergency department or admitted to a hospital together cost \$54 per patient, or \$16 plus \$38, respectively. The net cost savings from the screening and intervention was estimated at \$89 per patient, or \$330 for each patient receiving an intervention (27 percent had a positive screen). The benefit, in the form of reduced direct health costs, resulted in a savings of \$3.81 for every \$1.00 spent on screening and intervention, for a benefit cost ratio of 3.8:1. If interventions were routinely offered to injured adult patients nationwide, it was estimated that the potential net savings might approach \$1.82 billion annually.

In a retrospective study of admissions to the Naval Medical Center in Portsmouth, Virginia, Storer (132) estimated that intervention patients had significantly lower hospital readmission rates than other patients. The lower readmission rate for intervention patients alone generated an estimated savings of \$606,400, for a total cost of \$31,500 (benefit cost ratio of 19:1), for an average cost of \$154 for 205 brief interventions.

Summary: Although the findings support the use of certain SBIRT components on economic grounds, the studies should be used cautiously. The cost effectiveness of SBIRT may vary considerably, depending on how the technology is applied. If a program is aimed at a selected, high-risk portion of the population (e.g., emergency room patients with injury or trauma), a higher rate of risky drinkers will be identified than in a "population approach" (e.g., all members of an HMO), where a cross-section of the entire population is screened (133). This issue will affect the rate at which people receive an SBIRT service and the economic efficiency of any such operation. Similarly, the potential for cost savings is much greater among a higher

risk portion of the population. The labor cost of personnel designated to screen and conduct brief intervention, and whether SBIRT is their sole function or is incorporated into other functions will affect cost effective calculations. Additionally, the extent of the intervention—whether one five-minute session at the time of the screening, or multiple sessions of longer duration on different days—will significantly affect both treatment costs and costs incurred by patients.

CONCLUSION: TRANSLATING RESEARCH INTO PRACTICE

In the parlance of contemporary medical science, "translation" has three inter-related meanings: (1) applying what we have learned from research to practical settings; (2) making scientific knowledge accessible and relevant to practitioners; and (3) improving the health of the population by broad dissemination of effective medical and health promotion technologies. Translation from research to practice can be considered at two levels: (1) from the laboratory "bench" to the patient's "bedside"; and (2) from bedside to the entire community. In the former (called T1 translation), basic science research leads to new clinical investigation and interventions. Examples of T1 bench to bedside applications from the 25 years of SBIRT research considered in this review include the discovery of biomarkers for alcohol and drug screening, the use of psychometric theory to develop new self-report screening tests, and the development of new medications to dampen alcohol craving, reduce heavy drinking, and/or promote abstinence. Examples of the second form of translation, where clinical investigation leads to improved medical practice and enhanced population health (called T2 translation), are studies of SBIRT training, program implementation and cost effectiveness. Although much work needs to be done at both T1 and T2 levels, the findings of this review indicate that significant progress has been made in translating research into practice. For example, since 1980:

- Several hundred empirical studies on screening, brief intervention, referral and integration of SBIRT into health care settings have been conducted.
- Over 25 screening tests have been developed and validated.
- Scores of randomized controlled trials of brief intervention have been conducted in a wide range of countries.
- 15 or more integrative reviews of the SBIRT literature have been published.
- A growing literature on provider training, SBIRT implementation, and new applications is now available.

Based on the results of this review, the following conclusions seem warranted about the various components of SBIRT:

- Self-report screening tests are reliable and valid under most clinical conditions, but the use of screening tests depends on provider and patient characteristics.
- Self-report response bias can be predicted, detected and minimized.
- Brief Interventions (BI) can reduce alcohol use for at least 12 months in non-dependent heavy drinkers.
- The approach is acceptable to both genders and to adolescents and adults.
- Cost-effectiveness has been demonstrated in several countries.
- Brief interventions are effective with smokers and risky drinkers, and there is some evidence that they work well with marijuana users.
- Brief treatments are effective with persons who are dependent on alcohol, marijuana or other drugs.
- SBIRT risk reduction materials exist in diverse formats.

