Psychology of Addictive Behaviors
2011, Vol. 25, No. 2, 206–214

0893-164X/11/$12.00 DOI: 10.1037/a0022102

Strategies to Implement Alcohol Screening and Brief Intervention in Primary Care Settings: A Structured Literature Review

Emily C. Williams, M. Laura Johnson, and Gwen T. Lapham
VA Puget Sound Health Care System, Seattle, Washington, and University of Washington

Ryan M. Caldeiro
Group Health Cooperative, Seattle, Washington, and University of Washington

Lisa Chew and Grant S. Fletcher
Harborview Medical Center, Seattle, Washington, and University of Washington

Kinsey A. McCormick
Brigham and Women's Hospital, Boston, Massachusetts

William G. Weppner
Boise VA Medical Center, Boise, Idaho, and University of Washington

Katharine A. Bradley
VA Puget Sound Health Care System, Seattle, Washington, University of Washington, and Group Health Research Institute

Although alcohol screening and brief intervention (SBI) reduces drinking in primary care patients with unhealthy alcohol use, incorporating SBI into clinical settings has been challenging. We systematically reviewed the literature on implementation studies of alcohol SBI using a broad conceptual model of implementation, the Consolidated Framework for Implementation Research (CFIR), to identify domains addressed by programs that achieved high rates of screening and/or brief intervention (BI). Seventeen articles from 8 implementation programs were included; studies were conducted in 9 countries and represented 533,903 patients (127,304 patients screened), 2,001 providers, and 1,805 clinics. Rates of SBI varied across articles (2–93% for screening and 0.9–73.1% for BI). Implementation programs described use of 7–25 of the 39 CFIR elements. Most programs used strategies that spanned all 5 domains of the CFIR with varying emphases on particular domains and sub-domains. Comparison of SBI rates was limited by most studies' being conducted by 2 implementation programs and by different outcome measures, scopes, and durations. However, one implementation program reported a high rate of screening relative to other programs (93%) and could be distinguished by its use of strategies that related to the *Inner Setting*, *Outer Setting*, and *Process of Implementation* domains of the CFIR. Future studies could assess whether focusing on *Inner Setting*, *Outer Setting*, and *Process of Implementation* elements of the CFIR during implementation is associated with successful implementation of alcohol screening, as well as which elements may be associated with successful, sustained implementation of BI.

Keywords: alcohol screening, brief intervention, systematic review, implementation, unhealthy alcohol use

Alcohol screening and brief counseling interventions are effective for reducing drinking in primary care patients with unhealthy alcohol use (Kaner et al., 2007; Whitlock, Polen, Green, Orleans, & Klein, 2004), and together alcohol screening and brief intervention (SBI) have been ranked the third highest prevention priority for U.S. adults (Solberg, Maciosek, & Edwards, 2008). Despite their effectiveness and strong research evidence to support their implementation into real-world clinical settings (Maciosek et al.,

This article was published Online First April 25, 2011.

Emily C. Williams, M. Laura Johnson, and Gwen T. Lapham, Health Services Research and Development, Department of Veterans Affairs, VA Puget Sound Health Care System, Seattle, Washington; and Department of Health Services, University of Washington. Ryan M. Caldeiro, Chemical Dependency Services, Group Health Cooperative, Seattle, Washington; and Department of Psychiatry and Behavioral Science, University of Washington. Lisa Chew and Grant S. Fletcher, Harborview Medical Center, Seattle, Washington; and Department of Medicine, Division of General Internal Medicine, University of Washington. Kinsey A. McCormick, Brigham and Women's Hospital, Boston, Massachusetts. William G. Weppner, Boise VA Medical Center, Boise, Idaho; and Department of Medicine, University of Washington. Katharine A. Bradley, Health Services Research and Development, Department of Veterans Affairs, VA Puget Sound Health Care System; Departments of Medicine and Health Services, University of Washington; and Group Health Research Institute.

This study was supported by the Veteran's Affairs (VA) Substance Use Disorders Quality Enhancement Research Initiative (SUD QuERI) and the VA's Northwest Center of Excellence for Health Services Research & Development. Views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs or the University of Washington.

Correspondence concerning this article should be addressed to Emily C. Williams, VA Puget Sound Health Care System, 1100 Olive Way, Suite 1400, Seattle, WA 98101. E-mail: emily.williams3@va.gov

2006; U.S. Preventive Services Task Force, 2004), widespread, sustained implementation of SBI into clinical practice has not occurred (Nilsen, Aalto, Bendtsen, & Seppa, 2006). Further, although barriers to implementation have been identified (Aira, Kauhanen, Larivaara, & Rautio, 2003; Higgins-Biddle, Babor, Mullahy, Daniels, & McRee, 1997; McCormick et al., 2006) and dissemination strategies suggested (Babor & Higgins-Biddle, 2000), the circumstances under which SBI is likely to be successfully implemented in primary care settings remain elusive (Nilsen, 2010). Healthcare administrators working to implement and sustain SBI in their clinics, facilities, or systems have few evidence-based recommendations to guide them.

The Consolidated Framework for Implementation Research (CFIR) is a recently developed conceptual model, which synthesizes diverse literature relating to implementation of health care innovations in general (Damschroder et al., 2009). This global model, which was developed based on previous reviews of implementation research literature (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004) and other health services implementation models (Helfrich, Weiner, McKinney, & Minasian, 2007; Rycroft-Malone et al., 2002), identifies five implementation domains and multiple sub-domains in which strategies may be developed and employed that affect the success of implementing evidence-based practices into routine care (Damschroder & Hagedorn, 2011) including those focused on: characteristics of the intervention and individuals using it, the outer and inner settings in which implementation occurred, and the implementation process. However, neither the CFIR, nor any other conceptual framework for implementation, has been applied to efforts to implement alcohol screening and brief intervention in naturalistic primary care settings. To identify successful implementation strategies, we sought to summarize the literature on SBI implementation in primary care settings according to the domains and sub-domains of the CFIR and compare rates of SBI reported with regard to implementation strategies tested (Damschroder et al., 2009).

