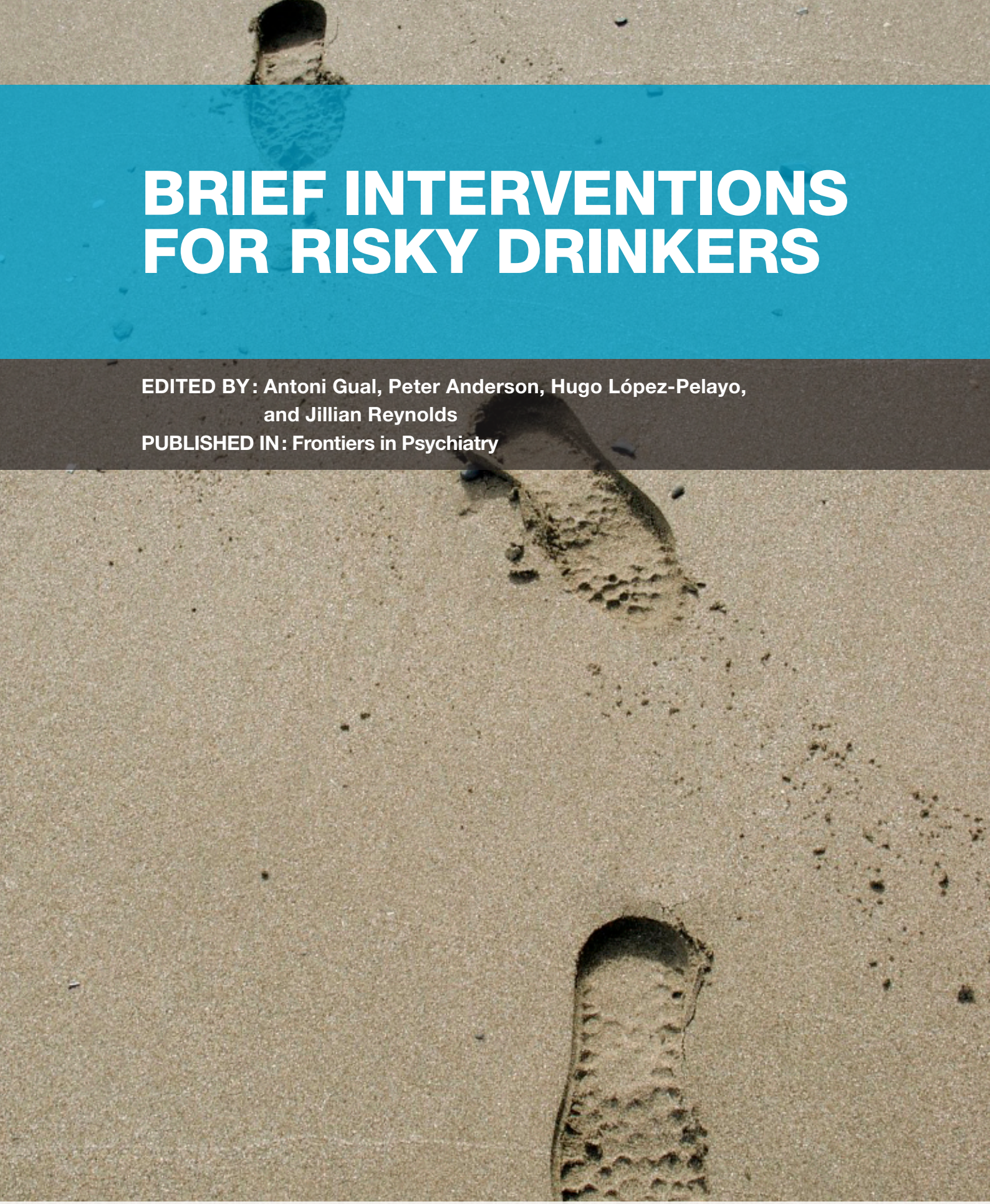

BRIEF INTERVENTIONS FOR RISKY DRINKERS

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PUBLISHED IN: Frontiers in Psychiatry

frontiers Research Topics

frontiers

ISSN 1664-8714
ISBN 978-2-88919-887-0
DOI 10.3389/978-2-88919-887-0

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BRIEF INTERVENTIONS FOR RISKY DRINKERS

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Alcohol is the sixth leading risk factor for disability and premature death all over the world, and one of the leading causes of premature mortality in western societies; it is a leading risk factor for death in young and middle-age males. Heavy drinking accounts for about two thirds of the burden of disease attributable to alcohol.

In the early 1980s, screening and brief interventions (SBI) in primary health care settings were proposed as effective strategies to identify risky drinkers and to help them reduce their drinking. Since then, a growing body of evidence, including several meta-analysis and Cochrane reviews, has shown the efficacy and effectiveness of SBI in primary health settings. However, demonstrating the effectiveness of SBI has not been insufficient to facilitate its general implementation in the routines of primary health care physicians, and in fact the dissemination of SBI has proven to be a difficult business. Qualitative and quantitative research has identified most of the facilitators and barriers for its implementation, and publicly funded research has been earmarked to address the dissemination problems worldwide. Some examples are the World Health Organization Phase III and Phase IV studies on the identification and management of alcohol-related problems in primary care, EU funded projects (PHEPA, AMPHORA, ODHIN, BISTAIRS), the UK SIPS trials and the SBIRT developments sponsored by the Substance Abuse & Mental Health Services Administration (SAMHSA) in the USA.

The efficacy and effectiveness of SBI in primary health is now well established, but there are still some questions that remain unsolved: which practitioners should deliver them; what length should they be; is there a need for booster sessions; is there added value of a motivational approach? These questions, together with other relevant aspects of SBI, need ongoing research.

In recent years, SBIs have been tested in settings other than primary health care, including hospitals, accident and emergency rooms, criminal justice, colleges and universities, social services and pharmacies. In some of those areas, the evidence is scarce (for example, pharmacies) while in others it is very promising (for example, students and hospitals). New technologies have also offered the possibility of online tools, and, in the last few years, different digital-based applications have been tested successfully as new ways to deliver effective SBIs to larger amounts of people. Brief interventions have also spread to drugs other than alcohol.

This book aims to be an update of the state-of-the art of brief advice. It is a compilation of articles published by some of the most relevant researchers in the field in Frontiers in Psychiatry between 2014 and 2016.

Citation: Gual, A., Anderson, P., López-Pelayo, H., Reynolds, J., eds. (2016). Brief Interventions for Risky Drinkers. Lausanne: Frontiers Media. doi: 10.3389/978-2-88919-887-0

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frontiers in Psychiatry

EDITORIAL
published: 17 March 2016
doi: 10.3389/fpsyt.2016.00042

Editorial: Brief Interventions for Risky Drinkers

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Keywords: alcohol drinking, hazardous drinking, at-risk drinking, brief intervention, brief advice

The Editorial on the Research Topic

Brief Interventions for Risky Drinkers

Alcohol consumption is a wholly or contributory cause for more than 200 diseases, injuries, and other health conditions with three-digit ICD-10 codes (1). Globally, alcohol is the fifth most important risk factor for ill-health and premature death (2). Risky alcohol use can be defined as a quantity or pattern of alcohol use that places individuals at risk for adverse health and social outcomes (3). Harmful use, in turn, can be defined as alcohol use that results in physical, psychological, or social harm (3). Using a threshold of an average of 60 g of alcohol/day for a man and 40 g/day for a woman (4), about one in four Europeans aged 15–64 years use alcohol in a risky fashion (5). And, using a threshold of an average of 100 g of alcohol/day for a man and 60 g/day for a woman, about one in eight of Europeans aged 15–64 years use alcohol in a harmful fashion (5). Harmful use causes comorbid illnesses such as liver disease, depression, and raised blood pressure (6). Risky and harmful alcohol use and their comorbid illnesses are frequently detected in primary health care, emergency departments, and other non-specialized clinical settings. Brief advice emerged in the 1980s (7–9) and progressed during the three following decades as a strategy to reduce risky and harmful alcohol use in non-specialized clinical settings (10). This article provides an update of the state-of-the art of brief advice.

EFFICACY AND EFFECTIVENESS OF BRIEF ADVICE

Twenty-four systematic reviews have demonstrated the efficacy and effectiveness of brief advice delivered in primary health care settings to reduce risky and harmful alcohol use [O'Donnell et al.; (11, 12)]. The negative results found in some studies can be explained by several misconceptions about null findings and should not diminish the strength of the evidence base for the efficacy and effectiveness of brief advice (Heather). Examples of misconceptions include difficulties in distinguishing between "evidence of absence and absence of evidence" and the interference of reduction in consumption in control groups from baseline to follow-up mediated by regression to the mean, a research participation effect, or assessment reactivity.

WHY DOES BRIEF ADVICE WORK?

The underlying mechanisms of the effectiveness of brief advice are only partially known (Gaume et al.). Personalized feedback seems an effective ingredient. Other components (including advice to reduce/stop drinking, presenting alternative change options, moderation strategies, changes in norms perception, discrepancy between current behavior and goals/values, and change plan

OPEN ACCESS

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Specialty section:
This article was submitted to Addictive Disorders, a section of the journal Frontiers in Psychiatry

Received: *02 March 2016*
Accepted: *04 March 2016*
Published: *17 March 2016*

Citation:
Gual A, López-Pelayo H, Reynolds J and Anderson P (2016) Editorial: Brief Interventions for Risky Drinkers. Front. Psychiatry 7:42. doi: 10.3389/fpsyt.2016.00042

exercises) appear to be promising. Change talk seems to acts as a mediator of brief advice, whereas readiness to change seems an inconsistent mediator of the effectiveness of brief advice. More research on other potential active ingredients is needed, such as the perceived risk/benefit of alcohol intake, alcohol treatment seeking, self-efficacy, or enhanced awareness.

FOR WHOM CAN BRIEF ADVICE HELP?

Brief advice seems to work in primary health care and, in emergency departments, for men without other drug use (Wojnar and Jakubczyk). Brief advice does not seem to work for men seen in emergency departments as a consequence of violence-related events, or for women as a whole seen in emergency departments. In general, the effectiveness of brief advice in primary health care for women remains limited (11). Research on the effectiveness of brief advice in social service settings and at the workplace is understudied, and no conclusions of its impact can be made (Schulte et al.). Data on the efficacy of brief advice for illegal drug users are lacking for a number of reasons: concomitant unhealthy alcohol use, comorbid mental health conditions, variety of drugs used, and a wide range in severity (Saitz). In conclusion, there is insufficient evidence to support the implementation of brief advice in settings other than primary health care or for drugs. Further research is needed in these areas.

IMPLEMENTATION BARRIERS

Although the cost-effectiveness of brief advice is well-established (Angus et al.), it has not proved a sufficient trigger for the widespread implementation of brief advice in clinical practice, even though key stakeholders in several European health systems (for example, Catalonia, England, Finland, Italy, Scotland, and Sweden) have pushed for it (Colom et al.). Several barriers for implementing brief advice have been identified, including a risk of upsetting patients and a lack of time, training, and incentives (13). This is why a fair share of the current research on brief advice focusses on implementation science, seeking strategies to overcome these barriers.

FUTURE LINES FOR BRIEF ADVICE

Facilitated access to e-health and m-health modules could potentially boost the implementation and coverage of brief advice, and a number of clinical trials are underway [Wallace and Bendtsen; (14, 15)]. Ambitious projects have already been carried out, such as the FP7 EU funded project ODHIN (www.odhinproject.eu), which compared three strategies for promoting screening and brief advice activity in primary care (training and support, financial reimbursement, and referral to internet-based brief interventions), delivered separately or in combination. The ODHIN project showed the relevance of training and support and of financial incentives to increase the delivery rates of screening and brief advice but failed to find a significant impact of the option of referral to internet-based brief interventions[1].

Despite the evidence of the effectiveness of brief advice, its uptake in Europe is very low (16). Several authors have recently proposed a new approach to improve dissemination of brief advice for heavy drinking in primary health care (17, 18). Rehm et al. propose a shift from the "prevention approach" to a more medical "treatment approach," where alcohol problems should be managed with the same strategies and up to the same standards applied for other chronic conditions, such as high blood pressure and diabetes (19). According to this model, special attention should be paid to comorbid conditions such as hypertension, insomnia, liver problems, depression, and anxiety disorders, all of them very prevalent in primary health care.

In conclusion, despite strong evidence on the efficacy, effectiveness, and cost-effectiveness of brief advice in primary health care, its implementation in Europe is still very low. Therefore, new approaches making the best use of new technologies and aiming for a medical management of risky and harmful and alcohol use in primary health care, with the same standards used for common chronic medical conditions, should be tested.

AUTHOR CONTRIBUTIONS

All authors have contributed in the writing and intellectual content of the article. All authors have read and approved the manuscript for submission to the journal.

ACKNOWLEDGMENTS

Research leading to this paper has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 259268 – Optimizing delivery of health care intervention (ODHIN). Participant organizations in ODHIN can be seen at www.odhinproject.eu. The views expressed here reflect those of the authors only and the European Union is not liable for any use that may be made of the information contained therein.

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Conflict of Interest Statement: AG has received grants from Lundbeck, DyA Pharma y TEVA and honoraria from Lundbeck, DyA Pharma and Abbivie that have no relation with the study. HL-P has received honoraria from Lundbeck and Janssen and travel grants from Lundbeck, Lilly, Pfizer, Rovi, and Esteve that has no relation with this work. JR and PA have no conflict of interest to declare.

frontiers in PSYCHIATRY

REVIEW ARTICLE
published: 28 August 2014
doi: 10.3389/fpsyt.2014.00113

From efficacy to effectiveness and beyond: what next for brief interventions in primary care?

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Background: Robust evidence supports the effectiveness of screening and brief alcohol interventions in primary healthcare. However, lack of understanding about their "active ingredients" and concerns over the extent to which current approaches remain faithful to their original theoretical roots has led some to demand a cautious approach to future roll-out pending further research. Against this background, this paper provides a timely overview of the development of the brief alcohol intervention evidence base to assess the extent to which it has achieved the four key levels of intervention research: efficacy, effectiveness, implementation, and demonstration.

Methods: Narrative overview based on (1) the results of a review of systematic reviews and meta-analyses of the effectiveness of brief alcohol intervention in primary healthcare and (2) synthesis of the findings of key additional primary studies on the improvement and evaluation of brief alcohol intervention implementation in routine primary healthcare.

Results: The brief intervention field seems to constitute an almost perfect example of the evaluation of a complex intervention. Early evaluations of screening and brief intervention approaches included more tightly controlled efficacy trials and have been followed by more pragmatic trials of effectiveness in routine clinical practice. Most recently, attention has shifted to dissemination, implementation, and wider-scale roll-out. However, delivery in routine primary health remains inconsistent, with an identified knowledge gap around how to successfully embed brief alcohol intervention approaches in mainstream care, and as yet unanswered questions concerning what specific intervention component prompt the positive changes in alcohol consumption.

Conclusion: Both the efficacy and effectiveness of brief alcohol interventions have been comprehensively demonstrated, and intervention effects seem replicable and stable over time, and across different study contexts. Thus, while unanswered questions remain, given the positive evidence amassed to date, research efforts should maintain a continued focus on promoting sustained implementation of screening and brief alcohol intervention approaches in primary care to ensure that those who might benefit from screening and brief alcohol interventions actually receive such support.

Keywords: brief alcohol intervention, efficacy, effectiveness, implementation, research needs, secondary prevention, primary care

INTRODUCTION

Brief interventions for alcohol provide a clinically effective and cost-effective means of identifying and addressing alcohol-related problems when delivered in primary healthcare settings (1–4). Originating in the field of smoking cessation (5), and grounded in social cognitive theory (6), brief alcohol interventions aim to detect problems at an early stage, when they are most amenable to adjustment, to promote positive behavior change (7), and thus avoid the development of more serious future problems in an individual (8).

WHAT IS THE BASIS FOR BRIEF INTERVENTIONS FOR ALCOHOL?

Brief intervention comprises two broad modalities. First, simple structured advice in the form of personalized feedback on how to address problematic drinking behavior as well as information and/or advice on how to avoid its adverse consequences. This form of intervention is typically delivered in one to five sessions, which are short in duration [a review by Kaner et al. who found a mean of 25 min per intervention (9)]. Second, extended or more intensive intervention, using counselling and other psycho-therapeutic techniques such as motivational interviewing or cognitive behavioural therapy (CBT), which may extend up to 50 minutes per session (9, 10). These more intensive interventions may be delivered either in a single appointment, or via a series of related sessions and the overall treatment exposure has been reported to be 60–175 minutes overall (9). Nevertheless, while the content and delivery style of brief interventions may vary, all are

designed to promote awareness of the negative effects of drinking and to motivate positive behavior change (11). The core elements of brief alcohol intervention are based on "FRAMES" (*F*eedback, *R*esponsibility, *A*dvice, *M*enu, *E*mpathy, and *S*elf-efficacy) principles (12), and important components include drawing out individuals' beliefs and attitudes about drinking, their self-efficacy or sense of personal confidence about changing their drinking, and a view about how their drinking sits in relation to other people's drinking behavior (normative comparison) (13).

WHAT ARE THE OVERALL FINDINGS FROM THE EVIDENCE?