After two decades of clinical research, program development and evaluation studies, SBIRT is poised for the next step in dissemination. There is general agreement on the need to “broaden the base” of treatment by expanding SBIRT services to less severe cases and populations at risk. In order for this to happen, the traditional, acute care model of curative medicine will have to be expanded to include a new population-based healthcare management perspec-

tive in which persons experiencing or at risk of substance use disorders are provided with a range of preventive, curative, and rehabilitative services. These services should be designed to fit the needs of defined populations, with providers organized into networks that attempt to shift utilization to lower cost settings or most appropriate level of care. Implementation models are currently inadequate to achieve sufficient population reach unless routine screening, which is the linchpin of SBIRT, is organized throughout the health care and social service systems. Contractual models for screening, brief intervention, and referral may work better in settings where there are limited resources or staff resistance. In all cases, it is important to fit the SBIRT program to the population, rather than requiring that patients suit the needs of the providers. It is clear from the findings of this review as well as other research (134) that population-wide measures to implement the various SBIRT components could have a significant effect on reducing the burden of illness associated with substance use disorders.

Nevertheless, there are still gaps in the literature, which suggest the need for further research. Little research has been devoted to the potential role that SBIRT could play to increase access to treatment for people with alcohol and drug dependence. Additional research is needed to evaluate screening and brief intervention methods for illicit drug users in general medical settings. To the extent that SBIRT programs are part of a broader network of specialized and general health care services, research is needed to determine how best to implement SBIRT programs, how to evaluate their impact on indicators of population health (such as alcohol-related morbidity and drunk driving rates), and what are the costs and benefits to society.

REFERENCES

1. Babor TF, Higgins-Biddle JC. Alcohol screening and brief intervention: Dissemination strategies for medical practice and public health. *Addiction*. 2000;95: 677-86.
2. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. *AUDIT The Alcohol Use Disorders Identification Test: Guideline for Use in Primary Care*. 2nd ed. Geneva: World Health Organization; 2001.