Method

We reviewed all Medline-indexed literature through March 2010 using the following key words and all combinations thereof: "alcohol," "alcohol drinking," "brief intervention," "brief alcohol counseling," "implementation," "translation," "dissemination," "secondary prevention," and "primary care." Studies were included in this review if they: (a) were written in English, (b) were conducted in a primary care setting, (c) reported rates of alcohol screening and/or brief intervention/counseling, and (d) studied implementation of SBI into routine practice in pragmatic or "real life," clinical settings. Consistent with a previous review (Nilsen et al., 2006), pragmatic studies were defined as those taking place in settings in which SBI procedures were integrated into the routine practice of the clinical setting and administered primarily by regular onsite providers, as opposed to research staff.

Each included article was systematically reviewed by two authors (ECW and MLJ) to extract information regarding country, number of patients, providers, and sites, rates of screening and brief intervention (separately), and strategies used to implement SBI. Because some articles presented results of single programs implemented in different facilities or countries or at different times (e.g., the World Health Organization's [WHO's] Multicountry Controlled Trial of Strategies to Promote Dissemination and Implementation of Brief Alcohol Intervention in Primary Health Care), articles were then grouped into implementation programs.

Rates of SBI

The proportion of all eligible patients who received screening (screening rate), and/or the proportion of all screen-positive patients who received a brief intervention (BI rate) was extracted from each individual article. Screening positive was defined variably across articles, but generally refers to a positive screen for unhealthy alcohol use on a validated instrument. Brief intervention was defined broadly to include any brief intervention (e.g., any alcohol-related discussions or advice) with screen-positive patients. Methods used to measure rates of screening and BI, such as medical record review or patient report, were also extracted from each article.

Domains and Sub-Domains of the CFIR Used in Implementation

Each individual article was coded for elements of the CFIR used in implementation. Because many articles from the same program provided information, codes from all articles of a program were aggregated at the program level. For example, all elements of the CFIR described in any of the five articles from the WHO program were coded together.

Each article was independently reviewed for CFIR elements addressed by the implementation strategy by at least two authors blinded to the authors of the included articles. Five authors who had not been a coauthor of any of the reviewed articles (LC, KM, RC, WW, GF) independently developed an understanding of the CFIR model and then read a group of included articles to identify elements of the CFIR addressed in the implementation. Coders met via teleconference with the lead and second authors to review coding discrepancies (broad for some codes). Coders then discussed interpretation of codes, arrived at a consensus regarding the meaning of each code, and revised their individual codes based on consensus. Remaining discrepancies (very few) were discussed, and consensus was achieved after reviewing the information presented in the article and crosschecking it with the determined meaning of the code.

Implementation strategies tested were categorized according to the five broad domains of the CFIR model, which include: (a) *Characteristics of the intervention*, (b) *The outer setting*, or "the economic, political, and social context in which an organization resides," (c) *The inner setting*, or the "features of the structural, political, and cultural contexts through which the implementation process proceeds," (d) C*haracteristics of individuals* using the intervention, and (e) *The process of implementation*. Examples of these domains for implementation of alcohol SBI might include the strength of the evidence for SBI (*Characteristics of the Intervention*), the political prioritization of implementing SBI (*Outer Setting*), the dedication of human resources in a healthcare system or facility for the purpose of implementing SBI (*Inner Setting*), the value placed on preventing unhealthy alcohol use by particular clinicians (*Characteristics of Individuals*), and the systems in place

to encourage clinicians to perform SBI (*Process of Implementation*).

Results

Seventeen reports from eight implementation programs met inclusion criteria (Aalto, Pekuri, & Seppa, 2003; Anderson et al., 2004; Aspy et al., 2008; Babor, Higgins-Biddle, Dauser, Higgins, & Burleson, 2005; Babor, Higgins-Biddle, Higgins, Gassman, & Gould, 2004; Bradley et al., 2007; Bradley et al., 2006; Chossis et al., 2007; Funk et al., 2005; Gomel, Wutzke, Hardcastle, Lapsley, & Reznik, 1998; Kaner, Lock, Heather, McNamee, & Bond, 2003; Kaner, Lock, McAvoy, Heather, & Gilvarry, 1999; Lock & Kaner, 2004; Rose et al., 2008; Seale, Shellenberger, Boltri, Okosun, & Barton, 2005; Seale, Shellenberger, Tillery, et al., 2005; Williams, Achtmeyer, et al., 2010). Studies were conducted in nine countries and represented 533,903 patients (127,304 of whom were screened), 2,001 providers, and 1,805 medical clinics (Table 1). Almost half (eight) of the seventeen studies were written by groups affiliated with two implementation programs (the WHO's multinational program and the U.S. Veterans Affairs [VA] Healthcare System). Measures of screening and BI varied and included patient report, provider report, medical record review, carbon copies of study records, and clinical reminder data (both aggregate and patient-level) derived from electronic medical records (Table 1). Rates of screening and BI based on these measures ranged considerably across articles (2-93 and 0.9–73.1%, respectively, Table 1).

Implementation programs described use of from 7 to 25 of the 38 CFIR elements (Table 2). Most programs used strategies that spanned all five domains of the CFIR with varying emphases on particular domains and sub-domains. Results specific to each CFIR domain are summarized below.

Characteristics of the Intervention

Adaptability was the sub-domain most frequently described and was generally reflected in descriptions of the ability to tailor and refine the ways in which implementation strategies were incorporated or SBI was delivered to better fit the organization's needs.