From the first study of the effects of opportunistic brief intervention carried out in Malmo, Sweden in the early 1980s (14) over three decades of research has been undertaken both locally and internationally to develop these simple technologies to assist with the identification of individuals at risk from their alcohol consumption, and the delivery of short, cost-effective interventions in community and health-care settings. A recent review of systematic reviews, covering a total of 56 unique primary healthcare-based randomized controlled trials, found consistent evidence for the effectiveness of brief alcohol interventions in reducing hazardous and harmful drinking when delivered in primary care settings (15). However, some of the more recent individual large scale pragmatic trials have failed to demonstrate significant differences between the effect sizes in the control and intervention groups (16, 17). In addition, as Heather has emphasized, while the evidence base for the implementation of brief structured advice as a form of opportunistic ASBI appears reasonably sound, this is not the case for extended, intensive interventions based more explicitly on motivational interviewing principles (18), despite the sound theory informing such approaches (19).

WHY MIGHT SOME STUDIES FAIL TO FIND SIGNIFICANT TREATMENT EFFECTS?

A consistent trend in trials of brief intervention is that of reduction of alcohol consumption in both the control and active intervention conditions (20–22). It is not yet clear if this is due to an artifact of participating in the research process itself (see below) or a response to active ingredients of behavior change, which may be provided to participants allocated to the control condition (23). These include feedback, provision of bibliometric information, and cursory advice about alcohol, which may be embedded with other lifestyle behaviors such as smoking or physical activity. Despite awareness of these issues, there has been little progress to address concerns about assessment reactivity, for example, through the use of Solomon 4-group designs (24–26).

WHAT DO WE KNOW ABOUT THE KEY ELEMENTS OF INTERVENTION AND HOW WELL THEY ARE DELIVERED?

Whilst there is undoubtedly a considerable and largely convincing body of literature supporting the overall effectiveness of brief interventions for alcohol, as the recent McCambridge review confirmed, our understanding of their "active ingredients" remains limited (27). Evidence suggests that for interventions to achieve statistically significant improvements in alcohol outcomes, they should include at least two of the following three elements – feedback, advice, and goal-setting (28). However, the results of a study by Bertholet and colleagues were far less clear-cut, finding that across different populations and settings, intervention characteristics viewed as central to efficacious brief motivational interviews were inconsistent predictors of drinking outcome (29). Further, as both Whitlock and Beich have emphasized (28, 30), given the inevitable "helping relationship" that exists between patient and practitioner, it remains challenging to isolate the impact that the additional support general practitioners might have on intervention effectiveness, particularly when such interventions may be delivered on multiple occasions, and via multiple modalities. There has been some recent work that focused on specific behavior change techniques embedded in advice or counseling (31) but we are not closer to understanding potential therapist effects (either skill, rapport-building, or trust) or the interaction between intervention *per se* and other aspects of recipients' lives (policy, corporate behavior, and family or personal context). There are also concerns as to whether current brief intervention approaches remain faithful to their theoretical roots. It has therefore been suggested that poor delivery of brief interventions coupled with potential content drift, should result in a cautious approach to future roll-out, whilst additional research is carried out to establish the efficacy of individual intervention components more conclusively (29).

Taking all the above considerations into account, it seems timely to review the current state of the screening and brief alcohol intervention evidence base to determine the extent to which further research is actually required, and to consider which research questions such studies might most usefully examine. After all, any additional research must build upon previous work to save public time and money. For "while replication is an important part of the scientific method, a field needs to progress rather than merely generate volume" (32). Importantly, the development, evaluation, initial adoption, and wider roll-out of a new health intervention or treatment should ideally be supported by a sequence of research studies, ranging from basic "proof of concept" research to demonstration studies. Flay identifies four key levels of experimental research: efficacy (or explanatory) trials; treatment effectiveness (or pragmatic) studies; implementation studies; and finally, program evaluation (or demonstration) research to measure the actual impact of an intervention at wider population level once an intervention becomes part of large scale, mainstream care (33, 34). These levels are both interlinked and interdependent, thus most research is best conceptualized as existing on a continuum, from optimized to naturalistic conditions, as opposed to being easily positioned within one distinct study category (35). Crucially, however, efficacy must be demonstrated before effectiveness is assessed, and the latter is a necessary pre-condition for wider dissemination and subsequent adoption (36).

Against this background, this paper aims to provide an overview of the development of the screening and brief alcohol intervention research field in primary health care drawing primarily on published systematic reviews in the field, supplemented with key recent literature to ensure the evidence presented reflects the cutting edge of this field. In doing so, it will assess the extent to which the existing ASBI evidence base has achieved Flay's four key levels of intervention research (efficacy → effectiveness → implementation → demonstration) (33,

34), which in turn, will help highlight any outstanding questions for future research.

METHODS

First, the paper draws on the results of a recent overview of systematic reviews and meta-analyses of the effectiveness of brief alcohol intervention in this setting (15). This overview searched key electronic databases (MEDLINE, EMBASE, PsycInfo, The Cochrane Database, The Database of Abstracts of Reviews of Reviews, and the Alcohol and Alcohol Problems Science Database) for systematic reviews and meta-analyses of studies examining the effectiveness of brief alcohol intervention in comparison to control conditions in primary healthcare settings, which were published between 2002 and 2012. Second, the paper synthesizes the findings of more recently published primary studies focused on the improvement and evaluation of the implementation of brief interventions for alcohol in routine primary healthcare to ensure the presented evidence reflects the state-of-the-art in this field.

For the purposes of this paper, primary healthcare has been operationalized to include all immediately accessible general healthcare facilities but not emergency settings. Brief intervention comprises a single session and/or up to a maximum of five sessions of engagement with a patient, and the provision of information and advice designed to achieve a reduction in risky alcohol consumption or alcohol-related problems. Heavy drinking is defined as drinking in excess of 60 g of alcohol per day for men and 40 g for women (37). Hazardous drinking is consumption at a level, or in such a pattern, that increases an individual's risk of physical or psychological consequences (38), while harmful drinking is defined by the presence of these consequences (39). Alcohol consumption, at a dependent level, results in repetitive problems, affecting three or more areas of life, including a strong desire or compulsion to use alcohol, inability to control use, and withdrawal from and tolerance to alcohol (40).

RESULTS

EFFICACY, EFFECTIVENESS, IMPLEMENTATION, AND PROGRAME EVALUATION: THE FOUR PHASES OF BRIEF ALCOHOL INTERVENTION RESEARCH

Level 1: Do brief interventions work? Efficacy studies on brief alcohol interventions

An efficacy trial is designed to evaluate what an intervention achieves under optimum conditions (33). It provides a test of (a) a well-specified and standardized treatment or therapy that (b) is made available in a uniform fashion, within standardized contexts or settings, to a specific target audience, which (c) completely accepts, participates in, complies with, or adheres to the treatment/programe as delivered (33). According to the US Society for Prevention Research (36, 41), efficacy testing necessitates the conduct of a minimum of two robust trials [defined as those which include tightly defined populations; psychometrically reliable measures and data collection procedures; rigorous statistical analysis; consistent positive effects (without adverse impacts); and one or more long-term follow-ups]. The randomized controlled trial is generally considered to be the "gold-standard" for intervention evaluation in medical research and the most rigorous way of determining whether a cause–effect relation exists between treatment and outcome (42). This is because this methodological approach is specifically designed to minimize bias and potentially confounding variables through randomization of study participants to prevent systematic differences between intervention groups in any factors (both known and unknown); and double blinding to ensure that the preconceived views of subjects and/or clinicians cannot systematically bias the assessment of outcomes (43).

Clinical drug trials, where a discrete dose of a pharmacological agent is delivered to patients, face fewer challenges in meeting the required standards of treatment efficacy. For behavioral interventions, which generally involve significant inter-personal interaction in the delivery and receipt of advice or counseling, the conditions are more challenging. There is inherent complexity where human actors are required to be a substantial part of "the therapy" (44). Although it can be argued that practitioners often deliver and/or explain the pharmaco-therapy in drug trials, the tablet or pill is generally regarded as the key active ingredient not the explanation or advice *per se*. Despite this challenge, an attempt has been made to disaggregate the component parts of brief alcohol intervention in trial-based evaluations (by characteristics of practitioners, patients, delivery settings, intervention content, scope for flexibility, skill-based training, implementation support, and fidelity monitoring) to assess the extent to which trial-based evaluations show features of uniformity and standardization (efficacy) or not (9). The conclusion of this work was that evaluations in this field sit on a continuum from efficacy to effectiveness trials, because a perfect model of either extreme is hard to achieve. In general, the older trials, which tended to include more tightly controlled evaluations with high levels of internal validity, demonstrated consistently positive outcome effects. Moreover, a series of sensitivity analyses excluding trials with less than adequate features of methodology found persistently positive outcomes. Thus, proof of concept via efficacy trials seems to have been comprehensively demonstrated (45) and more recently re-confirmed by a further systematic review by Jonas et al. (46).

Level 2: Do brief interventions work in the real world of primary care? Effectiveness trials

Efficacy trials can establish whether an intervention works (or does more good than harm) when delivered in optimum conditions; effectiveness trials determine whether those benefits continue to be realized in more real-world settings. Sufficient replicability and stability of effects are important aspects of this work especially in "typical" conditions of delivery where availability, compliance or acceptance, and measurement factor may vary (33). As Flay writes "an intervention will be effective only if an efficacious treatment/program is delivered/implemented in such a way as to be made available to an appropriate target audients in a manner acceptable to them (i.e. that they will be receptive to, participate in, comply with, or adhere to)" (33).

A recent review of reviews identified at least 56 separate randomized controlled trials of screening and brief alcohol interventions in primary health care, which consistently reported that brief alcohol interventions are effective at reducing hazardous and harmful drinking in primary healthcare, with weekly alcohol consumption the most commonly reported outcome (15). A

key issue here, is the size of the outcome effect and the extent to which it is diminished (or not) in more variable pragmatic evaluations. In 2007, meta-analysis of the results from 25 RCTs of screening and brief intervention by Kaner et al. (9) reported an average reduction in the quantity of alcohol drunk of 38 g/week for brief intervention compared with control conditions [95% CI (confidence interval): 23–54 g]. More recently, analysis of the pooled results from 23 RCTs and 6 systematic reviews by Jonas et al. (46) found a slightly increased reduction of 49 g/week for adults aged 18–64 (95% CI: 33–66 g). Thus outcome effects appear to have been generally stable over time as trials have become increasingly pragmatic in nature (9). Finally, in addition to reduced alcohol consumption, this field of work has regularly reported reductions in other outcomes such as alcohol-related problems (9) and reduced health-care utilization (47) and mortality (48). Importantly, delivery by a range of practitioners in primary healthcare settings has beneficial effects (49), although findings of one review suggest that the effect sizes are greater if delivered by doctors (50). In summary, there appears to be ample evidence of replicability and consistency of effects on a number of parameters.

This said, while the overall evidence base seems to show that brief alcohol interventions are both efficacious and effective when delivered in primary care settings, some individual large scale pragmatic trials have reported null findings. For example, a recent large UK trial (SIPS) reported no significant differences in hazardous and harmful drinking status in patients receiving simple feedback after screening plus a patient information leaflet (the control condition), those receiving 5 min of structured advice, and those receiving a further 20 min brief lifestyle counseling (16). This finding accords with three systematic reviews that focused on control conditions only and found consistently reduced drinking in these groups over time (20–22). It may be that the mere fact of participation in a brief intervention trial may be associated with positive behavior change. This may be due to a general "Hawthorn effect," whereby increased attention or scrutiny might influence drinking (51). It may be that most individuals who agree to participate in a trial have already started a change process. Moreover, given the fact that extreme measures of behavior tend to shift to less extreme positions over time (known as regression to the mean), such reductions in control groups may also be explained by natural reductions in heavy drinking over time (52). Finally, there is growing evidence to suggest that patients' reactions to the screening or measurement activity itself could influence their decision to cut down their alcohol consumption (known as assessment reactivity) (53, 54). Conversely, while it is possible that individuals with lower reported levels of consumption might increase their drinking over time, this is rarely captured in alcohol trials where only risky drinkers are included at enrolment. Nevertheless, an interesting trend in this field is that the definition of heavier or risky drinkers seems to have been falling over time (9). For example in a 2007 review, average weekly consumption at enrollment (baseline) was 55 standard drink units in the earliest trial (55) but was only 25 standard drink units in the most recent trial (16). Hence, it is possible that the scope for regression to the mean might be reducing in this field. Furthermore, the cumulative (pooled) meta-analyses reported in successive systematic reviews reveal positive outcome effects "over and above" those seen or expected in control conditions (15).

Level 3: What factors promote widespread adoption of brief interventions into routine practice? Implementation trials

Whilst there have been successive attempts to encourage the routine delivery of brief alcohol interventions in day-to-day practice, most efforts have demonstrated limited success (56–60), and implementation of this form of preventive care remains inconsistent. In the UK, for example, although survey data suggest that GPs see both preventative medicine and alcohol intervention as increasingly high priority public health areas, and they generally view primary health care as an appropriate setting to raise and discuss alcohol issues (61), most do not routinely ask patients about their drinking (62). In recognition of this mismatch, there has been an increased focus on implementation research to test potential approaches to improve their delivery (63).

Implementation studies may take a number of forms, exploring the many influences on patient, healthcare professional, and organizational behavior in either healthcare or population settings (63). In the alcohol intervention field, there has arguably been most progress in identifying the various obstacles experienced by practitioners seeking to deliver screening and brief alcohol interventions in routine primary health care. Some of the barriers to the provision of brief alcohol interventions identified to date concern the socio-cultural, interactional and attitudinal factors that influence their delivery by individual primary healthcare practitioners (64, 65). For example, there is an evidence to suggest that many GPs remain unconvinced that patients will heed advice to change their drinking behavior, particularly those patients drinking at heavier or dependent levels (66–68). Practitioners are also concerned that they might offend patients by discussing alcohol, or at least view alcohol as a "delicate" subject to raise in the standard consultation situation (65, 68), which potentially risks jeopardizing the patient–doctor relationship (69, 70). This "role insecurity" (71) may also relate to the potential impact that practitioners' own drinking practices may have on intervention delivery, alongside confusion about what advice they should actually be delivering on lower risk drinking (61).

In addition, previous research also points toward a series of structural and organizational factors that influence alcohol intervention delivery. Lack of training or suitable intervention materials (68, 72), inadequate financial incentives (73, 74), unsupportive specialist alcohol service provision (3, 67), and everyday time pressures (67, 75) has all been identified by GPs and other health practitioners as barriers to their successful engagement in and delivery of brief interventions for alcohol (32, 59, 62, 64, 73, 76–79). Moreover, these barriers are often interrelated. Thus GPs' discussions around alcohol are shaped by both the practical challenge of incorporating discussions about alcohol within the pressured, time-limited consultation process and their own (and the patient's) complex social, cultural, and moral beliefs about what constitutes "normal" versus "problematic" drinking (64, 80, 81).

Alongside research to identify notable barriers to the routine delivery of screening and brief alcohol intervention in primary care, there have also been studies exploring facilitating factors. For example, Screening, Brief Intervention, and Referral to Treatment

(SBIRT) is US-based program to promote the use of evidence-based practice to identify, reduce, and prevent problematic use, abuse, and dependence on alcohol and illicit drugs (82–86). One key message arising from this program of activities has been that effective training strategies for health professionals are an essential first step in the successful implementation of SBIRT, with team-based learning a potentially promising strategy to help maintain newly learned clinical skills (87). In addition, Ronzani et al. have shown the importance of involving managers in the dissemination of screening strategies and brief interventions to increase their implementation rates (88). Results from comparative work carried out in New Zealand, England, and Catalonia demonstrated the need to tailor procedures to fit with local circumstances, to break the process down into clinically acceptable steps, and to negotiate implementation strategies and timing taking into account local needs and competing demands to successfully embed intervention activity (89). The recent developments in the use of digitally mediated brief interventions (eBI) delivered via the internet and mobile phones represent another way of dealing with these issues (90). These offer practitioners a way to avoid the need to engage their patients directly in a discussion about alcohol, while at the same time providing an opportunity to reflect on their drinking behavior in a secure and confidential setting (see *Internet applications for screening and brief interventions for alcohol in primary care settings – implementation and sustainability* by Wallace and Bendtsen in this issue for more on this subject).

Regarding work that actively promotes uptake and adoption of brief interventions in practice, the largest study conducted to date was part of a World Health Organisation Collaborative project. This study found that active dissemination strategies were needed to ensure that practitioners were aware of the evidence on brief interventions, whilet both training and support were needed to convert this knowledge into action (60). Moreover, a systematic review and meta-analysis of strategies to engage practitioners in brief intervention activity found that a specific focus on alcohol *per se* and multi-component support programes were more effective (79) than focusing on several behavior and just a single education or support strategy. Bringing this field right up to date is the optimizing delivery of health care interventions (ODHIN) study, an ongoing Europe wide project involving research institutions from nine European countries. This trial has a factorial design and it aims to assess the impact on practitioner behavior of out-reach training, financial incentives, and the opportunity to refer patients to an electronic brief intervention programe, both individually and in differing combinations of approaches. This study is due to report in 2015.

Level 4: Wider roll-out work: Demonstration studies

A key limitation of earlier implementation research, however, is that changes in practitioner behavior tend to be limited to the time-frame of each individual study that attempts to promote screening and brief alcohol intervention. When the research work ends, the focus on screening and brief alcohol intervention also tends to stop. A significant challenge is to find ways of embedding this activity in mainstream clinical work to achieve sustained delivery (70), and also to be able to measure when and how often it occurs, and to whom it is delivered.