3. Institute of Medicine. *Broadening the Base of Treatment for Alcohol Problems*. Washington DC: National Academies Press; 1990.
4. Babor TF. Avoiding the "horrid and beastly sin of drunkenness:" Does dissuasion make a difference? *J Consult Clin Psychol*. 1994;62:1127-1140.
5. Babor TF, Kadden RK. Screening and interventions for alcohol and drug problems in medical settings: What works? *J Trauma*. 2005;59(3 Suppl):S80-S87.
6. Russell MA, Stapleton JA, Hajek P. District programme to reduce smoking: Can sustained intervention by general practitioners affect prevalence? *J Epidemiol Community Health*. 1988;42:111-115.
7. Kristenson H, Ohlin H, Hulten-Nosslin B, Trell E, Hood B. Identification and intervention of heavy drinking in middle aged men: Results and follow-up of 24-60 months of long-term study with randomized controls. *Alcohol Clin Exp Res*. 1983;7:203-209.
8. Babor TF, de la Fuente JR, Saunders J, Grant M. *AUDIT The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care*. WHO/MNH/DAT 89.4. Geneva: World Health Organization; 1989.
9. 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.
10. WHO Brief Intervention Study Group. A cross national trial of brief intervention with heavy drinkers. *Am J Public Health*. 1996;86:948-955.
11. WHO ASSIST Working Group. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): Development, reliability and feasibility. *Addiction*. 2002;97:1183-1194.
12. Hungerford DW, Pollock DA. Emergency department services for patients with alcohol problems: Research directions. *Acad Emerg Med*. 2003;10:79-84.
13. Whitlock EP, Polen MR, Green CA, Orlean T, Klein J. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: A summary of the evidence for the US Preventive Services Task Force. *Ann Intern Med*. 2004;140:557-568.
14. Selzer ML. The Michigan Alcoholism Screening Test: The quest for a new diagnostic instrument. *Am J Psychiat*. 1971;127:1653-1656.
15. Selzer ML, Vinokur A, Van Rooijen L. A self-administered Short Michigan Alcoholism Screening Test (SMAST). *J Stud Alcohol*. 1975;36:117-126.
16. Ewing JA. Detecting alcoholism: The CAGE questionnaire. *JAMA*. 1984;252:1905-1907.
17. Skinner HA, Holt S. Identification of alcohol abuse using laboratory tests and a history of trauma. *Ann Intern Med*. 1984;101:847-851.
18. Russell M. New assessment tools for risk drinking during pregnancy: T-ACE, TWEAK, and others. *Alcohol Health Res World*. 1994;18:55-61.
19. Chan AW, Pristach EA, Welte JW, Russell M. Use of the TWEAK test in screening for alcoholism/ heavy drinking in three populations. *Alcohol Clin Exp Res*. 1993;17:1188-1192.
20. Moore AA, Beck JC, Babor TF, Hays RD, Reuben DB. Beyond alcoholism: Identifying older, at-risk drinkers in primary care. *J Stud Alcohol*. 2002; 63: 316-324.
21. Aertgeerts B, Buntinx F, Bande-Knops J, Vandermeulen C, Roelants M, Ansoms S, Fevery J. The value of CAGE, CUGE, and AUDIT in screening for alcohol abuse and dependence among college freshmen. *Alcohol Clin Exp Res*. 2000;24:53-57.
22. Canagasaby A, Vinson D. Screening for hazardous or harmful drinking using one or two quantity-frequency questions. *Alcohol Alcohol*. 2005;40:208-213.
23. Williams R, Vinson DC. Validation of a single screening question for problem drinking. *J Fam Pract*. 2001;50:307-312.
24. O'Brien MC, McCoy TP, Champion H, et al. Single question about drunkenness to detect college students at risk for injury. *Acad Emerg Med*. 2006;13: 629-636.
25. Vinson DC, Galliher JM, Reidinger C, Kappus JA. Comfortably engaging: which approach to alcohol screening should we use? *Ann Fam Med*. 2004;2: 398-404.
26. Peterson K. Biomarkers for alcohol use and abuse—A summary. *Alcohol Res Health*. 2004;28(1): 30-37.
27. Skinner HA. The Drug Abuse Screening Test. *Addict Behav*. 1982;7:363-371.
28. Gavin DR, Ross HE, Skinner HA. Diagnostic validity of the drug abuse screening test in the assessment of DSM-III drug disorders. *Br J Addict*. 1989;84: 301-307.
29. Greene RL, Weed NC, Butcher JN, Arredondo R, Davis HG. A cross-validation of MMPI-2 substance abuse scales. *J Pers Assess*. 1992;58:405-410.
30. Rahdert E. *The Adolescent Assessment and Referral Manual*. DHHS Publication No. ADM-91-1735. Rockville, MD: National Institute on Drug Abuse; 1991.
31. McLaney MA, Del Boca FK, Babor TF. A validation study of the problem-oriented screening instrument for teenagers. *J Mental Health*. 1994;3:363-376.
32. Winters K. *Manual for the Personal Experience Screening Questionnaire (PESQ)*. Los Angeles: Western Psychological Services; 1990.
33. Winters KC. Development of an adolescent alcohol and other drug abuse screening scale: Personal experience screening questionnaire. *Addict Behav*. 1992;17: 479-490.
34. Miller FG. SASSI: Application and assessment for substance-related problems. *Subst Use Misuse*. 1997;2:163-166.
35. Feldstein SW, Miller WR. Does subtle screening work? A review of the SASSI. *Addiction*. 2007;102: 41-50.
36. Svanum S, McGrew J. Prospective screening of substance dependence: The advantages of directness. *Addict Behav*. 1995;20:205-213.