Table 1
Studies of SBI Implementation

Study	Sample size	Screening		Brief intervention (BI)	
Number and abbreviated name of program Author/year/country	Patients/providers/sites	% Screened	Screening indicator	% BI among screen-positive patients	BI measure
1. WHO Collaborative Study					
Aalto/2003/Finland	1,449/24/2	19.7	PAR	14.9	PAR
Anderson/2004/Australia, Europe[a]	NA/340/340	7.5	SR[g]	2.8	SR[g]
Funk/2005/6 countries[b]	60,989/727/727	6[c], 9[d]	SR[g]	3[c], 3[d]	SR[g]
Gomel/1998/Australia	23,820/161/161	14[c], 22[e], 26[f]	SR[g]	7[c],10[e],18[f]	SR[g]
Kaner/1999/England	11,007/128/128	2[c], 10[d]	SR[g]	55[d], 59[d]	SR[g]
2. VA SBI implementation					
Bradley/2006/USA	10,115/NA/21	93	MRR	42	MRR
Bradley/2006/USA	235,481/NA/21	—	—	28	PAR
Bradley/2007/USA		—	—	66	CR
Williams/2010/USA	4,198/NA/8	—	—	71	MRR
3. Cutting Back					
Babor/2004/USA	1,329/173/10	—	—	47	PAR
Babor/2005/USA	156,000[h]/NA/10	19[i], 24[j]	SR	57.1[i], 73.1[j]	SR
4. Swiss research foundation on alcohol					
Chossis/2007/Switzerland	260/26/26	—	—	54	PAR
5. Oklahoma physicians network					
Aspy/2008/USA	NA/9/9	59.6	MRR	0.9	MRR
6. Practice partner research network					
Rose/2008/USA	14,107/NA/21	64.5	MRR	50.5	MRR
7. UK programs					
Kaner/2003/England	5,541/212/212	—	—	61[c], 64[d]	SR
Lock/2004/England	5,541/128/128	—	—	62	SR
8. Medical Center of Central Georgia					
Seale/2005/USA	1,052/38/1	—	—	8.6	PRR
Seale/2005/USA	3,014/35/1	—	—	48.1	SR/MRR

Note. When studies tested more than one implementation strategy, the screening and brief intervention rates for these different strategies are specified as defined below. MRR = medical record review; PAR = patient report; PRR = provider report; CR = aggregate clinical reminder reports; SR = Study Records; NA = information not available.
[a] Belgium, Spain, England. [b] Six countries = Australia, Belgium, Denmark, New Zealand, Spain, England. [c] Training, initial training session. [d] Training + Additional Support, initial training session and biweekly telephone support calls. [e] Training + Reminders, initial training and data collection reminders. [f] Training + Maximal Support, initial training and biweekly support through telephone calls or site visits. [g] Median rates. [h] Number of patients was calculated by multiplying the average unique visits per month by the average length of the study (12 months), and then adding both intervention groups to obtain the total patients. [i] Intervention delivered by medical providers (physicians, nurse practitioners, physicians assistants). [j] Intervention delivered by mid-level professionals (nurses, health educators).

Table 2
Classification of Implementation Strategies Into Damschroder et al. Consolidated Framework for Advancing Implementation Science (CFIR) Model

	Implementation programs							
Domains and sub-domains of CFIR	1	2	3	4	5	6	7	8
I. Intervention characteristics								
A. Intervention source								
B. Evidence strength and quality								
C. Relative advantage								
D. Adaptability	X	X	X		X	X	X	X
E. Trialability	X	X						
F. Complexity								X
G. Design quality and packaging								
H. Cost	X		X				X	
Total number of sub-domains:	**3**	**2**	**2**	**0**	**1**	**1**	**2**	**2**
II. Outer setting								
A. Patient needs and resources		X						X
B. Cosmopolitanism	X	X			X			
C. Peer pressure						X		
D. External policies and incentives	X	X	X	X	X	X	X	X
Total number of sub-domains:	**2**	**3**	**1**	**1**	**2**	**2**	**1**	**2**
III. Inner setting								
A. Structural characteristics								
B. Networks and communication		X				X		
C. Culture	X	X						
D. Implementation climate	X	X						
1. Tension for change		X						
2. Compatibility	X	X			X	X		
3. Relative priority		X	X		X			
4. Organizational incentives and rewards	X	X	X					
5. Goals and feedback	X	X	X		X	X		X
6. Learning climate		X						
E. Readiness for implementation								
1. Leadership engagement		X						
2. Available resources	X	X	X		X	X	X	X
3. Access to knowledge and information	X	X	X	X	X	X	X	X
Total number of sub-domains:	**7**	**12**	**5**	**1**	**5**	**5**	**2**	**3**
IV. Characteristics of individuals								
A. Knowledge and beliefs about intervention	X	X	X	X	X	X	X	X
B. Self-efficacy	X		X					X
C. Individual stage of change								
D. Individual identification with organization								
E. Other personal attributes	X							
Total number of sub-domains:	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**2**
V. Process of implementation								
A. Planning	X	X	X	X	X	X	X	X
B. Engaging	X	X	X	X	X	X	X	X
1. Opinion leaders		X						X
2. Internal implementation leaders*		X	X					
3. Champions								
4. External change agents	X	X	X	X	X	X		
C. Executing	X	X	X	X	X	X	X	X
D. Reflecting and evaluating		X			X	X	X	X
Total number of sub-domains:	**4**	**7**	**5**	**4**	**5**	**5**	**4**	**5**

* Formally appointed.