The development of national alcohol strategies, specific guidance for practitioners on when and how to deliver screening and brief interventions, and national payment programs for ASBI has recently been introduced in the UK to promote their wider roll-out (91, 92). Khadjesari et al. drew on routine UK general practice data (covering 382,609 patients, drawn from over 500 general practices) to examine the impact of financial incentives on the rates of screening for alcohol-use disorders (93). It found that following the introduction of screening incentives, relatively high rates of newly registered adult patients (76% nationally) were being screened for an alcohol-use disorder in English general practice settings. In addition, research conducted in the North East of England, which used routine data to compare recorded rates of delivery between general practices that were incentivized or non-incentivized for ASBI activity, determined that overall, practices associated with higher recorded rates of key ASBI service indicators were signed up to pay-for-performance schemes (94). Finally, and moving the field beyond the UK, the ongoing EU co-funded research brief interventions in the treatment of alcohol-use disorders in relevant settings (BISTAIRS) project seeks to intensify the implementation of brief alcohol intervention across Europe, including through the identification and dissemination of existing pockets of evidence-based good practice in established national primary health-care programs, with results from this work expected in 2015 (95).

CONCLUSION

This paper demonstrates that overall, there is a plentiful outcome evaluation literature, which consistently reports positive effects of screening and brief alcohol intervention when delivered in primary care. Much of this literature is of a moderate to high quality, and the outcome effects persist even when the less well designed studies are discounted from the assessment. As such, we have surely long passed the point of needing to ask the question "do these interventions work?," or even "do they work in the real world of primary care?." Both efficacy and effectiveness have been comprehensively demonstrated through this substantial body of evidence, and intervention effects seem replicable and indeed stable over time, and across different study contexts. Indeed, with the benefit of hindsight, the brief intervention field seems to constitute an almost perfect example of the evaluation of a complex intervention (96). Early evaluations of screening and brief intervention approaches included more tightly controlled efficacy trials and were followed by more pragmatic trials of effectiveness in routine clinical practice. Attention then shifted to dissemination, implementation (60), and wider-scale roll-out (97). Nevertheless, we still seem to be a long way from consistent delivery of brief interventions to the majority of heavy drinking patients in routine primary care, and day-to-day implementation of this approach seems to be at best very modest (94). Moreover, while new studies appear at regular intervals in the published literature, these are still primarily focused on the assessment of intervention effects rather than on how to embed brief intervention approaches in mainstream care.

No field of research work is perfect however, and especially one that has been evolving over a 30 year period. Consequently, it is not surprising that a considerable degree of heterogeneity exists within the screening and brief intervention literature or that there can often seem to be a re-treading over previously covered ground.

There is also a genuinely interesting and as yet unanswered question concerning what specific factors prompt the positive changes in alcohol consumption that occur after brief alcohol intervention that undoubtedly needs further examination. However, the search for these "active ingredients" should not delay progress in rolling out these interventions into health systems for patient benefit. Many people do not fully understand how their car actually works, yet most still successfully drive them each day. Given the positive evidence amassed to date, research efforts should maintain a continued focus on promoting sustained implementation of screening and brief alcohol intervention approaches in primary care.

Moreover, frontline practitioners responsible for the implementation of any policy or health program may make adaptations based on the availability of resources, compatibility with organizational or professional values, expertise, and knowledge (98), resulting in their "reinvention" of the intervention (99). The research community needs to accept this reality which might result in some loss of scientific purity (98). For the credibility of research in practice is judged less by its rigor than how it fits with professional wisdom and experience, and understanding of what "best evidence" actually means in day-to-day health care (100). Looking further forward, therefore, the key challenge for the brief intervention field in the future is to embrace translational research (101), in which academics, practitioners, and policy-makers work in closer partnership, potentially also with patients, in order to understand their world-view more clearly, and identify mutually acceptable ways of embedding brief interventions in practice (102).

ACKNOWLEDGMENTS

This work was in part supported by the health program of the European Union as part of the BISTAIRS research project (agreement number 2011_1204). The sole responsibility lies with the author and the Executive Agency is not responsible for any use that may be made of the information contained therein. For further information, visit the project website at www.bistairs.eu.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 18 May 2014; accepted: 12 August 2014; published online: 28 August 2014.
*Citation: O'Donnell A, Wallace P and Kaner E (2014) From efficacy to effectiveness and beyond: what next for brief interventions in primary care? Front. Psychiatry **5**:113. doi: 10.3389/fpsyt.2014.00113*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in
PSYCHIATRY

REVIEW ARTICLE
published: 16 July 2014
doi: 10.3389/fpsyt.2014.00085

Interpreting null findings from trials of alcohol brief interventions

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The effectiveness of alcohol brief intervention (ABI) has been established by a succession of meta-analyses but, because the effects of ABI are small, null findings from randomized controlled trials are often reported and can sometimes lead to skepticism regarding the benefits of ABI in routine practice. This article first explains why null findings are likely to occur under null hypothesis significance testing (NHST) due to the phenomenon known as "the dance of the *p*-values." A number of misconceptions about null findings are then described, using as an example the way in which the results of the primary care arm of a recent cluster-randomized trial of ABI in England (the SIPS project) have been misunderstood. These misinterpretations include the fallacy of "proving the null hypothesis" that lack of a significant difference between the means of sample groups can be taken as evidence of no difference between their population means, and the possible effects of this and related misunderstandings of the SIPS findings are examined. The mistaken inference that reductions in alcohol consumption seen in control groups from baseline to follow-up are evidence of real effects of control group procedures is then discussed and other possible reasons for such reductions, including regression to the mean, research participation effects, historical trends, and assessment reactivity, are described. From the standpoint of scientific progress, the chief problem about null findings under the conventional NHST approach is that it is not possible to distinguish "evidence of absence" from "absence of evidence." By contrast, under a Bayesian approach, such a distinction is possible and it is explained how this approach could classify ABIs in particular settings or among particular populations as either truly ineffective or as of unknown effectiveness, thus accelerating progress in the field of ABI research.

Keywords: alcohol-related problems, brief interventions, randomized controlled trials, null findings, null hypothesis significance testing, Bayesian statistics

The effectiveness of alcohol brief intervention (ABI) in reducing alcohol consumption among hazardous and harmful drinkers is generally considered to have been demonstrated by a succession of systematic reviews with meta-analysis (1). The focus of these reviews in terms of types of ABI and settings for implementation has varied, together with the precise form in which effectiveness has been demonstrated (e.g., with regard to the intensity of effective intervention) (2, 3). The conclusions of secondary analyses concerning, for example, gender differences in response to ABI (2, 4) have also differed. There is little good evidence as yet for the effects of ABI on outcomes beyond consumption, e.g., morbidity or mortality (5). While apparently strong in the primary health care (PHC) setting, the evidence to support ABI in emergency (6) and general hospital (7) settings is more equivocal. But despite these reservations, all meta-analytic reviews of ABI in general and ABI in PHC in particular have found, without exception, that participants who receive ABI show greater reductions in alcohol consumption at follow-up than those who do not.

This positive verdict on the effectiveness of ABI notwithstanding, null findings from randomized or otherwise controlled trials, in which the statistical superiority of ABI over control conditions has not been demonstrated, frequently occur; they are often encountered in the literature and routinely reported at scientific conferences. Given the overall benefits of ABI shown in meta-analyses, reasons for these frequent failures to confirm effectiveness are not obvious but it may be that the effects of ABI are sufficiently small that they are difficult to detect (see below), in addition to other possible reasons. Whatever the reasons, they can have a dispiriting effect on researchers, health care administrators, and policy-makers. Researchers may be discouraged from pursuing research in the field of ABI and may not bother to submit their null findings for publication (8). Even if papers reporting null findings are submitted, and despite frequent admonitions that null findings based on competently designed research should be published (9), they may be rejected by journal editors, thus possibly biasing the results of meta-analyses. Health administrators may be persuaded to devote more resources to other areas of health care and policy-makers may listen more sympathetically to the arguments of those who are opposed to the widespread implementation of ABI as a means of reducing alcohol-related harm in the population (10). The damaging effects of null findings may be especially

pronounced when they originate from large, expensively funded, and well-publicized trials.

Another kind of problem associated with null findings is that they may be misinterpreted, leading sometimes to inappropriate calls for the implementation of interventions that lack supporting evidence. A prominent source of such misinterpretation arises because of the classic error of "proving the null hypothesis." Confusion is also likely to arise because of the frequent finding in trials of ABI of reductions in drinking, sometime quite large, in control conditions. Lastly, a limitation of the interpretation of null findings under the conventional null hypothesis significance testing (NHST) approach to ABI research is that it is unable to distinguish between two potentially different conclusions: that there is no evidence that the intervention under study is effective and that there is evidence that it is ineffective. As we shall see, this limitation has a retarding effect on scientific progress in this area of research.

Against this background, the issue of null findings from trials of ABI will be discussed with the following aims:

i. To show that, even though effects of ABI in the population may be real, it is not surprising that these effects often fail to be detected in research trials.
ii. To describe ways in which null findings are often misunderstood, with potentially damaging consequences for practice and policy on ABI.
iii. To explore one of the key characteristics of null findings in the field of ABI research – the tendency for control groups to show relatively large reductions in alcohol consumption.
iv. To suggest a way in which one of main drawbacks arising from null findings – the inability to distinguish between "absence of evidence" and "evidence of absence" – can be overcome.

THE DANCE OF THE *p*-VALUES

Over the past few years a YouTube video presentation by Emeritus Professor Geoff Cumming of La Trobe University, Melbourne, VIC, Australia, entitled "The dance of the *p*-values,"[1] has been circulating universities around the world [see also Ref. (11), p. 135–42]. Cumming amusingly and persuasively illustrates the enormous variability in the *p*-value simply due to sampling variability. He claims that most researchers fail to appreciate how unreliable the *p*-value is as a measure of the strength of evidence to support a finding.

In his demonstration, Cumming considers an experiment consisting of two independent groups, Experimental (E) and Control (C), designed to investigate the effect of an intervention on a variable measuring some relevant participant behavior. He assumes a population effect of the intervention, unknown of course to the experimenter, equivalent to an effect size of half a standard deviation or Cohen's $\delta = 0.5$, conventionally regarded as a medium effect (12). This results in two normally distributed populations with standard deviations of the same size. In the experiment, both E and C groups have size $N = 32$, giving a power to detect a medium-sized effect of 0.52 for a two-tailed test with $\alpha = 0.05$. Using his *Explanatory Software for Confidence Intervals* (ESCI)[2], Cumming runs a simulation of 1,500 experiments by sampling from the assumed populations and observes the resulting distribution of *p*-values for the obtained differences between E and C group means. These range from $p = 0.8$ to $p < 0.001$, even though there has been no change in the population effect. When grouped in a frequency histogram (**Figure 1**), the most frequent category of *p*-values at 36.1% is those exceeding $p = 0.10$ and clearly non-significant. A further 12.3% are in the questionable, "approaching significance" range of between $p < 0.10$ and > 0.05. Altogether, 48.4% of *p*-values are > 0.05, meaning that by orthodox statistical practice on nearly half the occasions this experiment might be conducted a null finding would eventuate, even though there is an effect of intervention in the population. The other 51.6% of results would be taken as statistically significant but these are distributed over the conventional labels of "significant" ($p < 0.05$), "highly significant" ($p < 0.01$), and "very highly significant" ($p < 0.001$), even though, again, nothing has changed in the size of the effect in the population. Cumming likens running a single experiment under these circumstances to visiting "the *p*-value casino" because the obtained *p*-value will be randomly chosen from the infinite series of possible values; obtaining a statistically significant *p*-value is like winning at roulette. The calculation of effect sizes with confidence intervals gives much more reliable information on what is likely to happen on replication (13).

It might be objected here that randomized controlled trials of ABI are usually more powerful than the experiment in the preceding paragraph. This may be true, although sample sizes not much different from $N = 32$ per group are not unknown in the scientific literature on ABI. Against that, the effect size for ABI is likely to be smaller than $\delta = 0.5$ and is better estimated as small to medium (14), say $\delta = 0.35$. The distribution of possible *p*-values

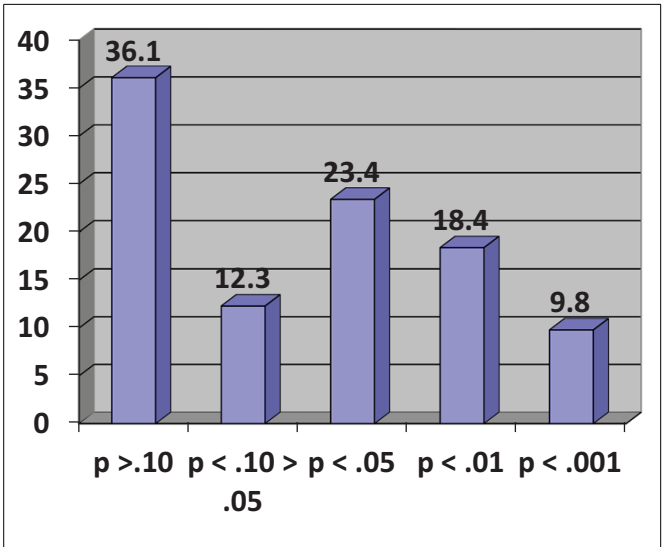

FIGURE 1 | Frequency histogram of *p*-values (%) for 1,500 simulated experiments (see text). Adapted from Cumming ((11), p. 139).

[1] http://www.youtube.com/watch?v=ez4DgdurRPg&feature=youtu.be

[2] http://www.latrobe.edu.au/psy/research/cognitive-and-developmental-psychology/esci

from any given experiment depends solely on statistical power. If the conventional recommendation for adequate power of 80% is accepted, in a two-group comparison similar to that described above, the sample size necessary to detect a small to medium effect by a two-tailed *t*-test at the 5% significance level and assuming equally sized groups is 130 per group [G*Power 3.0.10, (15)]. A minority of trials of ABI are this big and the remainder will be subject to varying degrees to the casino scenario described above. Even with a power of 80% to detect a real but small to medium effect, one-fifth of possible *p*-values will fail to reach the 0.05 significance level and will be erroneously regarded as null findings, i.e., they will be Type II errors. If the assumption of the effect of ABI is made more conservatively at $\delta = 0.2$, conventionally regarded as a small effect and arguably a minimally interesting effect of ABI, a sample size of 394 per group is needed to give a 80% chance of detecting an effect and very few trials of ABI are this large.

The solution to this problem of widely varying *p*-values carrying little information is, according to Cumming (11) and to many others, to abandon NHST in favor of estimating effect sizes with confidence intervals. He points out that this estimation approach to research findings is standard in the "hard" sciences like physics and chemistry, is commonly employed in most areas of medical research, and has been recommended in the Publications Manual of the *American Psychological Association* (16). At the same time, NHST has been severely criticized now for over 50 years (17) but still continues to be popular and standard practice in many disciplines within the human sciences. Without attempting to resolve this issue here, what can be said is that the abandonment of NHST – and particularly the abandonment of the dichotomy between observed differences that are "real" and those that are "just due to chance" (18) – would be a radical solution to the problem we are concerned with here – the difficulties inherent in interpreting null findings from trials of ABI.

COMMON MISUNDERSTANDINGS OF NULL FINDINGS: THE SIPS PROJECT

As we have seen, despite its apparent shortcomings, NHST continues to be the preferred framework for investigation in much of psychology, psychiatry, and other branches of human science, and is certainly still prevalent in research evaluations of the effectiveness of ABI. (NHST as taught in textbooks today is a hybrid of the Fisher and the Neyman–Pearson approaches and no distinctions between these two approaches will be discussed here.) Opponents of NHST would no doubt attribute the misunderstandings of null findings that we will shortly consider to basic flaws in the logic of NHST (17, 18).

To illustrate these misunderstandings, we will focus on the so-called Screening and Intervention Program for Sensible drinking (SIPS) project in England. Other research on ABI could have been chosen for this purpose but SIPS is a recent and prominent evaluation, with potentially important implications for policy and practice and from which all the necessary points may be made. The project was funded by the UK Department of Health in 2006 following the publication of the Government's Alcohol Harm Reduction Strategy for England (AHRSE) (19). In a section on Screening and Brief Interventions, the strategy said: "... the research evidence on brief interventions draws heavily on small-scale studies carried out outside the UK. More information is needed on the most effective methods of targeted screening and brief interventions, and whether the successes shown in research studies can be replicated within the health system in England. .. The Department of Health will set up a number of pilot schemes by Q1/2005 to test how best to use a variety of models of targeted screening and brief intervention in primary and secondary healthcare settings, focusing particularly on value for money and mainstreaming" [(19), p. 43]. This led eventually to the funding of SIPS which consisted of a pragmatic, cluster-randomized controlled trial in each of three settings: PHC, accident and emergency services, and the criminal justice system. At the time of writing, only the results for the PHC trial have been published (20) and the other two trials will not be covered here. As was clear in the Government's remit for this research stated above, the trials looked at issues to do with optimal forms of screening as well as effects of different modes of ABI but only the latter is of interest here.

The trial had a "step-up" design involving three groups in which components were successively added: (i) a control group consisting of the provision of a Patient Information Leaflet (PIL) together with the brief feedback of assessment results (i.e., whether or not the patient was drinking at a hazardous/harmful level); (ii) a brief advice (BA) group consisting of 5 min of structured advice about drinking plus the PIL; (iii) a brief counseling group (BLC) consisting of 20 min of counseling preceded by BA and followed by the PIL, and given to those patients who returned for a subsequent consultation. Across three areas of England, GPs and nurses from 24 practices that had not already implemented ABI were recruited and general practices were randomly allocated to one of the three conditions described above. Practices were incentivized to participate by payments amounting to £3,000 on successful completion of stages in the project. All primary care staff taking part in the trial were trained to deliver alcohol screening and brief intervention according to the trial protocol. Patients aged 18 or over routinely presenting in primary care and who screened positive on one of the screening instruments used in the trial were eligible for entry and a total of 756 were included. Analysis of outcomes at 6 and 12 months following intervention was by *intention to treat* which included all patients randomized to study groups whether or not they had been successfully followed up. Follow-up rates were 83% at 6 months and 79% at 12 months. Further details of the trial will be found in the protocol paper (21) and the main outcome paper (20).