37. Klitzner M, Schwartz RH, Gruenewald P, Blasinsky M. Screening for risk factors for adolescent alcohol and drug use. *Am J Dis Child*. 1987;141:45-49.
38. Schwartz RH, Wirtz PW. Potential substance abuse: Detection among adolescent patients: Using the drug and alcohol problem (DAP) quick screen, a 30-item questionnaire. *Clin Pediatr*. 1990;29:38-43.
39. Knight JR, Shrier LA, Bravender TD, Farrell M, Vander Bilt J, Shaffer HJ. A new brief screen for adolescent substance abuse. *Arch Pediatr Adolesc Med*. 1999;153:591-596.
40. Brown RL, Rounds LA. Conjoint screening questionnaires for alcohol and other drug abuse: Criterion validity in a primary care practice. *Wis Med J*. 1995;94:135-140.
41. Wolff K, Farrell M, Marsden J, Monteiro MG, Ali R, Welch S, Strang J. A review of biological indicators of illicit drug use, practical considerations and clinical usefulness. *Addiction*. 1999;94:1279-1298.
42. Babor TF, Brown J, Del Boca F. Validity of self-reports in applied research on addictive behaviors: Fact or fiction. *Behav Assess*. 1990;12:5-31.
43. Bien T, Miller WR, Tonigan JS. Brief interventions for alcohol problems: A review. *Addiction*. 1993;88:315-336.
44. Kahan M, Wilson L, Becker L. Effectiveness of physician-based interventions with problem drinkers: A review. *Can Med Assoc J*. 1995;152:851-859.
45. Wilk AI, Jensen NM, Havighurst TC. Meta-analysis of randomized control trials addressing brief interventions in heavy alcohol drinkers. *J Gen Intern Med*. 1997; 12(5):274-283.
46. Ballesteros J, Duffy JC, Querejeta I, Arino J, Gonzalez-Pinto A. Efficacy of brief interventions for hazardous drinkers in primary care: Systematic review and meta-analyses. *Alcohol Clin Exp Res*. 2004;28:608-618.
47. Moyer A, Finney J, Swearingen C, Vergun P. Brief interventions for alcohol problems: A meta-analytic review of controlled investigations in treatment-seeking and non-treatment seeking populations. *Addiction*. 2002;97:279-292.
48. Gentilello LM, Rivara FP, Donovan DM, Dunn CW, Rivera FP. Alcohol interventions in trauma centers. *JAMA*. 1995;274:1043-1048.
49. Charalambous MP. Alcohol and the accident and emergency department: A current review. *Alcohol Alcohol*. 2002;37:307-312.
50. Gentilello LM, Donovan DM, Dunn CW, Rivara FP. Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Ann Surg*. 1999;230:1-18.
51. 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;120(8):1024-1033.
52. Bernstein E, Bernstein J, Tassiopoulos K, Heeren T, Levenson S, Hingson R. Brief intervention at a clinic visit reduced cocaine and heroin use. *Drug Alcohol Depend*. 2005;77:49-59.
53. Baker A, Lee NK, Claire M, Lewin TJ, Grant T, Pohlman S. Brief cognitive behavioural interventions for regular amphetamine users: A step in the right direction. *Addiction*. 2005;100:367-378.
54. Cormack MA, Sweeney KG, Hughes-Jones H, Foot GA. Evaluation of an easy, cost-effective strategy for cutting benzodiazepine use in general practice. *Br J Gen Pract*. 1994;44:5-8.
55. 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;44:408-412.
56. Marsden J, Stillwell G, Barlow H, Boys A, Taylor C, Hunt N, Farrell M. An evaluation of a brief motivational intervention among young ecstasy and cocaine users: no effect on substance and alcohol use outcomes. *Addiction*. 2006;101(7):1014-1026.
57. Stephens RS, Roffman RA, Curtin L. Comparison of extended versus brief treatments for marijuana use. *J Consult Clin Psychol*. 2000;68:898-908.
58. Marijuana Treatment Project Research Group. Brief treatments of cannabis dependence: Findings from a randomized multi-site trial. *J Consult Clin Psychol*. 2004;72:455-466.
59. McLellan AT, Arndt ID, Metzger DS, Woody GE, O'Brien CP. The effects of psychosocial services in substance abuse treatment. *JAMA*. 1993;269(15):1953-1959.
60. Gottheil E, Weinstein SP, Sterling RC, Lundy A, Serota RD. A randomized controlled study of the effectiveness of intensive outpatient treatment for cocaine dependence. *Psychiatr Serv*. 1998;49:782-787.
61. Miller WR, Hester RK. Treating alcohol problems: Toward an informed eclecticism. In: Hester RK, Miller WR, eds. *Handbook of Alcoholism Treatment Approaches: Effective Alternatives*, 3rd ed. Boston: Allyn & Bacon; 2003.
62. Berglund M, Thelander S, Salaspuro M, Franck J, Andreasson S, Ojehagen A. Treatment of alcohol abuse: An evidence-based review. *Alcohol Clin Exp Res*. 2003;27:1645-1656.
63. Fiorentine R, Anglin D. More is better: Counseling participation and the effectiveness of outpatient drug treatment. *J Subst Abuse Treat*. 1996;13:341-348.
64. Brochu S, Slandry M, Bergeron J, Chiochio F. The impact of a treatment process for substance users as a function of their degree of exposure to treatment. *Subst Use Misuse*. 1997;32:1993-2011.
65. Jerrell JM, Ridgely MS. The relative impact of treatment program "robustness" and "dosage" on client outcomes. *Eval Program Plann*. 1999;22:323-330.
66. Ouimette PC, Moos RH, Finney JW. Influence of outpatient treatment and 12-step involvement on one-year substance abuse treatment outcomes. *J Stud Alcohol*. 1998;59(5):513-522.
67. Moos RH, Finney JW, Federman EB, Suchinsky R. Specialty mental health care improves patients' out-