For instance, among the WHO studies, participating countries were encouraged to modify the intervention package as appropriate for their language and country (Aalto et al., 2003; Anderson et al., 2004; Funk et al., 2005; Gomel et al., 1998; Kaner et al., 1999). Seale, Shellenberger, Tillery, et al. (2005) described monthly feedback sessions that were initiated as a result of low alcohol screening rates in the first months of the study. Three implementation programs specifically mentioned efforts aimed at *Cost* either via explicit cost-effectiveness measurement and analyses (Gomel et al., 1998; Kaner et al., 2003) or via tailoring training strategies

to meet the busy schedules of participating clinics (Babor et al., 2005; Babor et al., 2004). Two implementation programs addressed *Trialability* via pilot work. The WHO studies described four stages of work, including development, training, piloting, and implementation (Gomel et al., 1998). The VA program described pilot-testing screening for unhealthy alcohol use (Bradley et al., 2006), a clinical reminder for BI (Williams, Lapham, et al., 2010), and several methods of measuring performance on BI before large-scale implementation (Bradley et al., 2007). These two programs were distinguished from others that reported pilot work because theirs was completed to inform development of, as opposed to test, implementation strategies. *Complexity,* or the perceived difficulty of implementation, was explicitly described by only one implementation program, which observed how the stakeholders were reluctant to make further modifications to the SBI systems after experiencing a "fatigue effect" (Seale et al., 2005). The remaining four of the eight sub-domains of *Intervention Characteristics* (*Intervention Source, Evidence Strength and Quality, Relative Advantage, and Design Quality and Packaging*) encompass stakeholders' perceptions of the intervention. Although these elements (i.e., strength of the evidence for SBI) were often clear in the study publication, none of the included articles explicitly reported stakeholders' perceptions of them or efforts to improve stakeholders' perceptions.

Outer Setting

All studies described clinical guidelines, such as the U.S. Preventive Services Taskforce (U.S. Preventive Services Task Force, 2004), that served as a foundation for implementation efforts (i.e., *External Policies and Incentives*). Three implementation programs described networking with other organizations, reflecting *Cosmopolitanism*. The WHO studies reported that the content of their training program was endorsed by key organizations within each country and eligible for continuing medical education credits (Aalto et al., 2003; Anderson et al., 2004; Funk et al., 2005; Gomel et al., 1998; Kaner et al., 1999). Aspy et al. (2008) described systems in place to refer patients to external organizations such as the YMCA, Alcoholics Anonymous, or a smoking-cessation quitline. The VA described contracting with an outside agency to conduct standardized medical record reviews for performance monitoring, including screening and BI (Bradley et al., 2006). Two implementation programs provided information that reflected *Patient Needs and Resources*. The VA program reported that implementation efforts sprung in part from national patient survey data that suggested that most patients who wanted help with their drinking were not getting it (Bradley et al., 2006), and Seale et al. described changing the screening strategy to address patient complaints (Seale et al., 2005). Finally, Rose et al. (2008), the only implementation program to describe a strategy reflecting *Peer Pressure*, described quarterly reports that compared screening performance of participating sites with national benchmarks.

Inner Setting

All implementation programs offered participating clinics ready *Access to Knowledge and Information*. Most did this by distributing brochures, algorithms, training cards, or other informational literature to participating clinics. Seven of the eight implementation programs described *Available Resources*, which encompassed everything from these available educational materials to human resources (Aalto et al., 2003) and electronic medical records systems that document care given (Bradley et al., 2006; Rose et al., 2008). Most programs (six of the eight) also reported strategies that incorporated *Goals and Feedback*. For instance, Aspy et al. (2008) described monthly chart audits to provide feedback to clinicians on progress relative to goals, and Seale et al. (2005, 2005) described bimonthly meetings of a multi-disciplinary committee internal to the clinic in which progress was monitored and procedures were streamlined. *Compatibility* was addressed by four implementation programs and included use of existing electronic medical records with clinical decision support systems to facilitate the SBI intervention (Bradley et al., 2007; Bradley et al., 2006; Rose et al., 2008), ongoing staff support that offered solutions to problems related to time constraints and other commitments (Funk et al., 2005), and incorporation of alcohol screening as a "vital sign" during every visit (Aspy et al., 2008). *Relative Priority*, described by three implementation programs, was reflected in the VA by description of the implementation's being important across a broad span of stakeholders (Bradley et al., 2006), in the Cutting Back program via explicit measurement of the importance of competing organizational priorities to SBI implementation efforts (Babor et al., 2005), and by Aspy et al. (2008) via description of the competing demands of other major implementation efforts. *Organizational Incentives and Rewards* were encompassed in the WHO implementation program's use of continuing medical education credits as an incentive for participating providers (Funk et al., 2005), the VA's use of performance measures and performance monitoring linked to financial incentives (Bradley et al., 2006), and the Cutting Back program's description of financial incentives and reimbursement of participating Managed Care Organizations (Babor et al., 2005). Two implementation programs addressed *Networks and Communication*. Rose et al. (2008) described annual network meetings across Practice Partner Research Network (PPRN) practices, and the VA implementation program described communication pathways among researchers, clinicians, quality managers, and central offices to facilitate implementation of preventive care (Bradley et al., 2006). Only the WHO and VA implementation programs provided descriptions of *Implementation Climate* and *Culture*. The WHO program offered ongoing outreach and support to target anticipated barriers to implementation, which served as a strong foundation for implementation (*Implementation Climate*) (Funk et al., 2005). However, they also reported that the implementation setting (*Culture*) may have already reached "saturation" before the implementation study began (Funk et al., 2005). The VA program described how the leaders in each network were held personally accountable for implementing screening for unhealthy alcohol use (Bradley et al., 2006), reflecting the extent to which the implementation was expected within the organization (*Implementation Climate*), and reported use of a clinical reminder to facilitate BI at one 8-clinic facility in which clinical reminder use was routine (*Culture*) (Williams et al., 2010). Only the VA implementation program discussed *Tension for Change, Learning Climate*, and *Leadership Engagement* including aspects such as the systems for planning and evaluating implementation efforts in the VA (e.g., the national Quality Enhancement Research Initiative, or QuERI, Program) and VA leadership's commitment to incorporating evidence-based management of unhealthy alcohol use (Bradley

et al., 2007; Bradley et al., 2006). No implementation program described implementation elements reflecting *Structural Characteristics* or *Readiness for Implementation*.