With respect to interventions, the main hypothesis was that more intensive intervention would result in greater reduction in hazardous or harmful drinking, thus BLC > BA > PIL. In this context, and recalling the step-up design, the BA condition served as a control for the specific effects of BLC, the PIL condition served as a control for the specific effects of BA, and the PIL condition served as a control for the combined effects of BA and BLC). In the event, there were no significant differences between groups on the main outcome measure of the proportion of patients in each group who obtained a negative score on the Alcohol Use Disorders Identification Test [AUDIT, Ref. (22)]. This is shown by **Figure 2**, which gives these proportions at baseline, 6- and 12-month follow-up. Neither were there significant differences between groups on any other alcohol outcome measure [i.e., mean AUDIT score or

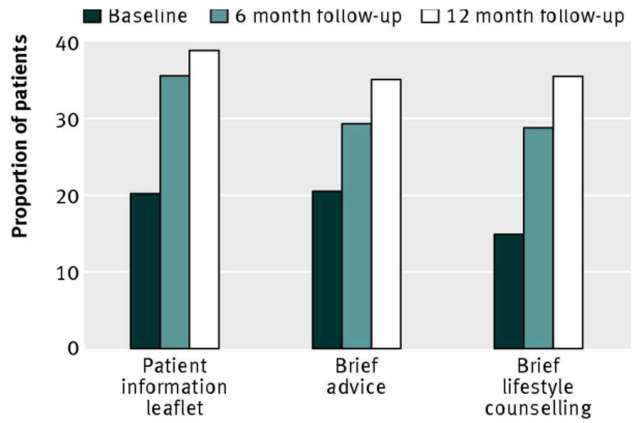

FIGURE 2 | Proportion of patients scoring <8 (negative status) on the alcohol use disorders identification test, representing non-hazardous or non-harmful drinking. Reproduced from Kaner et al. [(19), p. 14].

extent of alcohol problems (23)]. A *per-protocol* analysis, which included only those patients who received a complete intervention and were successfully followed up, also failed to show any significant differences between groups.

The SIPS PHC trial was thus a well-designed and efficiently conducted investigation of the effects of two forms of brief intervention in real-world settings with adequate statistical power to detect an effect of brief intervention if one existed. The null findings were no doubt disappointing to the SIPS investigators and to many in the ABI field. But how should these null findings be interpreted or, of equal or possibly greater importance, how should they *not* be interpreted? We will now consider a number of ways in which the findings of the SIPS PHC trial have been misunderstood.

(i) The findings show that the three "interventions" under study are of equal effectiveness in reducing hazardous or harmful drinking.

This interpretation makes the classic error of "proving the null hypothesis" (24). The logic of NHST is based on the assumption that the null hypothesis is true. (The null hypothesis can be any specified difference between population parameters against which the research hypothesis is tested but in practice is almost always taken to be the "nil hypothesis" that the samples come from populations with identical parameters, e.g., that there is no difference between their means.) In a comparison of an experimental versus a control procedure, the NHST method gives the conditional probability of the occurrence of an experimental effect equal to or greater than that observed *given that the null hypothesis is true.* If that probability is sufficiently small at a preselected level, conventionally 0.05 or smaller, the null hypothesis is rejected and the alternative hypothesis that the samples come from different populations is accepted. However, NHST gives us no information whatever about the conditional probability of the null hypothesis being true *given the observed data* and to imagine that it does is one of the most common errors in the interpretation of the results of statistical tests [(17), Chapter 3]. If the probability of the observed difference is greater than the pre-set level for significance, all one can conclude is that one has failed to reject the null hypothesis, *not* that the null hypothesis has been proved or in any way supported. Put simply, it is not possible to prove something that has already been assumed. Note, however, that it is also fallacious to believe that the null hypothesis can eventually be "proved" by increasing the sample size and statistical power (25). Thus, with regard to the SIPS null findings, all that they should be interpreted as showing is that there is no evidence from this trial that the brief interventions under study are superior in effectiveness to their respective controls – "absence of evidence," not "evidence of absence."

In more practical terms, in addition to sampling variability and lack of statistical power, there may be many reasons for the failure to observe a statistically significant difference between experimental and control group means. It could be, for example, that the interventions, although shown to be efficacious in randomized controlled trials conducted in ideal research conditions, are not effective in more real-world conditions of routine practice (26) because they have not been faithfully implemented by the practitioners taking part in the trial (27) or because of some other difference between real-world conditions and the ideal research conditions in which efficacy was demonstrated.

One particular version of the "proving the null hypothesis" error focuses on the control condition in the SIPS trial and concludes that, since the PIL and assessment feedback making up that condition has been shown to be no less effective that the two successively more intensive brief interventions, this shows that the provision of an information leaflet combined with feedback of assessment results can substitute in practice for ABI. Indeed, this approach has been called "BI lite" (28). This issue will be returned to below.

Given that the fallacy of "proving the null hypothesis" is taught at an elementary level in courses on research methodology and statistics all over the world, it may be found surprising that such an error is frequently made in relation to the SIPS PHC findings. However, the present author can attest that this error is commonly encountered in commentaries on the SIPS findings in publications of various kinds, in papers given and conversations overheard at scientific conferences and other meetings, and in grant proposals seeking funding to pursue in some way the implications of the misinterpreted SIPS findings. Just one example comes from *Pulse*, a magazine for health professionals and which claims to be "at the heart of general practice since 1960" (29). This article is headed, "Patient leaflet enough to tackle problem drinking, researchers suggest" and begins "GPs should give patients with problem drinking a leaflet rather than advise them to reduce their alcohol intake." This is because: "the SIPS study found informing patients of their drinking levels and offering a leaflet – handed to patients by a practice nurse – was just as effective as giving patient 5- or 10-min of lifestyle counseling."

A possible contribution to this level of misunderstanding may be the fact that in some publications, the SIPS investigators described the trials as a comparison of the effects of "three intervention conditions" [e.g., Ref. (21)]. This may have led readers to view the before–after changes in consumption shown by control group patients as of interest in their own right and as a finding forming part of the evidence base relevant to the effects of ABI.

What these changes mean will be discussed in the next section of this article but what can be said now is that the changes in the control group cannot be considered to be a "finding" about the effects of what was included in the control condition. At the risk of stating the obvious, any conclusion about these effects would have to be based on a comparison with a further non-intervention, assessment-only control group that did not include the PIL and/or assessment feedback, whichever of the two ingredients or their combination was thought to be of more interest. This was clearly recognized in the SIPS PHC outcome paper [(20), p. 5]. In view of the extensive evidence supporting ABI in general, the control condition used in the SIPS trials was the only kind likely to be found ethically acceptable. However, although the composition of the control group was perfectly defensible, to call it an intervention may have misled some consumers of the trial results and it would have been better to describe the trial in conventional terms as having two interventions that were evaluated in comparison to a control condition.

(ii) The PIL plus assessment feedback has been shown to be more cost–effective than BA and brief counseling and should therefore be implemented in practice.

This common misinterpretation is clearly related to the previous one but has more direct and very misleading implications for practice. It is certainly true that the provision of a leaflet together with information about assessment results would be cheaper to implement than either of the two forms of ABI because it would take less time and would require much less training to deliver. However, the conclusion that it would be less costly, even statistically significantly so, is all that can be claimed and, indeed, all that was claimed by the SIPS investigators (20). The underlying mistake is to infer that, because the three "interventions" were equally effective, then the less costly one must be more cost–effective but, as we have seen, it cannot be concluded that the ABI and control conditions were equally effective. And something cannot be called cost–effective if there is no evidence that it is effective in the first place.

(iii) The reductions in consumption shown in all three groups were caused by the "interventions" participants had received.

Again, this misunderstanding is closely related to the two previously described. The phenomenon in question will be explored in detail in the following section. Here though it can be noted that, by the logic of experimental research, in order to make a causal inference of this kind it is necessary to show that reductions in drinking shown in the ABI groups were statistically significant larger than those shown in their appropriate controls and this was obviously not the case. With regard to the control group reductions, as noted above, there was no appropriate further control for the effects of the ingredients of the SIPS control group, so no causal inferences of any kind may be made. Thus, there was no evidence from the SIPS PHC trial that any of the conditions under study led to changes in participants' drinking.

It should be stressed that the importance of these misunderstandings is not limited to academic debates between scientists in learned journals; they could well affect the future provision of ABI in England and perhaps in other countries. It is well known that there have been considerable difficulties in persuading GPs, nurses, and other healthcare professionals to implement ABI routinely in their practices; there is a copious literature on this problem (30) and how it may be redressed (31). In surveys of health professionals' attitudes to this work, one of the most commonly encountered obstacles is "lack of time" or "too busy" (32, 33). There has also been resistance in England to the inclusion of ABI in the NHS *Quality and Outcomes Framework*, under which general practices are reimbursed for preventive activity. This has created considerable pressure on the relevant sections of the Department of Health in London (and now its replacement body for this area of work, *Public Health England*) to make the interventions that health professionals are being encouraged to implement as short and easy to deliver as possible. So too, given the multitude of demands on their time from a large number of health bodies, it would be expected that many GPs would call for ABI to be whittled down to more manageable forms. In times of austerity, the appeal of shorter, simpler, and less expensive interventions for widespread implementation in practice must be seductive to policy-makers.

It is little wonder then that the misunderstandings of the SIPS findings listed above have been used to recommend the provision in practice of a PIL as a substitute for ABI, as in the *Pulse* article mentioned above. At the risk of repetition, it is not being argued here that this minimal kind of intervention would necessarily be ineffective, merely that there is no good evidence at present that it *would* be effective. If it is ineffective, or substantially less effective than ABI proper, and even if GPs and practice nurses definitely prefer it, its roll-out would represent a waste of precious resources. And before its ineffectiveness is clearly demonstrated, it might also derail the effort to achieve the full implementation of ABI proper that is necessary for widespread clinical benefit and put back the prospect for achieving this implementation by many years.

It might be conceded that the offer of a PIL following an assessment of alcohol-related risk and harm and the feedback of the results of that assessment could be defended on purely pragmatic *a priori* grounds. Given that resources to implement ABI proper are scarce and that most GPs and nurses are unwilling to implement anything more intensive, given too the principle that it is unlikely to do harm and may even do some good – perhaps starting a process of contemplating the need for change that might eventually lead to action to cut down drinking (34) – this could amount to a justification for implementing this minimal intervention (28). The claim would be that it must surely be better than nothing. But however it is justified, it should not be by a fallacious inference from the findings of the PHC arm of the SIPS trial.

WHY DO CONTROL GROUPS IN TRIALS OF ALCOHOL BRIEF INTERVENTION SHOW REDUCTIONS IN MEAN CONSUMPTION?

Control groups in trials of ABI frequently show reductions in mean alcohol consumption from baseline to follow-up and this was certainly the case in the SIPS PHC trial (see **Figure 2**). In a review of such trials, it was calculated that control group participants

reduce their drinking by approximately 20% (35, 36). A reduction in drinking of this size is larger than overall differences between experimental and control groups at follow-up (2) and it is a reasonable assumption that reductions in control groups of this order may prevent the true effects of ABI from being observed (37). We also saw that the reductions in consumption shown by control group participants in the SIPS trial (or, rather, the increase in the proportion of participants not showing hazardous/harmful drinking – see **Figure 2**) has been wrongly assumed to have been *caused* by the control group procedures, i.e., the provision of a PIL and/or the feedback of assessment results. To clarify further why it is a mistake to make this inference, we will now consider other possible reasons for reductions in control group consumption. In recent times, our understanding of these reasons had been greatly assisted by the work of Dr. Jim McCambridge of the London School of Hygiene and Tropical Medicine and his various colleagues.

REGRESSION TO THE MEAN

This must be one of the most misunderstood concepts in health care science (38). It is often thought that because, for example, participants in a trial of an alcohol intervention are recruited at a particularly high point in their alcohol consumption, they make a decision to try to cut down drinking, which is reflected in their lower consumption at follow-up. This is incorrect; regression to the mean is a purely statistical phenomenon with no reference whatever to decisions by trial participants or any other causal factor impinging on the outcome variable of interest.

Regression to the mean can be thought of as the obverse of correlation (39). If any two randomly distributed properties of individuals are less than perfectly correlated in a population, then it must be the case that extreme scorers on one of the variables will tend to show less extreme scores on the other. This applies in both directions; high scorers on the first variable will tend to show lower scores on the second and low scorers on the first will tend to show higher scores on the second. The smaller the correlation between the two variables, the greater will be the tendency for those with more extreme scores on one variable to approach the mean in their scores on the other. In the example in which we are interested, the two variables in question are the same participants' scores on the AUDIT questionnaire (22) at entry to the trial and at follow-up. In this case, however, participants will have been selected for entry to the trial on the basis of their relatively high scores (i.e., above the recognized cut-point for hazardous/harmful drinking) on the AUDIT. As a consequence, it is inevitably true that participants' scores at follow-up will tend to be lower than at intake due only to the nature of random fluctuation and statistical correlation. The same applies to any variable used for trial selection that is correlated, but less than perfectly so, with a variable used to evaluate outcome at follow-up.

The possible effects of regression to the mean on control group participants in brief intervention trials were studied empirically by McCambridge and colleagues (40). These authors gave the AUDIT to a large cohort of university students in New Zealand at baseline and 6 months later, without any attempt to intervene in their drinking. Selecting from this cohort for analysis those individuals with a baseline AUDIT score of 8+, the usual cut-point for entry to trials of ABI, the observed mean reduction over time was approximately half that obtained in the full sample without selection. When selection was made using a series of higher AUDIT thresholds, the observed reductions in mean alcohol consumption were successively larger. This evidence suggests that a substantial part of the reduction in consumption shown by control groups can be explained by the statistical artifact of regression to the mean.

RESEARCH PARTICIPATION EFFECTS

This is an umbrella term referring to a range of ways in which merely taking part in a research study can influence participants' behavior, quite apart from any effects on behavior the researchers may intend (41). An older term for these influences is "Hawthorne effects," referring to a famous series of studies from 1924 to 1933 at the Hawthorne Works of *Western Electric* outside Chicago. The results of these studies were interpreted as showing that the productivity of workers increased just through their awareness of having their behavior monitored as part of a research project, although other explanations are possible (42). In a systematic review of the literature relevant to the Hawthorne effect (43), it was concluded that the effect certainly existed but that little could be confidently known about it, including how large it was, without more research.

The wider term "research participation effects" refers to a range of phenomena that might introduce bias in estimates of behavior change in randomized controlled trials. These include the effects of signing an informed consent form and of reactions to randomization – for example, disappointment or resentment at being allocated to the control rather than the intervention condition. The possible effects on behavior of being screened or assessed prior to randomization will be considered below. Another important class of research participation effects is known by psychologists as "demand characteristics" (44). This refers to expectations participants may have about what the researcher is interested in studying and possible attempts by them to conform, or not, to what they think the researcher is trying to demonstrate. This source of bias is mainly relevant to laboratory research but McCambridge and colleagues have reviewed evidence of its possible influence on participant behavior in non-laboratory settings (45). An obvious example here is a tendency by a participant at research follow-up to underestimate their alcohol consumption because they surmise that the project is trying to reduce this outcome and they wish to please the follow-up interviewer; alternatively, they might exaggerate their consumption in a deliberate attempt to undermine what they guess is the purpose of the project. Influences of this sort could apply both to control and intervention group participants and represent one kind of problem with the validity of self-reports of behavior in research trials.

HISTORICAL TRENDS

An obvious way in which the alcohol-related behavior of control group participants might be influenced is by changes over time in the *per capita* consumption of alcohol in the geographical area in which the research is taking place. Average consumption at follow-up compared with trial entry could be reduced due to the increased price of alcoholic beverages, through higher taxation or in other ways, which is known to be strongly related to consumption levels

(46). Changes in the density of alcohol retail outlets, community attitudes to drunkenness, stricter enforcement of drink-driving legislation and a large number of other variables that can affect the level of alcohol consumption in a population (47) could also contribute to these reductions.

ASSESSMENT REACTIVITY

This last category of possible explanations for control group reductions in consumption has been the one to which most attention has been devoted in the literature on ABI. The idea here is that simply requiring a research participant formally to answer questions about their drinking can affect the drinking itself (48). This might be by directing participants' attention to their drinking and raising the possibility in their minds that it might be hazardous or harmful, thus leading to attempts to cut down, or in some other unknown way. The literature has focused on the effects of research assessment conducted after informed consent has been obtained, which can sometime take longer to complete than the ABI itself (49), but the effects of screening carried out prior to informed consent and entry to the trial have also been examined (50). Possible screening effects will be included under "assessment reactivity" in the remainder of this discussion.

McCambridge and Kypri (51) conducted a systematic review and meta-analysis of studies in the field of ABI that had attempted to answer the question of whether and by how much research assessments influence behavior by using randomized experimental methods. Ten studies were identified, of which eight provided findings for quantitative analysis. The general conclusion of this review was that research assessment did alter subsequent self-reported behavior in relation to alcohol consumption but that the effect was small, equivalent to 13.7 g of ethanol per week (one US standard drink or 11/2 UK units). On the other hand, as the authors point out, although small, this effect amounted to about 35% of the most recent and reliable estimate of the effect of ABI itself (2).