comes: Findings from a nationwide program to monitor the quality of care for patients with substance use disorders. *J Stud Alcohol*. 2000;61(5):704-713.

68. Ritsher J, Finney J, Moos R. The influence of treatment orientation and continuing care on substance abuse patients' two-year remission. *Psychiatr Serv*. 2002;53:595-601.

69. Moos RH. Addictive disorders in context: Principles and puzzles of effective treatment and recovery. *Psychol Addict Behav*. 2003;17(1):3-12.

70. Humphreys K, Tucker J. Toward more responsive and effective systems for alcohol-related problems. *Addiction*. 2002;97:126-132.

71. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. *Brief Interventions and Brief Therapies for Substance Abuse, Treatment Improvement Protocol (TIP) No 34*. Rockville, MD: Center for Substance Abuse Treatment; 1999.

72. O'Malley SS, Rounsaville BJ, Farren C, Namkoong K, Wu R, Robinson J, O'Connor PG. Initial and maintenance naltrexone treatment for alcohol dependence using primary care vs specialty care: A nested sequence of 3 randomized trials. *Arch Intern Med*. 2003;163:1695-1704.

73. Johnson BA, Ait-Daoud N, Aubin HJ, Van Den Brink W, Guzzetta R, Loewy J, Silverman B, Ehrich E. A pilot evaluation of the safety and tolerability of repeat dose administration of long-acting injectable naltrexone (Vivitrex) in patients with alcohol dependence. *Alcohol Clin Exp Res*. 2004;28:1356-1361.

74. Anton RF, O'Malley SS, Ciraulo DA, Cisler RA, Couper D, Donovan DM, Gastfriend DR, Hosking JD, Johnson BA, LoCastro JS, Longabaugh R, Mason BJ, Mattson ME, Miller WR, Pettinati HM, Randall CL, Swift R, Weiss RD, Williams LD, Zweben A, for The COMBINE Study Research Group. Effect of combined pharmacotherapies and behavioral interventions (The COMBINE Study) for alcohol dependence. *JAMA*. 2006;295:2003-2017.

75. Kranzler HR. Evidence-based treatments for alcohol dependence: New results and new questions. *JAMA*. 2006;295:2075-2076.

76. Ling W, Wesson DR. Clinical efficacy of buprenorphine: Comparisons to methadone and placebo. *Drug Alcohol Depend*. 2003;70(2Suppl):S49-S57.

77. Bridge TP, Fudala PJ, Herbert S, Liederman DB. Safety and health policy considerations related to the use of buprenorphine/naloxone as an office-based treatment for opiate dependence. *Drug Alcohol Depend*. 2003;70(2Suppl):S79-S85.

78. Amass L, Ling W, Freese TE, Reiber C, Annon JJ, Cohen AJ, McCarty D, Reid MS, Brown LS, Clark C, Ziedonis DM, Krejci J, Stine S, Winhusen T, Brigham G, Babcock D, Muir JA, Buchan BJ, Horton T. Bringing buprenorphine-naloxone detoxification to community treatment providers: The NIDA Clinical Trials Network Field Experience. *Am J Addict*. 2004;13:S42-S66.

79. Mattick RP, Kimber J, Breen C, Davoli M. *Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence*. The Cochrane Database of Systematic Reviews 2003; Issue 2, pub2: CD002207.

80. Fleming MF, Graham AW. Screening and brief interventions for alcohol use disorders in managed care settings. *Recent Dev Alcohol*. 2001;15:393-416.

81. 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;30:181-189.

82. D'Onofrio G, Bernstein E, Bernstein J, Woolard RH, Brewer PA, Craig SA, Zink BJ. Patients with alcohol problems in the emergency department, part 2: Intervention and referral. SAEM Substance Abuse Task Force. Society for Academic Emergency Medicine. *Acad Emerg Med*. 1998;5:1210-1217.