Characteristics of Individuals

All implementation programs included some training component to prepare providers to implement SBI (i.e., *Engaging*, discussed below), and all of the trainings provided new knowledge and education about SBI and its importance (i.e., *Knowledge and Beliefs about Intervention*). Three implementation programs also explicitly measured providers' confidence with offering alcohol-related interventions, which reflected a focus on *Self Efficacy*. The WHO implementation program was the only program to describe ongoing support that addressed a variety of providers' personal traits, reflecting *Other Personal Attributes* (Funk et al., 2005). Implementation programs did not describe efforts aimed at *Individual Stage of Change* or *Individual Identification with the Organization*.

Process of Implementation

All implementation programs reported in-depth *Planning* of efforts to implement SBI and all implementation programs reported *Executing* these plans. As above, all implementation programs also incorporated some strategies aimed at training of or social marketing to providers and other stakeholders, reflecting *Engaging*. Most training was conducted by outside trainers or academic-detailers who were external to the organization (i.e., *External Change Agents*). Use of *Opinion Leaders* and *Formally Appointed Internal Implementation Leaders* were described by two implementation programs each, either in the absence of or in conjunction with the external trainers. The VA's Office of Quality and Performance invited internal experts to educate national and facility quality managers about SBI via teleconference (Bradley et al., 2006), an example reflecting both domains. Seale et al. (2005) described creation of the multi-disciplinary Healthy Lifestyles Committee to develop processes for implementing SBI (i.e., *Opinion Leaders*), and the Cutting Back study asked each participating organization to appoint an overall coordinator of operations and each clinic to appoint a liaison who served as a *Formally Appointed Internal Implementation Leader* (Babor et al., 2005; Babor et al., 2004). Five implementation programs incorporated ongoing evaluation of the process of implementation (i.e., *Reflecting and Evaluating*). Examples include Aspy et al.'s (2008) use of practice-enhancement assistants who kept diaries and field notes and discussed them weekly to hone training approaches (Aspy et al., 2008) and Seale et al's (2005, 2005) multidisciplinary committee, which met bimonthly, or more when necessary, to streamline SBI procedures.

Implementation Outcomes

The highest screening rate (93%) was reported by the VA's implementation program (Table 1) (Bradley et al., 2006). This program used more elements of the *Inner Setting* (12 of the 14 sub-domains) and *Process of Implementation* (7 of the 8 sub-domains) domains than the other implementation programs and reported use of the most strategies relating to the *Outer Setting* domain (3 of the 4 sub-domains) (Table 2). The second and third highest screening rates were 64.5 and 59.6% reported by Rose et al. (2008) and Aspy et al. (2008), respectively (Table 1). Similar to the VA program, both described use of multiple sub-domains of *Inner Setting* (5 of the 14) and *Process of Implementation* (4 of the 8), but were not easily distinguishable from other implementation programs or comparable to the VA program in terms of other CFIR elements used. The remaining programs with outcomes data on screening reported rates between 2-26% (Table 1).

Two implementation programs reported similarly high rates of BI. The Cutting Back program reported 73% (Babor et al., 2005), and the VA program at one 8-site facility reported 71% (Williams et al., 2010) of screen-positive patients had documented BI (Table 1). Implementation strategies of each of these programs reflected similar domains of the CFIR, except that the VA program incorporated more elements of the *Inner Setting* and *Outer Setting* domains than did Cutting Back (Table 2). Remaining rates of BI ranged from 0.9–66%, with no clear patterns emerging regarding CFIR domains addressed.

Discussion

Results of this structured review of literature on implementation of SBI suggest that diverse strategies spanning all five domains of the CFIR have been used to implement SBI. A single implementation program, the VA healthcare system, reported a substantially higher rate of alcohol screening than other programs and could be distinguished from the other implementation programs for its focus on multiple elements of the *Inner Setting*, *Outer Setting*, and *Process of Implementation* domains of the CFIR. Studies of implementation of alcohol screening with the next highest rates of screening also included strategies focused on the *Inner Setting* and *Process of Implementation* domains. Studies with high rates of BI did not clearly share a focus on specific CFIR implementation domains and were not easily distinguishable from other studies based on their use of elements of the CFIR.

Results of this review suggested that focusing implementation strategies on the *Inner Setting*, *Outer Setting*, and *Process of Implementation* domains of the CFIR could be associated with achieving high rates of screening. However, the implementation programs with the highest rates of screening did not consistently share a focus on the same sub-domains within these broad categories and, when they did, were not easily discernable from implementation programs that did not report high rates of screening. Qualitatively, these three implementation programs shared several components, which are encompassed in Damschroder et al's description of *Inner Setting*, *Outer Setting*, and *Process of Implementation* and may have been influential to their successes. Each of these implementation efforts utilized electronic medical records and some form of performance accountability via measurement and feedback. Further, they all took place in large, geographically diverse, networks of clinical practices with centralized administrations that included a research infrastructure. These qualities are consistent with findings from previous efforts to understand how to implement effective interventions into routine medical practice that suggest changing provider behavior is possible but generally requires multifaceted approaches at multiple levels (Babor & Higgins-Biddle, 2000; Greenhalgh et al., 2004;

Grol & Grimshaw, 2003; Grol, Bosch, Hulscher, Eccles, & Wensing, 2007; Rogers, 1995).