Of the eight studies included in the meta-analysis (51), five took place in university student populations and might be considered less than fully relevant to the matter at hand here. The three studies that took place in health care settings included two in emergency departments (52, 53) and one in PHC (54). None of these studies reported significant effects of assessment (or, indeed, of ABI). It is obvious that we need more studies of this kind to arrive at reliable estimates of the effects of assessment on subsequent drinking but at present it appears that such effects are smaller in health care than in university student settings.

McCambridge and colleagues subsequently conducted a study in Sweden (the AMADEUS Project) (55) to evaluate the effects of online assessment and feedback of results from the AUDIT-C (56). University students were randomized to groups consisting of (i) assessment and feedback; (ii) assessment-only without feedback; and (iii) neither assessment nor feedback. Findings were that students in group (i) had significantly fewer risky drinkers at 3-month follow-up than those in group (iii), while students in group (ii) scored lower on the AUDIT-C at follow-up that those in group (iii). This study thus provided some evidence for the effects of assessment and feedback on drinking behavior but findings were short-term and inconsistent, and the effects themselves small.

To return to a consideration of the SIPS primary care findings, it is sometimes suggested that a mere assessment of someone's drinking can serve as well as an ABI or, at least, will result in a reduction in alcohol consumption that would be valuable in busy health care settings with little time to do much else. The notion that research assessments could be the ABIs of the future has received serious attention (57). There are several points to make here. First, we have just seen that the evidence to support this suggestion is very thin; more research may reveal a different picture but, at present, there is insufficient evidence to conclude that assessments, at least of the kind normally used in research, can substitute for ABI as it has traditionally been conceived in health care settings. Secondly, although they may have the effect of inducing behavioral change by drawing attention to drinking, questions making up conventional research assessment are not designed explicitly to promote such change, e.g., by deliberately seeking to foster a discrepancy between the person's actual self-concept in relation to drinking behavior and the drinking of their ideal self, by asking explicitly about intentions to cut down or quit, or by enquiring about the perceived benefits of more moderate drinking (51, 58). Thus, future research might evaluate the effects of assessments of alcohol-related behavior deliberately designed to encourage changes in drinking. Thirdly, an appropriate research design for the investigation of the effects of assessment reactivity would be a non-inferiority trial (59) in which an assessment-only condition is compared to an ABI with the hypothesis that it is not inferior in its effects on drinking at follow-up. Using the methodology and recommended analysis for a non-inferiority trial, it would be possible to show that two types of intervention do not differ in effectiveness.

Lastly, the suggestion that assessments might serve to reduce drinking says nothing about the possible effects of feeding back assessment results or of providing a PIL. If it is true that assessments are effective in themselves, the contents of the control condition in the SIPS trial might be entirely redundant and need not be part of an effective intervention. On the other hand, it is reasonable to think that assessment feedback *would* make an additional contribution to change and that giving the patient information to take away that could be consulted if the motivation to change increases might also be an effective ingredient of intervention. In the first case, assessment feedback forms an essential part of a type of intervention known in different circumstances to be effective (60), albeit over two sessions, and is also integral to *Motivational Enhancement Therapy* (61), albeit over three or four sessions. In relation to the provision of a PIL, and depending on how much information of what kind it contained, bibliotherapy in general has been shown to be an effective means of decreasing alcohol problems (62). The truth, however, is that we do not know if assessments, assessment feedback or PILs are effective in themselves or in combination, and it is to these questions that research should be directed.

It will not have escaped the reader's attention that all four possible explanations above for reductions in alcohol consumption in control groups in trials of ABI apply equally well to reductions in intervention groups in those trials. It is precisely for that reason that, if we wish to make real progress in implementing effective ABIs in routine practice, we cannot avoid relying on randomized

trials in which these factors are controlled across intervention and control groups, leaving the only difference between groups the intervention component under test. However, plausible current inferences from the literature may seem in which a case is made for the widespread introduction of assessment feedback and PIL as a substitute for ABI proper, there is no way such a policy can pretend to be evidence-based. If they believe at all in evidence-based practice, those who favor the implementation of screening followed by simple feedback and written information must be able to show that such a procedure is superior in effectiveness to appropriate control conditions in well-designed and sufficiently powered pragmatic randomized controlled trials. To implement this procedure without such evidence risks wasting hard-fought gains of 30 years research on ABI.

DISTINGUISHING BETWEEN ABSENCE OF EVIDENCE AND EVIDENCE OF ABSENCE

We saw above that, under the conventional NHST approach to statistical inference from RCTs, when no significant differences on outcome measures between intervention and control groups have been found, we are unable to distinguish between two conceivable interpretations of these null findings: (i) there is no evidence that the means of the two groups differ and nothing can be said about the effectiveness of intervention one way or the other, and (ii) there is evidence that the means do not differ, that the null hypothesis is true and that the intervention is therefore ineffective. These two interpretations have been shortened here to (i) absence of evidence and (ii) evidence of absence. This dilemma can be applied, of course, to more than one experimental group in comparison to a control group, as in the SIPS PHC findings discussed above. It is this dilemma, so this article has argued, that has held back, and continues to hold back, progress in a scientific understanding and beneficial application of ABI.

There are two sets of unfortunate possible consequences of this lack of information. First, in the situation where absence of evidence is properly concluded from non-significant findings but there is actually no difference between means in the population, time and resources may be wasted on continuing to search for an effect of intervention when none in fact exists. On the other hand, if it is improperly concluded under the NHST approach that there is evidence of an absence of difference between means when there is in fact a real potential effect of intervention in the population, then an opportunity to implement, or at least to support the implementation of, an effective intervention will have been missed. Both these kinds of negative consequence may have interfered with progress on particular forms of ABI in the past. More important from the present perspective, they are likely to retard research on the effects of ABI in the many novel populations of hazardous and harmful drinkers in which it is desired to implement ABI and the novel settings in which these drinkers may be found.

There is, however, a solution to this problem but it means abandoning the NHST handling of null findings in favor of an approach from Bayesian statistics. The Bayesian approach to the problem of interpreting null findings has been developed recently by Dr. Zoltán Dienes of the University of Susses (63) and this section will rely heavily on his work. This is not the place to attempt a complete description of Bayesian statistics but good introductions are available (64, 65), including one by Dienes (66) comparing the Bayesian approach to statistical inference by the orthodox approach.

Suffice it to say here that Bayesian statistics is founded on a completely different philosophical understanding of probability from conventional NHST statistics. Bayesian statistics defines probability *subjectively*, as a measure of the degree of confidence one has that some event will occur or that some particular hypothesis is true. The conventional, Neyman–Pearson approach on which NHST is based defines probability *objectively*, in terms of long-run relative frequencies of the occurrence of events. From this fundamental difference in the understanding of probability all other differences flow. The mantra of Bayesian statistics is: "the posterior is proportional to the likelihood times the prior." Working backwards, the "prior" is the subjective probability that a hypothesis is true before collecting data; the "likelihood" is the probability of obtaining the observed data given that the prior hypothesis is true; the "posterior" is the probability of the hypothesis being true given the observed data and is calculated by multiplying the likelihood by the prior. From the Bayesian perspective, scientific progress consists of updating the probability of hypotheses being true in the light of observed data (66).

While under NHST only two conclusions are possible from the results of an experiment, either the null hypothesis is rejected or it is not, from a Bayesian perspective there are three: (i) there is strong evidence for the alternative hypothesis; (ii) there is strong evidence for the null hypothesis; (iii) the data are insensitive with respect to the alternative and null hypotheses. To determine which of these conclusions applies to any given sets of results, it is necessary to calculate something called the *Bayes Factor* (B). This is the ratio of the likelihood of the observed data given the alternative hypothesis over the likelihood of the data given the null hypothesis. If this ratio is >1, the alternative hypothesis is supported; if it is <1, the null hypothesis is supported; and if it is about 1 the experiment is insensitive and neither hypothesis is supported. To arrive a firm decision in practice, recommended cut-offs (67) are that $B > 3$ represents substantial evidence for the alternative hypothesis and B less that 1/3 represents substantial evidence for the null hypothesis, with values in between representing a range of weak evidence for either hypothesis depending on whether B is greater or less than 1.

One immediate advantage of the Bayesian method is that the researcher is forced to stipulate an alternative hypothesis in terms of the size of the effect that, say, an intervention is expected to show relative to a control condition and its minimum and maximum values. While the stipulation of the alternative hypothesis is often said to be desirable under NHST, it is rarely done. In practice, the Bayesian researcher specifies a range of population values for the parameter of interest, say the difference between intervention and control group means, with prior probabilities for each population value and the way in which these probabilities are distributed over the range of population values [(66), Chapter 4]. This procedure facilitates good science.

It will have been noted that, although the Bayesian approach allows the null hypothesis to be accepted, there is still an

intermediate range of values of B, conventionally between 1/3 and 3, where the evidence is weak and which can therefore be considered a reappearance of the absence of evidence conclusion. However, the striking difference between Bayes and NHST in this situation is that, in the former, the researcher can quite legitimately continue to collect data until one of the two boundary conditions, either 3 or 1/3, is reached; this is the only "stopping rule" that applies to data collection under Bayes. By contrast, under NHST the collection of further data beyond the sample size given by the power calculation and stipulated before the experiment began is methodologically spurious and, if not openly declared, unethical. Of course, owing to the finite nature of research funding, fixed research plans and other practical matters, it will often be impossible to collect more data but the opportunity remains available in principle under the Bayesian method. And it is important to repeat that, even if further data collection is not possible, the information deriving from the Bayesian approach is still superior to that from NHST in allowing the distinction to be made between evidence of absence and absence of evidence.

In more general terms, the battle for dominance between Bayesian and Fisher/Neyman–Pearson statistical inference has been waged for many years between camps of statisticians, philosophers, and those researchers who take an interest in the fundamentals of their scientific disciplines (68). Those who favor Bayes, and have described its varied advantages over conventional statistics, have found that change in scientific practice, especially in the human sciences, is slow to occur. Journal editors, for example, may be loath to accept papers based on Bayesian statistics and, in any event, Bayesian and conventional analyses will often agree in their conclusions. As Dienes (63) points out, however, one way in which they do clearly disagree is in the interpretation of non-significant results. The solution here is to use mainly orthodox statistics but, whenever a non-significant result is found, to calculate a Bayes factor in the interest of disambiguation. This seems an eminently sensible solution to the problem of null findings which, as has been argued in the article, holds back progress in the field of ABI research. A program for calculating Bayes Factors can be accessed at http://www.lifesci.sussex.ac.uk/home/Zoltan_Dienes/inference/Bayes.htm.

If this solution were adopted, when we observed a non-significant result from an RCT, it would be possible to conclude that the specific form of ABI being evaluated was ineffective and not worth pursuing further, so that precious resources would not be wasted. On the other hand, we could conclude that it was unclear whether the ABI in question was effective or not and that further research was needed. The difference from the conclusion based on the conventional perspective, however, is that we would already have ruled out the possibility that the intervention was ineffective. [It is also possible that the Bayes Factor could provide evidence for the alternative hypothesis and allow the conclusion that the intervention was effective when the conventional NHST approach had not been able to reject the null hypothesis (63).] This method could be applied to the non-significant results of trials such as SIPS to reduce uncertainly about and possible misunderstanding of their results. The results of an analysis of SIPS data using the Bayesian approach to null findings will form the basis of a further communication.

ACKNOWLEDGMENTS

The author is grateful to Geoff Cumming, James Morris, and Zoltán Dienes for useful advice on various points in this article.

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Conflict of Interest Statement: The present author was a Principal Investigator on the SIPS trial that is discussed in this article and an author on papers arising from it. He has no other possible conflicts of interest to declare.

Received: 15 May 2014; paper pending published: 17 June 2014; accepted: 03 July 2014; published online: 16 July 2014.

Citation: Heather N (2014) Interpreting null findings from trials of alcohol brief interventions. Front. Psychiatry ***5****:85. doi: 10.3389/fpsyt.2014.00085*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in PSYCHIATRY

REVIEW ARTICLE
published: 26 August 2014
doi: 10.3389/fpsyt.2014.00108

Mechanisms of action of brief alcohol interventions remain largely unknown – a narrative review

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A growing body of evidence has shown the efficacy of brief intervention (BI) for hazardous and harmful alcohol use in primary health care settings. Evidence for efficacy in other settings and effectiveness when implemented at larger scale are disappointing. Indeed, BI comprises varying content; exploring BI content and mechanisms of action may be a promising way to enhance efficacy and effectiveness. Medline and PsychInfo, as well as references of retrieved publications were searched for original research or review on active ingredients (components or mechanisms) of face-to-face BIs [and its subtypes, including brief advice and brief motivational interviewing (BMI)] for alcohol. Overall, BI active ingredients have been scarcely investigated, almost only within BMI, and mostly among patients in the emergency room, young adults, and US college students. This body of research has shown that personalized feedback may be an effective component; specific MI techniques showed mixed findings; decisional balance findings tended to suggest a potential detrimental effect; while change plan exercises, advice to reduce or stop drinking, presenting alternative change options, and moderation strategies are promising but need further study. Client change talk is a potential mediator of BMI effects; change in norm perceptions and enhanced discrepancy between current behavior and broader life goals and values have received preliminary support; readiness to change was only partially supported as a mediator; while enhanced awareness of drinking, perceived risks/benefits of alcohol use, alcohol treatment seeking, and self-efficacy were seldom studied and have as yet found no significant support as such. Research is obviously limited and has provided no clear and consistent evidence on the mechanisms of alcohol BI. How BI achieves the effects seen in randomized trials remains mostly unknown and should be investigated to inform the development of more effective interventions.

Keywords: brief intervention, alcohol, mechanisms, active ingredients, components, mediators, motivational interviewing

INTRODUCTION

A growing body of evidence has shown the efficacy of brief intervention (BI) for hazardous alcohol use in primary health care settings (1). In a review of systematic reviews and meta-analyses of the effects of alcohol BI in primary health care, O'Donnell and colleagues (1) found 34 systematic reviews covering a total of 56 randomized controlled trials reporting about 80 papers, among which it was consistently reported that BI was efficacious for addressing hazardous and harmful drinking in primary health care, particularly in middle-aged, male drinkers. However, even within this important body of research, it was limited on the effects of BI among certain groups such as women, older and younger drinkers, minority ethnic groups, dependent and other co-morbid drinkers, and those living in transitional and developing countries (1). They also concluded that evidence was lacking as regards to the optimum length and frequency of BI, as well as the optimum content of BI. Furthermore, recent null findings from large pragmatic trials (2, 3) have called into question the extent to which the systematic review evidence on BI efficacy can be generalized to effectiveness in routine primary care, and further pointed to the lack of knowledge on intervention content and active ingredients.

As primary health care providers have the ability to reach a broad population, primary health care was identified as the most desirable setting within the health care system to screen, identify, and deliver BI to people with hazardous or harmful drinking. As such, most of the BI research from 1980s onward was designed and conducted in primary health care [even though seminal studies of BI were originally conducted in the emergency department, see Ref. (4)]. This may explain why primary health care is the setting in which evidence of BI efficacy has been most established. However, BI has been implemented and tested in several other settings such as general hospitals (5), emergency departments (6), and colleges and universities (7, 8). While BI has been shown to produce small effects within US college settings (7, 8), evidence has been surprisingly slow to accumulate in other settings (9), and additional research is required to investigate mixed findings, refine current practice guidelines, and continue to bridge the gap between science and practice (10).

Brief intervention is an umbrella term that is used to describe a quite heterogeneous group of interventions, from advice to more personalized forms of intervention based on motivational interviewing (MI). This heterogeneity in intervention content may well explain some of the inconsistencies observed in intervention effects across studies. Differences in setting characteristics (e.g., ongoing vs. single contacts with health care provider, professional training, and context of delivery) may also explain differences in efficacy.

In many ways, BI research has been conducted as if the intervention could be treated as a black box, without regard for detailed content, as has been the case for most behavioral treatments (11). The problem is that, over the years and across studies, the black box content has been drastically modified (12), with little, if any, careful study of the implications. Researchers have not deployed the same diligence in efforts to study BI content as has been done for the study of the efficacy of the different versions of the black box.

Conflicting evidence between efficacy studies and pragmatic trials, as well as between studies conducted in different contexts and settings might be explained by the wide range of interventions, and the effects of setting characteristics, on the various hypothesized active ingredients of efficacy. For these reasons, it has been suggested that "BI content matters" in research (13) is of great importance to identify which element of intervention may be related to efficacy, in order to develop more effective interventions. It is also crucial for implementation since training clinicians to deliver BIs is challenging, particularly so when key skills needed for the accomplishment of key tasks remain to be clarified. Therefore, in order to establish the state of current knowledge about which elements of content matter, we conducted a review of studies that reported on mechanisms of action of BI for hazardous or harmful alcohol use. This is fundamentally a hypothesis generation study, seeking to identify important targets for further study.

MATERIALS AND METHODS

INCLUSION CRITERIA

We included publications meeting the following criteria: (1) the intervention was described as "BI," "brief advice," "brief motivational intervention," or "BMI"; (2) the intervention targeted alcohol; (3) the intervention was delivered face-to-face (i.e., group interventions and computer interventions were excluded); (4) some mechanism of intervention effect was investigated; and (5) the publication was either an original research article or a literature review, published in a peer-reviewed journal. Literature reviews were included if at least part of the content met the above criteria (i.e., reviews comparing different type of interventions were included if some but not all studied interventions met inclusion criteria).

DATA COLLECTION

The electronic databases PubMed and PsychInfo were first searched for studies meeting the aforementioned inclusion criteria. We had three key constructs, which were operationalized for keywords searches as follows: active ingredient (component, mechanism, or process); BI (brief advice, brief motivational intervention, or BMI); and alcohol (drinking). Then, we reviewed references of retrieved publications.