83. 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.

84. Elvy GA, Wells, JE, Baird KA. Attempted referral as intervention for problem drinking in the general hospital. *Br J Addict*. 1988;83:83-89.

85. Hillman A, McCann B, Walker NP. Specialist alcohol liaison services in general hospitals improve engagement in alcohol rehabilitation and treatment outcome. *Health Bulletin*. 2001;59:420-423.

86. Rochat S, Wietlisbach V, Burnand B, Landry U, Yersin B. Success of referral for alcohol dependent patients from a general hospital: Predictive value of patient and process characteristics. *Subst Abus*. 2004;25(1):9-15.

87. Timko C, Moos RH, Finney JW, Moos BS, Kaplowitz MS. Long-term treatment careers and outcomes of previously untreated alcoholics. *J Stud Alcohol*. 1999;60:437-447.

88. Moos RH, Moos BS. Long-term influence of duration and intensity of treatment on previously untreated individuals with alcohol use disorders. *Addiction*. 2003;98(3):325-337.

89. Dyches H, Alemagno S, Llorens SA, Butts JM. Automated telephone-administered substance abuse screening for adults in primary care. *Health Care Manag Sci*. 1999;2:199-204.

90. Saitz R, Larson MJ, Horton NJ, Winter M, Samet JH. Linkage with primary medical care in a prospective cohort of adults with addictions in inpatient detoxification: Room for improvement. *Health Serv Res*. 2004;39(3):587-606.

91. Spandorfer JM, Israel Y, Turner BJ. Primary care physicians' views on screening and management of alcohol abuse: Inconsistencies with national guidelines. *J Fam Pract*. 1999;48(11):899-902.

92. Arndt S, Schultz SK, Turvey C, Petersen A. Screening for alcoholism in the primary care setting:

Are we talking to the right people? *J Fam Pract.* 2002;51:41-46.

93. Hansen LJ, de Fine ON, Beich A, Barfod S. Screening for alcohol overconsumption in general practice. Experiences of general practitioners with a patient questionnaire. *Ugeskr Laeger.* 2001;163:2358-2361.

94. Beich A, Thorsen T, Rollnick S. Screening in brief intervention trials targeting excessive drinkers in general practice: Systematic review and meta-analysis. *BMJ.* 2003;327:536-542.

95. Anderson PA, Grey SF, Nichols C, Parran TV Jr, Graham AV. Is screening and brief advice for problem drinkers by clergy feasible? A survey of clergy. *J Drug Educ.* 2004;34:33-40.

96. Hungerford DW, Pollock DA, Todd KH. Acceptability of Emergency Department-based screening and brief intervention for alcohol problems. *Acad Emerg Med.* 2000;7:1383-1392.

97. Schermer CR, Bloomfield LA, Lu SW, Demarest GB. Trauma patient willingness to participate in alcohol screening and intervention. *J Trauma.* 2003;54(4):701-706.

98. Rivara FP, Tollefson S, Tesh E, Gentilello LM. Screening trauma patients for alcohol problems: Are insurance companies barriers? *J Trauma.* 2000;48(1):115-118.

99. Roche AM, Freeman T. Brief interventions: Good in theory but weak in practice. *Drug Alcohol Rev.* 2004;23(1):11-18.

100. Modesto-Lowe V, Boornazian A. Screening and brief intervention in the management of early problem drinkers: Integration into healthcare settings. *Disease Management & Health Outcomes.* 2000;8(3):129-137.

101. D'Onofrio G, Degutis LC. Preventive care in the Emergency Department: Screening and brief intervention for alcohol problems in the Emergency Department: A Systematic Review. *Acad Emerg Med.* 2002;9:627-638.

102. Copeland J, Martin G. Web-based interventions for substance use disorders: A qualitative review. *J Subst Abuse Treat.* 2004;26:109-116.

103. Saitz R, Horton N J, Sullivan LM, Moskowitz MA, Samet JH. Addressing alcohol problems in primary care: a cluster randomized, controlled trial of a systems intervention. The Screening and Intervention in Primary Care (SIP) study. *Ann Intern Med.* 2003;138(5):372-382.