The successes of these three programs in implementing screening could have been a product of being conducted within infrastructures that were aligned with implementation and evaluation of programs. However, smaller networks or singular clinical practices with infrastructures that may be less robust for implementing new practices should not be discouraged. In her review of implementation research, Greenhalgh suggests that the next generation of research on diffusion of health service innovations be "process rather than package oriented." In other words, we should not be asking if strategy X is effective, but should instead be asking "what features account for the success of program X in this context and the failure of a comparable program in a different context?" (Greenhalgh et al., 2004). To that end, qualitative or comparative effectiveness research may be needed to identify successful implementation strategies in specific contexts.

Results of this review also suggest that the strategies necessary to implement alcohol screening may differ from those necessary to implement brief intervention. For instance, although, the VA program could be distinguished for obtaining high rates of screening, and a single article from the VA program reported a very high rate of BI at a single 8-site healthcare facility (Williams et al., 2010), two studies that were not included in this review (in press at the time the review was completed) found substantially lower rates of documented BI at other VA facilities (Lapham et al., 2010; Williams et al., 2010). The need for different approaches for implementing BI compared with screening may be related to the fact that screening, which involves adoption of a validated instrument and can be self-administered or performed by clinical staff at all levels, is a less complex intervention than BI, which involves assessment and decision-making regarding specific feedback and advice to be offered. The VA, because it has variability, offers an opportunity to conduct qualitative and formative evaluations to understand what distinguishes high performing sites from low performing sites. Some formative evaluations were conducted by other implementation programs (Anderson et al., 2004; Peltzer, Matseke, & Azwihangwisi, 2008) and may be ongoing. These evaluations may highlight implementation strategies that may be effective specifically for BI implementation.

Based on this review, conceptual frameworks for implementation, and the CFIR in particular, may be useful at two stages of implementation of SBI. First, conceptual frameworks may be useful as a roadmap in the development phases of an implementation program for SBI. Only two of the eight implementation programs reviewed in the present study described use of specific conceptual models for planning their implementation strategies (Aspy et al., 2008; Rose et al., 2008), but future efforts could consider incorporating implementation strategies that reflect the domains of the CFIR or another applicable framework (Greenhalgh et al., 2004). A recent article by Nilsen (2010) suggested new pathways for research on implementation of SBI, many of which reflect CFIR domains or sub-domains. For instance, they recommended collaborations between health professionals and policy-makers, reflecting *Cosmopolitanism*, and population-based organizational interventions, reflecting multiple elements of *Inner Setting* (Nilsen, 2010). Combining expert recommendations with domains described in the CFIR and/or other conceptual frameworks may suggest a broader set of implementation strategies for testing. Second, going forward, the CFIR, or a similar global conceptual framework, could provide a useful guideline for the reporting of strategies tested for implementation of SBI. The Standards for Quality Improvement Reporting Excellence (SQUIRE) Guidelines have recently been published to guide reporting of quality improvement work (Davidoff, Batalden, Stevens, Ogrinc, & Mooney, 2008). Similarly, the domains and subdomains of a global conceptual framework for implementation could be incorporated into reporting guidelines for implementation research such that, once published, studies or groups of studies could easily be compared.

However, there are several limitations related to using the CFIR to understand implementation of SBI, which may also be true of other conceptual frameworks. First, the CFIR assumes that the intervention is homogenous (i.e., a single intervention that is being implemented), when, in fact, implementation of SBI involves multiple steps. Each step is often implemented in a different manner and, therefore, could utilize different elements of the CFIR model. Therefore, although the CFIR could be used prospectively to plan and document the domains that will be addressed at each step, as well as for an implementation program as a whole, retrospective application of the CFIR may be of limited value. Second, many implementation efforts have multiple levels, such that the definitions of the *Inner* and *Outer* settings are not mutually exclusive. For instance, many of the implementation programs reviewed here took place across multiple clinical sites associated with larger healthcare systems. In these circumstances, the *Inner Setting* could have been used to describe the facility- or system-level context. There may be important differences both within and between clinical sites of healthcare systems that encompass elements of both *Inner Setting* and *Outer Setting.* If these elements are categorized into one or the other setting, concepts or efforts important for implementing preventive care may be lost in semantics. As recognized by Damschroder et al, "the line between inner and outer setting is not always clear and . . . the specific factors considered 'in' or 'out' will depend on the context of the implementation effort" (Damschroder et al., 2009). A stronger approach might be to consider all organizational levels, from the inner-most to the outer-most, simultaneously. Third, the model as constructed is useful for categorization and description of strategies used but, as noted by Damschroder et al. (2009), offers no guidance as to which elements are more important than others in influencing or prioritizing strategies for a specific implementation effort. Which CFIR elements are relevant and how they should be incorporated into an implementation effort might depend on local developmental formative evaluation results. Finally, future efforts to compare implementation approaches would benefit from standardized definitions of implementation success (Greenhalgh et al., 2004), for which the CFIR and other similar conceptual frameworks offer no consensus.

This review also has important limitations. First, reporting bias likely underestimated elements of the CFIR used in the reviewed studies. Because of publication space limitations, many elements of implementation were likely not described in the reviewed articles, and this review assumed that a component was not present if it was not described. The two implementation programs that accounted for almost half of the articles reviewed also were coded as using the most CFIR elements, potentially reflecting the greater space available in multiple publications. Similarly, the context, or

pre-existing conditions, in which each implementation program was initiated may have been more or less aligned with the intended changes, and the research reports may not have described pre-existing conditions that could have rendered focus on some domains unnecessary. This phenomenon could account for implementation programs that obtained high rates of screening or BI (e.g., Chossis et al., 2007) but did not describe use of many elements of the CFIR. Second, we attributed any elements reported in a single article from an implementation program to all articles on that program. This strategy was chosen because it improved the information available on each implementation program overall, but, at this aggregated level, this approach also combined low and high performing sites that may have had implementation strategies that differed in important but unknown ways. Combining facilities or countries in this way could obscure important site-specific differences in implementation strategies. Third, although the articles were reviewed and coded by clinicians who were blinded to study authors and not involved in any of the included articles, the lead author and some co-authors have been involved in efforts to implement SBI in the VA, which potentially biases this review. Fourth, it is possible that the search strategy missed important studies that evaluated efforts to implement SBI. Finally, the research reviewed is, itself, limited because studies were conducted on relatively short timeframes. As recently discussed by Nilsen (2010), educational interventions with providers are unlikely to produce immediate measurable benefits and likely require a long-term process of individual change.