DATA ANALYSIS

Retrieved articles that met inclusion criteria were very heterogeneous with respect to their type, methods, and focus. It was apparent that meta-analysis would not be appropriate or feasible. We thus chose to analyze the retrieved articles in topics and types of mechanisms, and to present them in a narrative review format. The key distinction in the included evidence-base pertains to two different types of mechanisms: BI components (i.e., intervention strategies, or components, that were isolated and analyzed as possible predictors of enhanced effects), and BI effect mediators (i.e., psychological dimensions, psycholinguistic behaviors, or cognitive states affected by the intervention and associated with targeted behavior change). A short introduction and discussion of evidence for each mechanism is presented below. The discussion at the end of the paper offers a more general synthesis and overview of possible implications for further developments in BI research.

RESULTS

COMPONENTS

In their early review of BI for alcohol problems (which included both opportunistic BI for non-treatment seekers, where the research comparison is with no or more minimal intervention, and BI for treatment seekers, where the comparison is with longer forms of regular treatment), Bien and colleagues (14) showed that BI (a) were usually significantly more effective than no intervention, (b) commonly showed similar impact to that of more extensive interventions, and (c) could enhance the effectiveness of subsequent treatment. In the second part of this article, they reviewed common elements of effective BIs, and six elements summarized by the acronym FRAMES (feedback, responsibility, advice, menu, empathy, and self-efficacy) were identified for further study.

In the review of systematic reviews of alcohol BI studies in primary health care (1), the authors found few reviews considering the impact of the actual content of interventions on their effectiveness (15–18). In general, these reviews highlighted the lack of available evidence on this issue, mainly due to the heterogeneity of the included studies (1). Whitlock and colleagues (17) reported that all interventions demonstrating statistically significant improvements in alcohol outcomes included at least two of the three key elements: feedback, advice, and goal setting. Different BI components highlighted in the empirical studies of BI mechanisms or derived from meta-analyses are presented below.

Feedback

Early BI models have focused explicitly on feedback of risk or harm as a tool for instigating change (14). In the review on alcohol BI in primary health care by Bertholet and colleagues (19), all BI models but one included feedback. The role of feedback within BI has more recently been empirically questioned in the studies reported below.

Murphy and colleagues (20) evaluated the relative efficacy of personalized drinking feedback delivered with and without BMI among 54 drinking college students. At 6-month follow-up, participants in both groups showed significant, small to moderate reductions in alcohol consumption, but the groups did not differ. The hypothesis that a BMI would enhance the efficacy of

feedback was thus not supported. Another study (21) evaluated the relative efficacy of BMI and feedback among 122 hazardous drinking college students. Participants were randomized to (a) BMI with feedback, (b) BMI without feedback, (c) mailed feedback only, (d) BMI with mailed feedback, or (e) assessment-only control. At 2-month follow-up, all groups reduced their consumption, peak BAC, consequences, and dependence symptoms, with no significant difference between groups. Walters and colleagues (22) used a similar design among 279 heavy-drinking students, which were randomized to (a) web feedback only, (b) a single BMI session without feedback, (c) a single BMI session with feedback, or (d) assessment only. At 6-month follow-up, BMI with feedback significantly reduced drinking, as compared with assessment only (effect size = 0.54), BMI without feedback (effect size = 0.63), and feedback alone (effect size = 0.48). Neither BMI alone nor feedback alone differed from assessment only.

One study (23) evaluated the costs and cost-effectiveness of combining BMI with feedback to address heavy drinking among university freshmen (i.e., first year), with a total of 727 students randomized to four conditions: (a) assessment only, (b) BMI only, (c) feedback only, and (d) BMI with feedback, followed-up 3 months later. Cost–effectiveness analyses showed that despite being the most expensive intervention, BMI with feedback was the most effective intervention and might be a cost–effective intervention.

In their meta-analysis of prevention interventions for drinking college students, Carey and colleagues (8) suggested that individual, face-to-face interventions using MI and personalized normative feedback predicted greater reductions in alcohol-related problems than other interventions. In their subsequent meta-analysis (7), face-to-face interventions including feedback were significantly more effective on alcohol outcomes than interventions not including it.

Brought together, the studies presented above suggest that feedback might be an important component of BMI, but some caveats should be noted. Meta-analytic findings were supportive of the use of feedback (7, 8, 14). These are, however, observational data, and other study characteristics may be relevant. Studies that experimentally investigated this question via dismantling the relative efficacy of feedback and BMI produced more mixed findings. Two studies showed significantly enhanced effects when BMI included feedback (22, 23), while two other found equivalent effects (20, 21), thus showing no impact of feedback. It must, however, be noted that the latter two studies had smaller sample sizes. An important limitation to these findings is that, with the exception of the meta-analysis by Bien and colleagues (14), all studies reported above included only US college students.

Decisional balance

The decisional balance is a brief detailing of the advantages (the "pros") and disadvantages (the "cons") of behavior change, originally conceptualized by Janis and Mann (24), which has become a critical construct in the transtheoretical model of behavior change (25) and a common component of BI (or at least BMI).

Three studies empirically evaluated the effects of decisional balance as a stand-alone BI, or as a component of alcohol BI (26–28), all within the US college setting. Collins and Carey (26) examined the effects of decisional balance exercises on measures of risky drinking among college students with alcohol-related problems ($N = 131$). Students were randomized to (a) an in-person 30-min decisional balance discussion, (b) a written decisional balance, or (c) an assessment-only control group. No significant differences among the groups were found at 2-week and 6-month follow-up on alcohol consumption, heavy-drinking episodes, alcohol consumption during peak drinking occasions, and alcohol-related problems. In another randomized controlled trial (27), the authors compared (a) a basic BMI, (b) BMI enhanced with a decisional balance module, and (c) an assessment-only control group. Assessments at 1, 6, and 12 months showed that the basic BMI improved all drinking outcomes beyond the effects of the assessment-only control group at 1 month, whereas the enhanced BMI did not. Risk reduction achieved by both BMI models maintained throughout the follow-up year. Thus, both studies did not provide support for decisional balance as an effective component of BI or stand-alone BI for at-risk drinking college students.

LaBrie and colleagues (28) examined the impact of decisional balance among 47 men in the college setting. The students completed questionnaires on alcohol use and unsafe sexual practices and were engaged in a discussion of pros and cons of decreasing their drinking, but not of safer sex. One-month follow-up data showed statistically significant decreases in drinking, but no change in sexual behaviors. This study thus suggests a potential impact of decisional balance, but the small size and design of the study limits confidence in its conclusions.

Two meta-analyses also tested whether interventions including decisional balance were more effective than interventions not including it. In a meta-analysis of 62 controlled studies evaluating prevention interventions for drinking college students (8), it was suggested that the interventions were somewhat more successful at reducing alcohol-related problems at short-term follow-up if the intervention content contained a decisional balance exercise ($B = 0.17$, $p = 0.05$). However, in their more recent meta-analytic review of BI for college students, Carey and colleagues (7) found that the reductions in quantity of alcohol consumption (per week/month) were smaller when face-to-face BIs included a decisional balance exercise ($B = -0.60$, $p = 0.04$, 7 studies including decisional balance compared to 26).

The abovementioned analyses showed mixed findings, and tend to suggest a potential detrimental effect of the decisional balance exercise. Miller and Rose (29) have suggested that decisional balance may be both theoretically and empirically contraindicated with ambivalent people when the goal of treatment is to foster change. They recommended that clinicians using MI to help clients resolve ambivalence and to promote behavior change should not include decisional balance as a part of the intervention. For these authors, evocation of change talk (i.e., only one part of the decisional balance) is more appropriate when the clinician intends to help clients resolve ambivalence in the direction of change.

MI skills

Among the essential effective BI components summarized by the FRAMES acronym (14), several are directly shared with MI (30). This is the case for the emphasis on personal responsibility for change (i.e., patients are advised that change in drinking

is their own responsibility and choice), therapeutic empathy as a counseling style (i.e., warm, reflective, and understanding approach in opposition to directive, aggressive, authoritarian, or coercive elements), and enhancement of client's self-efficacy for change (i.e., optimism regarding the possibility of change rather than emphasizing helplessness or powerlessness). In the meta-analysis on prevention interventions for drinking college students, Carey and colleagues (8) showed that interventions using MI predicted greater reductions in alcohol-related problems.

Several studies did directly and empirically addressed MI skills as active ingredients of alcohol BI and are presented below. McNally and colleagues (31) examined the role of five MI components in a BMI for heavy episodic alcohol use among college students (*N* not specified, random half of 73 participants included in the study). These components were evaluated by the students at post-intervention. Two of these were MI skills (perceived empathy and relative focus on personal responsibility for change). Partial correlations were conducted between the individual component and a composite alcohol involvement score measured at 6-week follow-up (controlling for baseline drinking). Participants' subjective experience of the relative focus on personal responsibility for change was not significantly associated with outcome in these analyses. However, findings suggested that BMI participants who reported a greater sense of perceived empathy from the counselor were more likely to show lower levels of alcohol involvement at follow-up.

Feldstein and Forcehimes (32) examined the specific role of empathy in a BMI for alcohol use among underage heavy-drinking college students. Contrary to predictions, empathy was not correlated with 2-month outcomes (binge drinking and alcohol-related problems). Authors noted, however, that limited variability existed for empathy, due to therapists' consistent high performance on the empathy variable (mean of 6.92, SD = 0.27 on a scale of 1–7) and that the sample was small ($N = 35$).

Gaume and colleagues (33) tested several counselors' behaviors as predictors of change in alcohol use among patients in the emergency department receiving BMI. Counselor's empathy was correlated with decreases in alcohol use (baseline to 12-month follow-up difference) but this association was no longer significant when a significant patient predictor (patient ability to change, see below) was covaried. Using the same data, however, these authors used multilevel models to test MI skills taking clustering within counselors into account (34). Findings showed that counselors with better MI skills achieved better outcomes overall and maintained efficacy across all levels of the significant patient predictor mentioned above (i.e., patient ability to change). On the other hand, counselors with poorer MI skills were effective mostly at high levels of ability to change. Findings indicated that avoidance of MI-inconsistent skills was more important than frequency of using MI-consistent skills and that training and selection of counselors should be based more on an overall MI-consistent attitude (combining acceptance, MI spirit, confrontation and warning avoidance, use of complex reflective listening, and more reflecting than asking) than on particular MI techniques.

Bertholet and colleagues (35) found that MI skills measured within three BMI studies were neither robust nor consistent predictors of drinking outcomes. These authors coded audio recordings of 314 BMIs across one US BMI study among middle-aged medical inpatients with unhealthy alcohol use ($N = 124$) and two Swiss BMI studies among young men with binge drinking in a non-clinical setting ($N = 62$ and 128). In all three studies, mean MI counselor's rating scores were consistent with MI proficiency but most MI skills were not significantly associated with alcohol outcomes at 3/6-month follow-up. In the US study, confrontation (an MI-inconsistent behavior) was associated with more drinking. Limited variability in scores was proposed by the authors to explain this lack of effect.

The limited variability in scores points to methodological limitations of the abovementioned studies. All of these were secondary analyses of the BMI condition of randomized controlled trial, where counselors were trained to perform high-quality BMI. On the other hand, results from meta-analyses cited above [e.g., Ref. (8, 14)] compared BI including MI skills to BI not including this approach. A recent study tried to address these limitations by designing a study including heterogeneous counselors (18 counselors ranging from beginners to MI experts) and comparing participants receiving a BMI with high level of MI skills to those receiving a BMI with low MI skill level and to a control group receiving no BMI (36). This study included non-treatment seeking young men (age 20) screened as hazardous drinkers and found that BMI where MI global ratings (acceptance, empathy, and MI spirit) were high, with no MI-inconsistent behaviors, and with a higher percentage of complex reflections, had better outcomes than those having had no intervention, whereas those with lower scores on these dimensions did not significantly differ from those in the non-intervention control group. Surprisingly, young men receiving BMI with counselors exhibiting a high number of MI-consistent behaviors did not significantly differ in outcome from those in the control group, while those having a lower number of MI-consistent behaviors had significantly better outcomes. The authors proposed that the quality and the exact combination of skills might have mattered more than the quantity.

Two studies by Tollison and colleagues (37, 38) also suggested potential iatrogenic effects of some MI skills. Specifically, these authors examined the association between change in the drinking behavior of the college student and peer facilitator adherence to MI microskills within a BMI. In the first publication (37), results indicated that a higher number of simple reflections were associated with increased rather than decreased drinking at the 3-month assessment among the 67 participants; however, complex reflections were found to attenuate the effects of simple reflections on changes in drinking. In a replication of this study with 327 students (38), higher frequency of both open questions and simple reflections were associated with increases in drinking quantity over 5- and 10-month follow-up. These data are not necessarily in conflict with the view that MI skillfulness is an important component of BI, as greater use of these specific microskills may be indicative of lower overall skill. Together with results from the study by Gaume and colleagues (36), these findings highlight the key importance of competent reflective listening skills (i.e., the use of more complex reflections).

Direct advice to reduce or stop drinking, alternative change options, and drinking moderation strategies

In their early review of BI for alcohol problems, Bien and colleagues (14) identified advice as the essence of BI. They further observed that all of the interventions described in their review contained explicit verbal or written advice to reduce or stop drinking. The studies described in their review seldom prescribed a single approach, but advised either a general goal or a range of options. Bien and colleagues (14) consequently posited that this "menu" of alternative change options may increase the likelihood that an individual will find an approach appropriate and acceptable to his or her own situation.

In their meta-analysis of BI for college students, Carey and colleagues (7) showed that face-to-face interventions including moderation strategies were significantly more effective than those not including moderation strategies, in reducing quantity of alcohol consumed, frequency of heavy drinking, and alcohol-related problems. Interventions including alcohol/BAC education also reduced quantity of alcohol consumed significantly more.

On the other hand, in their examination of the components of a BMI for heavy episodic alcohol use among college students, McNally and colleagues (31) showed that students' (N not specified, random half of 73 participants included in the study) subjective report of whether change options had been proposed was not significantly associated with 6-week alcohol outcomes.

In the study by Bertholet and colleagues (35), MI skills measured within three BMI studies were assessed, as previously described, and giving advice was significantly associated with less drinking in one of the studies (BMI with 62 Swiss non-treatment seeking young men with binge drinking in a non-clinical setting).

Meta-analytic findings showed that BI models including advice giving as a strategy had enhanced alcohol outcomes. However, studies that empirically assessed advice giving gave more contrasting results. It should also be noted that this kind of studies was rare (only two studies), and the lack of study of the effects of direct advice is striking.

Change plan

Completion of a plan to change alcohol use is an MI component that may represent a culmination of the motivational dialog resulting in verbal statements of intention and a written contract for behavior change (39). Change plans are supposed to be conducted only when the patient is engaged in change, when the client and clinician are working on strengthening commitment to change ("Phase 2" in MI), and if the patient agrees to complete one (40).

Magill and colleagues (39) examined the change plan component within an alcohol-focused BMI among patients included in a hospital-based clinical trial ($N = 291$). This study examined within-session therapist and client language predictors of a client's decision to complete a written change plan. Logistic regression analyses found that therapist MI-consistent behaviors and client change talk were significant positive predictors, and client sustain talk was a significant negative predictor of the decision to complete a change plan regarding alcohol use. This study provides first elements to link the completion of a change plan with MI-consistent behaviors during a BMI. However, the study did not investigate if the completion of a change plan was associated with follow-up alcohol outcomes.

Lee and colleagues (41) examined the potential predictive role of the quality of an alcohol-related change plan on BMI outcomes within an emergency department sample of injured hazardous drinkers. A mediational analysis framework tested directional hypotheses between pre-treatment readiness, quality of change plan (interventionists completed the change plans with their patients by hand and the quality of the resulting written change plans were coded on 0–3 scale), and treatment outcomes. Participants who completed a BMI and a change plan were included ($N = 333$). Pre-treatment readiness to change was significantly negatively associated with alcohol consequences at 12 months and good-quality change plans. While controlling for pre-treatment readiness to change, good-quality change plan remained a significant predictor of treatment outcomes in the expected direction. Follow-up generalized linear modeling including an interaction term (change plan and pre-treatment readiness) revealed that those with high readiness and a good-quality change plan vs. those with low readiness and a poor-quality change plan had better than predicted outcomes for either readiness or change plan alone. The authors concluded that their findings suggest that the change plan may be an active ingredient of BMI associated with better outcomes over and above the influence of pre-treatment readiness.

If further research and study replication obviously seem necessary, these preliminary elements showed that the completion of a change plan and the quality of this plan might be important components of BMI efficacy. It should be cautioned, however, that change plans will only be completed when sessions have gone well and change has been decided upon, so this evidence may constitute a marker of successful implementation of MI skills resulting in a change plan, rather than suggesting that a change plan may be effective in isolation from other components.

MEDIATORS

Mediators of treatment effects might be defined as psychological dimensions, psycholinguistic behaviors, or cognitive state that are affected by the intervention and transmitted its effects on targeted behavior change. Effects may be partially or fully mediated in this way. Full-mediation analyses (42) posit how, or by what means, an independent variable (X) affects a dependent variable (Y) through one or more potential intervening variables, or mediators (M). Several paths are tested: path a represents the effect of X on the proposed mediator(s), path b is the effect of M on Y, and the ab path is the indirect effect of X on Y through M. A few BMI studies empirically evaluated full-mediation models (see below). Several studies only investigated either the a or b paths and are also presented below.

Readiness to change

Despite its emphasis on motivation, surprisingly little is known about the role of motivation within BI (and particularly BMI). If motivation or readiness is only thought about and measured pre-intervention, this makes it a moderator rather than only a mediator and such data were not considered here. Motivation, or readiness to change, has been tested as a mediator of BMI's effects in three studies.