104. Brady M, Sibthorpe B, Bailie R, Ball S, Sumnerdodd P. The feasibility and acceptability of introducing brief intervention for alcohol misuse in an urban aboriginal medical service. *Drug Alcohol Rev.* 2002;21:375-380.

105. Kaner EFS, Healthier N, Brodie J, Lock CA, McAvoy BR. Patient and practitioner characteristics predict brief alcohol intervention in primary care. *Br J Gen Pract.* 2001;51:822-827.

106. Babor TF, Higgins-Biddle JC, Higgins P, Gassman R, Gould B. Training medical providers to conduct alcohol screening and brief intervention. *Subst Abuse.* 2004;25(1):17-26.

107. Babor TF, Higgins-Biddle J, Dauser, Higgins P, Burleson J. Alcohol screening and brief intervention in primary care settings: Implementation models and predictors. *J Stud Alcohol.* 2005;66:361-369.

108. Stephens RS, Roffman RA, Burke R, Williams C, Balmer A, Picciano J, Adams S. "The Marijuana Check-Up." Paper presented at the annual conference of the Association of Behavior Therapy, Washington, DC; November 1998.

109. Fleming MF, Barry KL, Davis A, Kahn R, Rivo M. Faculty development in addiction medicine: Project SAEFP, a one-year followup study. *Fam Med.* 1994;26:221-225.

110. Brewster J, Single E, Ashley M, Chow YC, Skinner H, Rankin M. Preventing alcohol problems: Survey of Canadian medical schools. *Can Med Assoc J.* 1990;143:1076-1082.

111. Fleming MF, Manwell LB, Barry KL, Adams W, Stauffacher EA. Brief physician advice for alcohol problems in older adults: A randomized community-based trial. *J Fam Pract.* 1999;48(5):378-384.

112. Wallace P, Haines A. The use of a questionnaire in general practice to increase the recognition of patients with excessive alcohol consumption. *BMJ.* 1985;90(6486):1949-1953.

113. Church OM, Babor TF. Barriers and breakthroughs: Substance abuse curricula in nursing education. *J Nurs Educ.* 1995;34:278-281.

114. Negrete JC. The role of medical schools in the prevention of alcohol-related problems. *Can Med Assoc J.* 1990;143(10):1048-1053.

115. Bendtsen P, Akerlind I. Changes in attitudes and practices in primary health care with regard to early intervention for problem drinkers. *Alcohol Alcohol.* 1999;34:795-800.

116. Ockene JK, Adams A, Hurley TG, Wheeler EV, Hebert JR. Brief physician- and nurse practitioner-delivered counseling for high-risk drinkers: Does it work? *Arch Intern Med.* 1999;159(18):2198-2205.

117. Roche AM, Stubbs JM, Sanson-Fisher RW, Saunders JB. A controlled trial of educational strategies to teach medical students brief intervention skills for alcohol problems. *Prev Med.* 1997;26(1):78-85.

118. Walsh RA, Sanson-Fisher RW, Low A, Roche AM. Teaching medical students alcohol intervention skills: Results of a controlled trial. *Med Educ.* 1999;33(8):559-565.

119. El-Geubaly N, Toews J, Lockyer J, Armstrong S, Hodgins D. Medical education in substance-related disorders: Components and disorders. *Addiction.* 2000;95:949-957.

120. McRee B. Curriculum for Implementing Screening and Brief Intervention Services for Smokers and At-risk Drinkers in Primary Care Settings. Robert Wood Johnson's Prescription for Health Toolkit 2004. Available at: <http://www.prescriptionforhealth.org/toolkit/index.html>.

121. Richmond R, Heather N, Wodak A, Kehoe L, Webster I. Controlled evaluation of a general prac-

tice-based brief intervention for excessive drinking. *Addiction*. 2000;95(6):949-957.

122. McRee B, Granger J, Babor TF, Feder I, Folino M, Horn A, Steinberg J, vom Eigen K Reducing tobacco use and risky drinking in underserved populations: The need for better implementation models. *Ann Fam Med*. 2005;3(2):558-560.

123. Adams A, Ockene JK, Wheller EV, Hurley TG. Alcohol counseling: Physicians will do it. *J Gen Intern Med*. 1998;13:692-698.