The generalizability and validity of findings from this review may be limited by several factors. Publication bias may have resulted in the most successful implementation efforts' being included. Further, this review does not address sustainability of interventions or the quality of alcohol screening and/or brief interventions that occurred during implementation programs. Finally, comparison of rates of screening and/or intervention across implementation strategies tested was limited by different outcome measures, scopes, and duration of studies, as well as by the fact that eight of the 17 articles described only two implementation programs (VA and WHO).

Despite these limitations, this review suggested that programs with high rates of screening could be distinguished for implementation strategies that focused on elements of the *Inner Setting*, *Outer Setting*, and *Process of Implementation* described in the CFIR. Future studies could further assess whether focusing on *Inner Setting*, *Outer Setting*, and *Process of Implementation* elements of the CFIR during implementation is associated with successful implementation of alcohol screening, as well as evaluate CFIR elements that may be associated with successful, sustained implementation of BI.

References

Aalto, M., Pekuri, P., & Seppa, K. (2003). Primary health care professionals' activity in intervening in patients' alcohol drinking during a 3-year brief intervention implementation project. *Drug and Alcohol Dependence, 69*(1), 9–14.

Aira, M., Kauhanen, J., Larivaara, P., & Rautio, P. (2003). Factors influencing inquiry about patients' alcohol consumption by primary health care physicians: Qualitative semi-structured interview study. *Family Practice, 20*(3), 270–275.

Anderson, P., Kaner, E., Wutzke, S., Funk, M., Heather, N., Wensing, M., . . . WHO Brief Intervention Study Group. (2004). Attitudes and managing alcohol problems in general practice: An interaction analysis based on findings from a WHO collaborative study. *Alcohol and Alcoholism, 39*(4), 351–356.

Aspy, C. B., Mold, J. W., Thompson, D. M., Blondell, R. D., Landers, P. S., Reilly, K. E., & Wright-Eakers, L. (2008). Integrating screening and interventions for unhealthy behaviors into primary care practices. *American Journal of Preventive Medicine, 35*(5 Suppl), S373–S380.

Babor, T., & Higgins-Biddle, J. (2000). Alcohol screening and brief intervention: Dissemination strategies for medical practice and public health. *Addiction, 95*(5), 677–686.

Babor, T. F., Higgins-Biddle, J., Dauser, D., Higgins, P., & Burleson, J. A. (2005). Alcohol screening and brief intervention in primary care settings: Implementation models and predictors. *Journal of Studies on Alcohol and Drugs, 66*(3), 361–368.

Babor, T. F., Higgins-Biddle, J. C., Higgins, P. S., Gassman, R. A., & Gould, B. E. (2004). Training medical providers to conduct alcohol screening and brief interventions. *Substance Abuse, 25*(1), 17–26.

Bradley, K. A., Williams, E. C., Achtmeyer, C. E., Hawkins, E. J., Harris, A. H., Frey, M. S., . . . Kivlahan, D. R. (2007). Measuring performance of brief alcohol counseling in medical settings: A review of the options and lessons from the Veterans Affairs (VA) health care system. *Substance Abuse, 28*(4), 133–149.

Bradley, K. A., Williams, E. C., Achtmeyer, C. E., Volpp, B., Collins, B. J., & Kivlahan, D. R. (2006). Implementation of evidence-based alcohol screening in the Veterans Health Administration. *American Journal of Managed Care, 12*(10), 597–606.

Chossis, I., Lane, C., Gache, P., Michaud, P. A., Pecoud, A., Rollnick, S., & Daeppen, J. B. (2007). Effect of training on primary care residents' performance in brief alcohol intervention: A randomized controlled trial. *Journal of General Internal Medicine, 22*(8), 1144–1149.

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science, 4,* 50.

Damschroder, L. J., & Hagedorn, H. J. (2011). A guiding framework and approach for implementation research in substance use disorders treatment. *Psychology of Addictive Behaviors, 25,* 194–205.

Davidoff, F., Batalden, P., Stevens, D., Ogrinc, G., & Mooney, S. (2008). Publication guidelines for quality improvement studies in health care: Evolution of the SQUIRE project. *Journal of General Internal Medicine, 23*(12), 2125–2130.

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M., & Wallace, F. (2005). Implementation Research: A Synthesis of the Literature *Implementation Research: A Synthesis of the Literature.* University of South Florida, Louis de la Parte Florida Mental Health Institute.

Funk, M., Wutzke, S., Kaner, E., Anderson, P., Pas, L., McCormick, R., . . . Saunders, J. (2005). A multicountry controlled trial of strategies to promote dissemination and implementation of brief alcohol intervention in primary health care: Findings of a World Health Organization collaborative study. *Journal of Studies on Alcohol and Drugs, 66*(3), 379–388.

Gomel, M. K., Wutzke, S. E., Hardcastle, D. M., Lapsley, H., & Reznik, R. B. (1998). Cost-effectiveness of strategies to market and train primary health care physicians in brief intervention techniques for hazardous alcohol abuse. *Social Science Medicine, 47*(2), 203–211.

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly, 82*(4), 581–629.

Grol, R., & Grimshaw, J. (2003). From best evidence to best practice: Effective implementation of change in patients' care. *Lancet, 362*(9391), 1225–1230.