Using data from three published randomized trials implementing BMIs among drinking college students, Borsari and colleagues (43) examined readiness to change as a potential mediator of intervention effects. Two of the three studies indicated that BMI was associated with increases in motivation to change alcohol use that are apparent immediately after BMI sessions and persist up to 6-month post-intervention. However, readiness to change did not appear to be a mechanism of behavior change, as it did not mediate reductions in alcohol use or problems in any of the studies.

Barnett and colleagues (44) evaluated several moderators and mediators of alcohol BMI for young adults (18–24 years; $N = 172$) conducted in an emergency department. Readiness to change was evaluated as a mediator of the intervention's efficacy but no significant mediation was found. BMI was associated at the trend level to higher readiness to change post-intervention ($p < 0.1$), but higher readiness to change did not predict better alcohol outcome.

Stein and colleagues (45) examined readiness to change drinking as a mediator of the effects of BMI on alcohol-related consequences also within an emergency department setting. Participants were randomized into three conditions: (a) standard care plus assessment, (b) standard care plus BMI, and (c) standard care plus BMI plus a booster session. Patients receiving any BMI maintained higher readiness scores 3 months after treatment than did patients receiving standard care. At 12-month follow-up, BMI plus a booster session patients had significantly reduced alcohol consequences more than standard-care patients. However, readiness mediated treatment effects only for those highly motivated to change prior to the intervention but not for those with low pre-intervention motivation. Authors speculated that two sessions of BMI will be sufficient to sustain the motivation to change for those more highly motivated to change prior to the intervention, but for those less ready to change prior to the intervention, two sessions of BMI are insufficient to motivate the patient to mobilize his or her resources to initiate or sustain the targeted behavioral change.

Even if motivation and readiness to change are theoretically central constructs of all BIs (and not just BMI), there are sparse and unsupportive data as mediators of BMI effects. There are also few investigations of motivation within the alcohol treatment literature [see Ref. (46)]. Difficulties in measurement may explain these findings of lack of effect. Interestingly, more detailed analyses, such as those proposed by Stein and colleagues (45) might help understand how interventions work. Using a moderated mediation framework, these authors showed that readiness to change did mediate BMI effects only under specific circumstances. Such conditional effects might help understand inconsistent findings.

Change talk

Motivational interviewing has been described as a collaborative conversation style for strengthening a person's own motivation and commitment to change (30) and central to it is the hypothesis that people are more likely to be persuaded by what they hear themselves say (30, 47). Client statements toward and against change (or change talk and sustain talk) are thus hypothesized to mediate MI intervention efficacy (48).

Baer and colleagues (49) analyzed 54 recordings of BMI with homeless adolescents, who used alcohol or illicit substances but were not seeking treatment. Results indicated that statements about desire not to change or inability to change, although infrequent (mean = 0.61/5 min), were strongly predictive of less abstinence of alcohol and substance use at both 1- and 3-month follow-up. Statements about reasons for change were associated with greater reductions in days of substance use at 1-month assessment. Commitment language was not associated with outcomes.

Gaume and colleagues (33, 50) and Bertholet and colleagues (51) assessed change talk during 97 BMIs in an emergency department. They showed that MI-consistent behaviors were the only counselor behaviors that were significantly more likely to be followed by patient change talk overall (i.e., aggregating the different sub-dimensions such as ability, desire, commitment to change, etc.) (50). Using the same data, these authors showed that patient ability to change expressed during BMI was a significant predictor of alcohol use at 12-month follow-up (33). Patient change talk overall was not tested as a predictor of alcohol outcomes so that a complete chain from counselor's behaviors to patient change talk to outcome cannot be derived from these two studies. Nevertheless, another analysis using these data (51) suggested that change talk might have been a mechanism of change within this intervention. Using a hidden Markov model, analyses showed that a patient's attitude "toward change" at the end of the intervention was associated with improved outcomes at follow-up, independent of the type of change talk at the beginning of the intervention.

Similar analyses were carried by the same group using data on BMI among young men from the general population (52, 53). Again, MI-consistent behaviors were the only counselor behaviors that were significantly more likely to be followed by patient change talk overall (53) and alcohol use at 6-month follow-up was significantly predicted by a change talk variable combining ability, desire, and need to change or not to change (52). Patient change talk overall was not a significant predictor of alcohol outcomes but change talk averaged strength (i.e., a composite variable combining statements expressed toward change and away from change) trended toward prediction of alcohol outcome ($p = 0.08$). Again, the complete chain from counselor's behaviors to patient change talk to outcome was not observed in these two studies, leaving the mediation hypothesis needing to be further tested.

A full-mediation analysis was addressed in the paper by Vader and colleagues (54). In this study, the authors examined the relationship between counselor behaviors and client change talk, personalized feedback and change talk, and client change talk and client drinking outcome (composite score consisting of drinks per week, peak blood alcohol concentration, and protective drinking strategies), in a sample of heavy-drinking college students. MI was delivered in a single session with or without a personalized feedback report. A. In the MI with feedback group, MI-consistent counselor's behaviors were positively associated with client change talk. After receiving feedback, MI with feedback clients showed lower levels of sustain talk, relative to MI only clients. Finally, in the MI with feedback group, clients with greater change talk showed improved drinking outcomes at 3 months, while clients with greater sustain talk showed poorer drinking outcomes. Building on these positive findings within the MI with feedback group, the authors tested change talk as a mediator between MI-consistent

behaviors and drinking outcomes but observed a non-significant indirect effect (i.e., no evidence of mediation).

Self-efficacy

Enhancing client self-efficacy was previously a central component of MI (40), which has more recently been referred to as strengthening confidence to change (30). Research on self-efficacy as a mediator has shown mixed findings, but self-efficacy has not been well evaluated in studies of BMI for alcohol use (44).

Among the heavy-drinking college students who were randomly assigned to a BMI (N not specified, random half of 73 participants included in the study) in the study by McNally and colleagues (31), the participants' subjective experience of how much the counselor encouraged self-efficacy was not significantly associated with 6-week alcohol outcomes.

Barnett and colleagues (44) evaluated moderators and mediators of brief alcohol interventions conducted in an emergency department. Patients (18–24 years; $N = 172$) received a BMI with personalized feedback or feedback only, with 1- and 3-month booster sessions and 6- and 12-month follow-up. Among the tested mediators, self-efficacy was not significant. Individual path analysis showed that higher self-efficacy was significantly associated with lower levels of alcohol use, but randomization status (BMI vs. feedback only) was not related to a shift in self-efficacy.

Enhancement of discrepancy

Motivational interviewing seeks to develop and resolve discrepancy between the individual's current behavior and broader life goals and values (30). McNally and colleagues (31) examined the effects of a BMI for heavy, episodic alcohol use on discrepancy-related psychological processes. Heavy-drinking college students ($N = 73$) were randomly assigned to a BMI or an assessment-only control condition. Cognitive (actual–ideal discrepancy) and affective (cognitive dissonance) discrepancy processes were assessed at baseline and immediately following the experimental manipulation. At 6-week follow-up, BMI participants demonstrated significantly greater reductions in problematic drinking than controls. Moreover, actual–ideal discrepancy and negative, self-focused dissonance were significantly increased following the intervention (discomfort-related dissonance was not) and were correlated with the outcome alcohol involvement. These discrepancy processes did not, however, significantly mediate the relationship between condition and outcome.

Within the same study (31), the authors also tested whether MI components assessed after the BMI (N not specified, random half of the 73 participants) were related with alcohol outcome at 6-week follow-up (controlling for baseline drinking). The findings suggested that BMI participants who reported enhanced awareness of their drinking were more likely to show better outcomes. In their discussion, these authors suggested that this raised awareness might be conceptualized as having a direct relationship to discrepancy-related psychological processes as students' conscious awareness of their actual drinking patterns (enhanced through personalized feedback and/or through the MI format discussion) might raise their cognitive or affective discrepancy.

In their study evaluating moderators and mediators of emergency department based BMI for young adults (18–24 years; $n = 172$), Barnett and colleagues (44) tested a risk-benefit difference score as a potential mediator of the effect of BMI. Analysis of individual paths showed that as compared to feedback only, the BMI with personalized feedback group did not show the expected shift in perceived risks/benefits of drinking at 6-month follow-up. On the other hand, a shift in perceived risks/benefits at 6-month follow-up showed a trend toward lower alcohol use ($p < 0.1$) at 12-month follow-up. No significant mediation was observed.

Norm perceptions

In their trial on BMI with or without feedback to reduce heavy drinking among college students, Walters and colleagues (22) also tested if norm perceptions did mediate the effect of the intervention. They found that (a) BMI with feedback ($N = 73$) significantly affected the alcohol outcomes as compared to the assessment-only control condition ($N = 69$); (b) the intervention reduced norm discrepancies at 6 months, becoming more accurate in their norm estimates (i.e., smaller discrepancies); (c) smaller norm discrepancies were associated with better alcohol outcomes; and (d) adjusting for norm discrepancies reduced the magnitude of the intervention effect on alcohol outcomes.

Use of protective behavior and alcohol treatment seeking

Two other mediators were tested in two papers already presented above, but were not significant.

In their trial of BMI with or without feedback to reduce heavy drinking among college students, Walters and colleagues (22) also tested if the use of protective behaviors when drinking alcohol [e.g., set a target for number of drinks, alternate alcoholic and non-alcoholic drinks, and use a designated driver; (55)] mediated the effect of the BMI with feedback ($N = 73$) as compared to the assessment-only control condition ($N = 69$). They indicated that protective behaviors were only weakly related to the intervention and to the 6-month outcomes (no statistics reported) and did not mediate the intervention effect.

Alcohol treatment seeking was tested by Barnett and colleagues (44) within a BMI with personalized feedback for young adults (18–24 years; $n = 172$). Analysis of individual paths showed that as compared to feedback only, the BMI group showed a trend toward greater treatment seeking at 6-month follow-up ($p < 0.1$), but treatment seeking at 6 months was not significantly related with lower alcohol use at 12-month follow-up.

DISCUSSION

We conducted a review of studies reporting mechanisms of action of BI for hazardous or harmful alcohol use. Overall, BI active ingredients have been scarcely investigated, almost only within BMI studies, and mostly among patients in the emergency room, non-treatment seeking young adults, and US college student populations. This is surprising considering that BI evidence of efficacy comes mostly and primarily from studies conducted in primary health care settings. It may indicate that null trials have led researchers to investigate the BI black box in search for clues as to which elements of BI may carry efficacy, a task they somewhat did not carry in the context of efficacious studies. As such, it should be noted that some of the evidence summarized herein comes from null trials and that almost all of it comes from research conducted

in settings in which evidence of BI efficacy should be considered inconclusive [with the exception of the US colleges, see Ref. (7, 8)].

On the basis of the evidence reviewed herein, we summarize that:

(1) personalized feedback may be an effective component;
(2) decisional balance showed mixed findings, which tend to suggest a potential detrimental effect;
(3) some MI skills and techniques showed mixed findings;
(4) direct advice to reduce or stop drinking has not been empirically studied; presenting alternative change options, and relatedly using a range of moderation strategies are promising but need further study;
(5) change plan exercises are promising and need to be further studied as discrete components and also in relation to MI skills;
(6) client change talk is a potential mediator of BMI effects;
(7) change in norm perceptions and enhanced discrepancy have received preliminary support, but from only one study each;
(8) enhanced awareness of drinking, perceived risks/benefits of alcohol use, alcohol treatment seeking, and self-efficacy have as yet found no significant support as mediators, but were seldom studied; and
(9) readiness to change was only partially supported as a mediator of BI effect.

Readers familiar with the BI literature will notice that the conclusions summarized here include active ingredients from different models of BI (e.g., normative feedback, MI, and psychoeducation). The paucity of studies, especially of studies designed specifically to investigate active ingredients of BI shows that more research is needed. In addition, most of the evidence on active ingredients comes from studies conducted on one particular subtype of BIs, i.e., those derived or adapted from MI, and is limited to particular settings and populations (college students and young adults, emergency department). It is important that active ingredients can be identified in settings in which BI has been shown efficacious, like primary health care (1). For now, it is still unknown how BI achieves the effects observed in these randomized trials.

Another important area for future research is BI effects on the moderators, i.e., for whom or under which conditions BI is effective (or not). These were not the focus of our study (here we have investigated how BI works rather than for whom), and we suggest a contribution to be made on studying moderators effects, but also on investigating moderators of mediators effects. Determining what are the active ingredients of BI, and whether these ingredients are robust across settings and populations, is crucial to further develop effective interventions and will aid understanding of observed discrepancies between studies on both mediators and effects. Which combination (if any) of active ingredients (possibly across the different theoretical models of BI) is most effective deserves to be investigated but must await progress in the areas identified for further study.

ACKNOWLEDGMENTS

Work on this paper was supported by a Wellcome Trust Research Career Development fellowship in Basic Biomedical Science (WT086516MA) to Jim McCambridge.

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Conflict of Interest Statement: No conflicts of interest are to be reported. The authors disclose that part of the studies reviewed in the present article were their own work. They tried to consider those as objectively as possible, but some partiality might have remained.

Received: 26 June 2014; accepted: 06 August 2014; published online: 26 August 2014.
*Citation: Gaume J, McCambridge J, Bertholet N and Daeppen J-B (2014) Mechanisms of action of brief alcohol interventions remain largely unknown – a narrative review. Front. Psychiatry **5**:108. doi: 10.3389/fpsyt.2014.00108*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in PSYCHIATRY

MINI REVIEW ARTICLE
published: 03 November 2014
doi: 10.3389/fpsyt.2014.00152

Brief interventions for hazardous and harmful alcohol consumption in accident and emergency departments

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The prevalence of alcohol abuse among patients treated in accident and emergency departments (A&E) is considered as substantial. This paper is a narrative review of studies investigating the effectiveness of brief interventions (BI) for hazardous and harmful alcohol consumption in A&E. A&E departments in hospitals (and other health care infrastructures) are commonly the place where serious consequences of alcohol drinking are seen and need to be tackled, supporting the suggested theoretical usefulness of delivering BI in this environment. Available research shows that BI may be considered a valuable technique for dealing with alcohol-related problems. However, it is suggested that the usefulness of BI may depend significantly on the target population to be dealt with. BI have proved to be beneficial for male individuals and those patients who do not abuse other psychoactive substances. In contrast, evidence indicates that BI in A&E settings are not effective at all when dealing with men admitted as a consequence of a violence-related event. In addition, some studies were unable to confirm the effectiveness of BI in female population, in emergency setting. Studies investigating the association between drinking patterns and the effectiveness of BI also present inconsistent results. Most studies assessing the effectiveness of BI in A&E settings only adopted a short perspective (looking at the impact up to a maximum of 12 months after the BI was delivered). When assessing the effects of BI, both the amount of alcohol consumed and expected reductions in alcohol consequences, such as injuries, can be taken into account. Evidence on the implementation of brief intervention in emergency departments remains inconclusive as to whether there are clear benefits. A variety of outcome measures and assessing procedures were used in the different studies, which have investigated this topic.

Keywords: emergency department, brief intervention, alcohol, implementation, effectiveness

INTRODUCTION

Accident and emergency departments (A&E) can be defined as a medical treatment setting specialized in acute care of patients who are admitted presenting rapid symptoms and without prior appointment. The prevalence of alcohol abuse among patients treated (or least diagnosed) in this setting is considered to be substantial. Not surprisingly, alcohol is regarded as one of the leading causes of car accidents (1) as well as injuries in general (2). According to different studies, up to 77% (2, 3) of subjects admitted in A&E presented an alcohol-related injury, with about 30% of patients drinking alcohol above recommended levels (4), and between 6 and 22% (2, 3) meeting the criteria of alcohol dependence according to DSM-IV (5). It has been shown that injuries (which are responsible for about 40% of visits to A&E) are especially associated with alcohol drinking. A recent systematic review by Zerhouni et al. (6) has shown that, compared to uninjured patients, individuals with injuries admitted into A&E have a significantly higher probability of presenting elevated blood alcohol levels. Furthermore, in comparison to non-injured individuals entering A&E, injured individuals more frequently report having drunk alcohol during the 6-h preceding the fatal event and suffer from drinking-related consequences that adversely affect their social life. Notably, a recent meta-analysis (7) has shown that compared with general population, male subjects with alcohol-use disorders had more than 6.5-fold higher risk for mortality by injury in 10 years follow-up.

The above mentioned numbers regarding prevalence of alcohol-related problems in A&E exceed the general frequency of dealing with patients with problem drinking that occurs in other medical settings (8). However, they also show that most of the victims of alcohol-related health problems admitted to A&E are not alcohol-dependent individuals according to DSM-IV, but rather subjects drinking alcohol in a risky or harmful way. Therefore, actions aimed at reducing the amount of alcohol consumed but not requiring absolute abstinence such as SBIRT (*screening, brief intervention, and referral to treatment*) programs may be considered particularly useful.

The drinking pattern of special concern in A&E departments would probably be binge drinking (defined as consuming four or more standard drinks for females and five or more standard drinks for males on one occasion; with one standard drink containing 10 g of pure ethanol), which has been identified as particularly risky,

leading to injuries and general health consequences (9, 10). Moreover, A&E is usually the place where individuals are confronted for the first time with serious consequences of their own or others' alcohol drinking. Therefore, the usefulness of brief interventions (BI) in this setting is strongly supported.