124. Wilk AI, Jensen NM. Investigation of a brief teaching encounter using standardized patients: Teaching residents alcohol screening and intervention. *J Gen Intern Med*. 2002;17(5):356-360.

125. Gomel MK, Wutzke SE, Hardcastle DM, Lapsley H, Reznick RB. Cost-effectiveness of strategies to market and train primary health care physicians in brief intervention techniques for hazardous alcohol use. *Soc Sci Med*. 1998;47:203-211.

126. Zarkin GA, Bray JW, Davis KL, Babor TF, Higgins-Biddle JC. Costs of screening and brief intervention for risky alcohol use. *J Stud Alcohol*. 2003;64:849-857.

127. Gentilello LM, Ebel BE, Wickizer TM, Salkever DS, Rivara FP. Alcohol interventions for trauma patients treated in emergency departments and hospitals: A cost benefit analysis. *Ann Surg*. 2005;241:541-550.

128. Kunz FM, 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;65:363-370.

129. Broskowski A, Smith S. *Estimating the Cost of Preventive Services in Mental Health and Substance Abuse Under Managed Care*. DHHS Pub. No. SMA-02-3617. Rockville, MD: SAMHSA; 2001.

130. Wutzke SE, Shiell A, Gomel MK, Conigrave KM. Cost effectiveness of brief interventions for reducing alcohol consumption. *Soc Sci Med*. 2001;52:863-870.

131. Fleming MF, Mundt MP, French MT, Manwell LB, Staauffacher EA, Barry KL. Brief physician advice for problem drinkers: Long-term efficacy and cost-benefit analysis. *Alcohol Clin Exp Res*. 2002;26:36-43.

132. Storer RM. A simple cost-benefit analysis of brief interventions on substance abuse at Naval Medical Center Portsmouth. *Mil Med*. 2003;168(9):765-768.

133. NIAAA. *Eighth Special Report to the U.S. Congress on Alcohol and Health by NIAAA*. September 1993. Table 5, P.14.

134. Chisholm D, Rehm J, Van Ommeren M, Monteiro M. Reducing the global burden of hazardous alcohol use: A comparative cost-effectiveness analysis. *J Stud Alcohol*. 2004;65:782-793.

135. Mayer J, Filstead WJ. The Adolescent Alcohol Involvement Scale: An instrument for measuring adolescents' use and misuse of alcohol. *J Stud Alcohol*. 1979;40:291-300.

136. Fink A, Morton SC, Beck JC, Hays R, Spritzer K, Tsai M, Moore AA. Comparing the alcohol-related problems survey (ARPS) to traditional alcohol screening measures in elderly outpatients. *Arch Gerontol Geriatr*. 2002;34:55-78.

137. Tarter RE. Evaluation and treatment of adolescent substance abuse: A decision tree method. *Am J Drug Alcohol Abuse*. 1990;16:1-46.

138. Hodgson R, Alwyn T, John B, Thom B, Smith A. The FAST Alcohol Screening Test. *Alcohol Alcohol*. 2002;37:61-66.

139. Seppa K, Lepisto J, Sillanaukee P. Five-shot questionnaire on heavy drinking. *Alcohol Clin Exp Res*. 1998;22(8):1788-1791.

140. Alexander DA. Marijuana Screening Inventory (Experimental Version): Description and preliminary psychometric properties. *Am J Drug Alcohol Abuse*. 2003;29(3):619-645.

141. Cherpitel CJ. Screening for alcohol problems in the emergency room: A rapid alcohol problems screen. *Drug Alcohol Depend*. 1995;40:133-137.

142. Kelly TM, Donovan JE, Chung T, Cook RL, Delbridge TR. Alcohol use disorders among emergency department-treated older adolescents: A new brief screen (RUFT-Cut) using the AUDIT, CAGE, CRAFFT, and RAPS-QF. *Alcohol Clin Exp Res*. 2004;28:746-753.

143. Spak F, Hallstrom T. Screening for alcohol dependence and abuse in women: Description, validation, and psychometric properties of a new screening instrument, SWAG, in a population study. *Alcohol Clin Exp Res*. 1996;20(4):723-731.

144. Sokol RJ, Martier SS, Ager JW. The T-ACE questions: Practical prenatal detection of risk-drinking. *Am J Obstet Gynecol*. 1989;160(4):863-870.