Grol, R. P., Bosch, M. C., Hulscher, M. E., Eccles, M. P., & Wensing, M.

(2007). Planning and studying improvement in patient care: The use of theoretical perspectives. *Milbank Quarterly, 85*(1), 93–138.

Helfrich, C. D., Weiner, B. J., McKinney, M. M., & Minasian, L. (2007). Determinants of implementation effectiveness: Adapting a framework for complex innovations. *Medical Care Research and Review, 64*(3), 279–303.

Higgins-Biddle, J. C., Babor, T. F., Mullahy, J., Daniels, J., & McRee, B. (1997). Alcohol screening and brief intervention: Where research meets practice. *Connecticut Medicine, 61*(9), 565–575.

Kaner, E., Lock, C., Heather, N., McNamee, P., & Bond, S. (2003). Promoting brief alcohol intervention by nurses in primary care: A cluster randomised controlled trial. *Patient Education & Counseling, 51*(3), 277–284.

Kaner, E. F., Beyer, F., Dickinson, H. O., Pienaar, E., Campbell, F., Schlesinger, C., . . . Burnand, B. (2007). Effectiveness of brief alcohol interventions in primary care populations. *Cochrane Database of Systematic Reviews, (2),* CD004148.

Kaner, E. F., Lock, C. A., McAvoy, B. R., Heather, N., & Gilvarry, E. (1999). A RCT of three training and support strategies to encourage implementation of screening and brief alcohol intervention by general practitioners. *British Journal of General Practice, 49*(446), 699–703.

Lapham, G. T., Achtmeyer, C. E., Williams, E. C., Hawkins, E. J., Kivlahan, D. R., & Bradley, K. A. (2010). Increased documented brief alcohol interventions with a performance measure and electronic decision support. *Medical Care*. [Epub ahead of print]

Lock, C. A., & Kaner, E. F. (2004). Implementation of brief alcohol interventions by nurses in primary care: Do non-clinical factors influence practice? *Family Practice, 21*(3), 270–275.

Maciosek, M. V., Coffield, A. B., Edwards, N. M., Flottemesch, T. J., Goodman, M. J., & Solberg, L. I. (2006). Priorities among effective clinical preventive services results of a systematic review and analysis. *American Journal of Preventive Medicine, 31*(1), 52–61 (see erratum page 458 Volume 432, Number 455).

McCormick, K. A., Cochran, N. E., Back, A. L., Merrill, J. O., Williams, E. C., & Bradley, K. A. (2006). How primary care providers talk to patients about alcohol: A qualitative study. *Journal of General Internal Medicine, 21,* 966–972.

Nilsen, P. (2010). Brief alcohol intervention-where to from here? Challenges remain for research and practice. *Addiction, 105*(6), 954–959.

Nilsen, P., Aalto, M., Bendtsen, P., & Seppa, K. (2006). Effectiveness of strategies to implement brief alcohol intervention in primary healthcare. A systematic review. *Scandinavian Journal of Primary Health Care, 24*(1), 5–15.

Peltzer, K., Matseke, G., & Azwihangwisi, M. (2008). Evaluation of alcohol screening and brief intervention in routine practice of primary care nurses in Vhembe district, South Africa. *Croatian Medical Journal, 49*(3), 392–401.

Rogers, E. M. (1995). *Diffusion of innovations.* New York: Free Press.

Rose, H. L., Miller, P. M., Nemeth, L. S., Jenkins, R. G., Nietert, P. J., Wessell, A. M., & Ornstein, S. (2008). Alcohol screening and brief counseling in a primary care hypertensive population: A quality improvement intervention. *Addiction, 103*(8), 1271–1280.

Rycroft-Malone, J., Harvey, G., Kitson, A., McCormack, B., Seers, K., & Titchen, A. (2002). Getting evidence into practice: Ingredients for change. *Nursing Standard, 16*(37), 38–43.

Seale, J. P., Shellenberger, S., Boltri, J. M., Okosun, I. S., & Barton, B. (2005). Effects of screening and brief intervention training on resident and faculty alcohol intervention behaviours: A pre- post-intervention assessment. *BMC Family Practice, 2005*(6), 46.

Seale, J. P., Shellenberger, S., Tillery, W. K., Boltri, J., Vogel, R., Barton, B., & McCauley, M. (2005). Implementing alcohol screening and intervention in a family medicine residency clinic. *Substance Abuse, 26*(1), 23–31.

Solberg, L. I., Maciosek, M. V., & Edwards, N. M. (2008). Primary care intervention to reduce alcohol misuse ranking its health impact and cost effectiveness. *American Journal of Preventive Medicine, 34*(2), 143–152.

U.S. Preventive Services Task Force. (2004). Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: Recommendation statement. *Annals of Internal Medicine, 140,* 554–556.

Whitlock, E. P., Polen, M. R., Green, C. A., Orleans, T., & Klein, J. (2004). Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: A summary of the evidence for the U.S. Preventive Services Task Force. *Annals of Internal Medicine, 140,* 557–568.

Williams, E. C., Achtmeyer, C. E., Kivlahan, D. R., Greenberg, D., Merrill, J. O., Wickizer, T. M., . . . Bradley, K. A. (2010). Evaluation of an electronic clinical reminder to facilitate brief alcohol-counseling interventions in primary care. *Journal of Studies on Alcohol and Drugs, 71*(5), 720–725.

Williams, E. C., Lapham, G., Achtmeyer, C. E., Volpp, B., Kivlahan, D. R., & Bradley, K. A. (2010). Use of an electronic clinical reminder for brief alcohol counseling is associated with resolution of alcohol misuse. *Journal of General Internal Medicine, 25*(1), 11–18.

Received July 2, 2010
Revision received October 14, 2010
Accepted October 18, 2010 ■