The aim of this paper was to summarize the available evidence on the effectiveness of BI in A&E departments, as well as the effectiveness of specific BI implementation strategies that have been used in this setting. In order to do so, the Medline database has been searched using the following terms: "brief intervention," "alcohol," "emergency department," "emergency room," "accident and emergency room," "alcohol drinking," "harmful drinking," and "screening." All papers included in this review were published during the last decade, as to provide a summary of the most recent research results. References listed in all selected articles were additionally searched.

EFFICACY OF BI IN ACCIDENT AND EMERGENCY DEPARTMENTS

A systematic review performed by Nilsen et al. (11) showed that a positive effect of BI delivered in A&E on the level of alcohol drinking or the frequency of injuries was observed in 11 out of 12 studies. In addition, more intensive interventions were shown to yield more positive effects. The positive effects were observed in alcohol intake, risky drinking practices, alcohol-related negative consequences, and injury frequency, although in different studies different outcomes were measured and not in all of these outcome measures a positive effect was observed. In more recent randomized controlled trials, the positive effect of BI has been shown to reduce all outcomes: number of drinking days, amount of alcohol drunk on a single occasion, as well as the negative consequences of drinking (12). Notably, the study by Cherpitel et al. provides evidence for effectiveness of BI itself not just as an assessment reactivity (reactivity to the results of questionnaires evaluating amount of alcohol drunk and consequences of drinking), which has been raised as a potential mechanism of BI efficacy (12). In addition, Drummond et al. (13) showed that, contrary to the conclusions of the review by Nilsen et al., more intensive clinical interventions do not add significant benefits to very simple and short interventions. Importantly, BI directed toward subjects in the mild range of drinking severity have been shown to be significantly less effective compared to BI used in individuals within the moderate to heavy range of drinking (12).

In available research studies on BI in A&E departments, BI were shown to be effective in the short-term (with a follow-up measure up to 12 months after the BI took place). Most of these studies have assessed effectiveness in 12 months of observation only (14–17), whereas the few projects, which followed subjects for a longer period of time, did not confirm long-term effectiveness. On the other hand, in a study by Gwaltney et al. (18) the effects of BI did not emerge immediately after an initial session (evaluation after 1 month), but became visible later – at 3- and 6-months follow-up visits. In a study by Woolard et al. (19), a reduction of binge drinking days occurred and persisted also during 12 months of observation after delivering BI; however, a significant decrease in the consequences of drinking (such as injuries) was not observed when the BI group was compared to controls. However, results of many studies, also confirmed by meta-analyses (11, 20), suggest the opposite association – that BI reduces negative consequences of alcohol rather than the amount of alcohol consumed.

The analysis of the literature shows that the results of the studies on the effectiveness of BI in accident and emergency departments, although in most cases encouraging, remain inconsistent. D'Onofrio et al. (21) described no differences in effectiveness between emergency practitioner-performed Brief Negotiation Interview and usual discharge instructions in terms of either alcohol-use or alcohol-related negative consequences. As previously described, numerous studies showed that the experience of being injured and having to be attended in an emergency department by itself may provide enough motivation for reducing drinking, without any alcohol-related intervention taking place (11). Also, it has been suggested that the environment of A&E with its chaos, hurry, and quick decisions is not a context offering a desirable atmosphere enabling reflection for change (11). Finally, in the randomized controlled clinical trial performed by Daeppen et al. (22), no effect of BI delivered in A&E on alcohol drinking outcomes during the follow-up was observed.

Interestingly, the use of SBIRT techniques and questionnaires in a group of non-risky drinkers from emergency settings has been shown to lead to *increases* in the amount of alcohol drunk (23). The authors suggested as an explanation that these non-risky drinking subjects might have felt to be low consumers and at "safe levels" according to the presented thresholds, which emphasizes the significance of screening in this procedure.

GENDER PERSPECTIVE

Like in other settings (24, 25), results of the studies considering gender differences in the efficacy of BI in accident and emergency departments are inconsistent and conflicting. In a study by Choo et al. (26) BI turned out not to be effective at all in female participants and successful in men, but only for those without a history of involvement in violence. Also in a study by Woodruff et al. (27), men were more likely than women to benefit from BI, However, in another study, no differences between genders were reported (28), whereas, in a study by Blow et al. (16), younger adult women (ages 19–22 years) were most likely to decrease their heavy episodic drinking after receiving brief advice. Despite these contradicting findings, the general trend is for men to be more prone to benefit from BI in A&E settings. This observation is consistent with research findings showing that alcohol misuse is commonly a primary problem in male individuals, while in women alcohol drinking is often associated with other psychiatric conditions (personality, depressive, or anxiety disorders) (29). Therefore, from this perspective, interventions in women may be more effective when aimed at psychiatric symptoms rather than drinking itself. On the other hand, in male individuals interventions directed on drinking itself may appear to be the most appropriate, reasonable strategy.

BRIEF INTERVENTIONS IN YOUNG INDIVIDUALS

It has been suggested that emergency departments are especially suitable for interventions of a preventive kind as the age of patients treated in A&E is lower than in any other medical setting, thus allowing identification of harmful and risky behaviors at early stages. The results of studies conducted in young individuals are

in accordance with data concerning older patients. Two systematic reviews of literature concerning the effectiveness of BI in A&E in youngsters and college drinkers show that most of the studies confirm a positive effect of BI in alcohol drinking (30, 31). BI turned out to be effective in reducing alcohol intake and risky behaviors associated with drinking [including aggression (32)], although these effects were measured in just a short-term (up to 1 year) perspective (30, 31, 33). Also, similarly to adult individuals, the female gender was shown to be associated with significantly weaker effects of BI in adolescents (34), and computer-assisted SBIRT procedures were shown to be as effective as those conducted face-to-face (33). However, due to numerous inconsistencies in the results of previous research studies (33, 35), clear conclusions concerning the usefulness of delivering BI to the young population in emergency settings cannot be drawn.

PATIENTS' CHARACTERISTICS

Few studies have investigated the psychological factors contributing to the success (or lack of success) of BI in emergency departments. The small number of studies aimed at more sophisticated elaboration of the procedure is, however, consistent with the core idea of brief intervention, which is that it has to be brief, easy to implement, and not time-consuming. Designing a study assessing psychological factors and investigating detailed mechanisms of BI effectiveness would probably mean that the whole procedure would no longer be brief.

Brief interventions have been shown to be particularly effective in individuals who attribute their injury to alcohol (36, 37), suggesting that one of the major aims of BI in accident and emergency departments may be to identify the link between alcohol and injury. As previously mentioned (see Gender Perspective), BI were reported to be ineffective in individuals involved in violent actions (26). The largest reduction in drinking following discharge from A&E without receiving a BI was observed in subjects characterized by a history of alcohol-related accidents and injuries, and more severe consequences of drinking in general (37). Most likely, this was the group with highest motivation and readiness for change, which has been identified as one of the main factors diminishing the effectiveness of brief intervention (38).

As mentioned previously, a history of involvement in violence (26) and comorbid misuse of other substances (than alcohol) (27) have been shown to decrease the effectiveness of BI in A&E departments. These observations emphasize the plausible association between the level of psychopathology (e.g., personality disorders) and efficacy of BI in accident and emergency departments. This issue remains a possible objective for further research, although this idea may be challenged by the concept of BI as a short, not complicated, and easy to administer intervention.

IMPLEMENTATION OF BRIEF INTERVENTIONS IN THE EMERGENCY SETTING

As shown above, the emergency setting seems to be an appropriate place to introduce BI for alcohol drinking, both from a theoretical and a clinical perspective, whereas the efficacy of BI in A&E has been shown by the results of most of the studies. It has been emphasized that the moment directly after an accident or admission to A&E may be considered the most "teachable" one. Moreover, in most of the studies reduction of drinking was even observed in control groups not receiving BI (11), making it reasonable to assume that the injury and admission to A&E by itself constitute a motivation for change in drinking habits, and thus a favorable moment to take advantage for delivering BI. Notably, the implementation of BI in accident and emergency department has also been recommended in official guidelines for alcohol prevention (39–41). However, the specificity of A&E departments includes brevity of contact with patients, overloading of the staff, and engaging in numerous activities that may be considered more important and more directly associated with life-saving approaches that remain the core of A&E functioning. In addition, a lack of adequate training has been suggested as a significant barrier in implementing BI in the emergency setting (42, 43).

This clear discrepancy between the needs and capabilities has been confirmed in numerous studies showing that less than one-third of accident and emergency departments offers BI for alcohol drinking by trained personnel (42). Such surprisingly low prevalence of BI implementation stimulated studies aimed at identifying barriers and facilitators of SBIRT use in the emergency setting. Among possible facilitators, presence of official guidelines and health policy (44), as well as use of computer-assisted screening and brief intervention procedures (45, 46) were emphasized. In addition, during the introduction of a screening procedure into everyday routine practice (47), a positive change in attitudes toward screening and BI of A&E staff was observed, as they reported to experience that the procedure worked well and that patients were willing to cooperate.

DIFFERENT WAYS OF IMPLEMENTING BRIEF INTERVENTION

Taking into account the barriers and facilitators identified in previous research for implementing BI in emergency settings, a few recent research studies focused on the possibility of using a computer-assisted SBIRT procedure in A&E. The results of these studies show that the use of such technological supports substantially increases screening rates (even up to 89–97%) (45, 46), but the outcomes in terms of effectiveness remain inconsistent (11). Therefore, more research is needed to establish knowledge about possible benefits of technologically modified SBIRT procedures.

Other research analyzing the kinds of intervention performed, showed that individuals for whom alcohol was not a factor involved in the injury or cause of admission, although they presented symptoms of risky or harmful alcohol use justifying the delivery of BI benefited from a counselor-guided intervention (consideration of the risks related to their alcohol use), whereas subjects already experiencing previous consequences of alcohol use did not show added benefit from the counselor intervention compared to receiving the feedback report only (28).

Telephone-applied BI delivered orally decreased impaired driving and alcohol-related injuries in patients discharged from A&E with greatest effects for those with more severe alcohol drinking (48, 49). However, this type of intervention was not shown to be effective in terms of change in alcohol consumption and other alcohol-related consequences (49). In a recent multisite randomized clinical trial, brief intervention using personalized feedback delivered before the subject was discharged from A&E and followed by a telephone booster once discharged, was shown

to be the most effective way of reducing alcohol drinking in A&E patients (50).

CONCLUSION

Available research studies show that BI may be considered a useful technique for dealing with alcohol problems in A&E departments. However, it is suggested that the usefulness of BI may depend significantly on the population that it is offered to. The effects of BI can be measured both in terms of the amount of alcohol consumed and in terms of expected reductions in alcohol consequences, such as injuries, and therefore, different outcome measures were taken into consideration and a variety of assessing procedures were used in the studies addressing this topic. In addition, different methods of BI implementation were assessed, hampering the comparison between results. It is also important to consider that the number of research studies on the effectiveness of BI in A&E settings is still relatively small, while the most important methodological limitation of such studies consists in the fact that in most of them BI effectiveness was assessed in a short (up to 12 months) perspective. Although, it may seem challenging for a *brief* intervention to result in significant long-term effects, it would be useful to examine their effectiveness in longitudinal research studies designed for long-term observation, also providing more insight as to whether BI delivered in A&E departments have a significantly greater impact in reducing drinking and alcohol-related harm than the effect of being admitted into A&E after an alcohol-related event in itself.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 01 August 2014; accepted: 17 October 2014; published online: 03 November 2014.
*Citation: Wojnar M and Jakubczyk A (2014) Brief interventions for hazardous and harmful alcohol consumption in accident and emergency departments. Front. Psychiatry **5**:152. doi: 10.3389/fpsyt.2014.00152*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in PSYCHIATRY

REVIEW ARTICLE
published: 06 October 2014
doi: 10.3389/fpsyt.2014.00131

Alcohol screening and brief intervention in workplace settings and social services: a comparison of literature

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Background: The robust evidence base for the effectiveness of alcohol screening and brief interventions (ASBIs) in primary health care (PHC) suggests that a widespread expansion of ASBI in non-medical settings could be beneficial. Social service and criminal justice settings work frequently with persons with alcohol use disorders, and workplace settings can be an appropriate setting for the implementation of alcohol prevention programs, as a considerable part of their social interactions takes place in this context.

Methods: Update of two systematic reviews on ASBI effectiveness in workplaces, social service, and criminal justice settings. Review to identify implementation barriers and facilitators and future research needs of ASBI in non-medical settings.

Results: We found a limited number of randomized controlled trials in non-medical settings with an equivocal evidence of effectiveness of ASBI. In terms of barriers and facilitators to implementation, the heterogeneity of non-medical settings makes it challenging to draw overarching conclusions. In the workplace, employee concerns with regard to the consequences of self-disclosure appear to be key. For social services, the complexity of certain client needs suggest that a stepped and carefully tailored approach is likely to be required.

Discussion: Compared to PHC, the reviewed settings are far more heterogeneous in terms of client groups, external conditions, and the focus on substance use disorders. Thus, future research should try to systematize these differences, and consider their implications for the deliverability, acceptance, and potential effectiveness of ASBI for different target groups, organizational frameworks, and professionals.

Keywords: brief alcohol intervention, workplace health, social services, criminal justice setting

BACKGROUND

Alcohol is a significant risk to public health (1) and globally, heavy drinking represents the fifth leading cause of morbidity and premature death after high-blood pressure, tobacco smoking, household air pollution from solid fuels, and a diet low in fruits (2). A variety of interventions exist for the prevention and treatment of alcohol-related risk and harm, ranging from health promoting interventions aimed at tackling hazardous and harmful drinking, to more intensive and specialist treatment for severely dependent drinking (3). Alcohol screening and brief intervention (ASBI) has emerged as an effective, and cost-effective, preventative approach to reduce hazardous, and harmful drinking in non-treatment seeking individuals, and has been shown consistently to reduce the quantity, frequency, and intensity of drinking when delivered in primary health care (PHC) settings (4).

The robust evidence for ASBI effectiveness in PHC suggests that an extension of ASBI implementation into further settings with groups that may be at an increased risk of alcohol-related harm may be beneficial (5). For example, while the evidence remains equivocal, individual studies have demonstrated positive effects of ASBI in emergency departments and general hospital wards (6, 7). Also, non-medical settings may also provide a valuable point of contact to risky drinkers (5), and to target groups who are not routinely accessed via PHC settings. Not least, as in addition to the well documented health harms (2), alcohol also impacts significantly upon individuals, families, and communities, with heavy drinkers potentially experiencing social harms such as family disruption, interpersonal violence (8–10), involvement in crime, problems within the workplace, and financial difficulties (11).

First, social work has a long history of working with persons with alcohol or substance use disorders (12, 13), and therefore, social services in their various forms potentially represent an important field for brief intervention delivery. In an US survey on a large and representative sample of social workers, 71% of respondents reported having taken some action related to substance abuse diagnosis and treatment in the preceding 12 months with clients, whereas only 2% stated substance use disorders being their primary practice area (14). Indeed, further studies confirm the substantial contribution of substance misuse to a social worker's caseload in children's services (8), mental health services (15), adult's services (16), as well as those employed within specialist drug and alcohol teams (17). Importantly, delivering ASBI

within a social service setting may take advantage of the teachable moment wherein individuals can consider their alcohol use behavior within the context of the contact with a social worker: an approach, which has been shown to be beneficial within PHC (18). Thus, social service and criminal justice system settings may be another valuable point to contact further populations of risky and hazardous drinkers who are not necessarily reached within healthcare settings.

Second, given that alcohol is the most widely used substance among working adults, and the fact that almost 80% of risky drinkers are employed, workplace health services may also present a valuable opportunity for the delivery of preventative alcohol work. Alcohol abuse is associated with multiple negative workplace outcomes, including absenteeism, accidents, turnover, and other sources of productivity losses (19–23). Specific job-related influences associated with problem drinking, including job stressors and participation in work-based drinking networks, may pose a particular problem for young adults as they try to fit in their workplace (24). Using the workplace for the provision of alcohol prevention is important because the workplace is an identifiable setting where a prevention program can be disseminated (25). Further, the workplace is a traditional setting for providing prevention messages to individuals with drinking problems (26), and therefore, a useful existing network in which health psychologists, behavioral medics, public health professionals, and employers can deliver health-related messages and interventions regarding alcohol consumption that reach the majority of employees (27). Workplaces also appear to be appropriate sites for conducting early interventions as most people spend substantial periods of time at work (26, 28). For example, 28% of the 18 million salaried French people who are looked after by their occupational health doctor see no other doctor during the year (29).

Against this background, this paper examines the existing evidence for the delivery of ASBI in social service and workplace settings, and considers the challenges that providers and recipients alike might experience in achieving their routine implementation. In doing so, we report on the findings of two recent setting-specific (social services and workplace) systematic literature reviews focused around three key questions:

1. First, what evidence is there for the effectiveness of ASBI in social service and workplace settings?
2. Second, what barriers and facilitators exist to ASBI implementation in social service and workplace settings?
3. Third, and finally, what are the key evidence gaps and future research needs in this area of ASBI research?

The present study aimed to update the results obtained in a previous search[1] conducted as part of the European Union financed BISTAIRS research project. Additionally, we expanded the original research question by adding the analysis of barriers/facilitators to ASBI implementation and by reviewing the need for future research in these settings.

[1] http://bistairs.eu/material/BISTAIRS_WP4_evidence_report.pdf

METHODS

The following electronic databases were searched: Medline (OVID); EMBASE (OVID); PsycInfo (OVID); The Cochrane Library (Wiley); CINAHL (EBSCO); and Web of Science (Databases: SCI-EXPANDED, SSCI, A&HCI) using appropriate MeSH terms. The search was divided into three core concepts:

A. Setting: workplace, worksite, occupational, employee, or labor; social service, social work, services for homeless people, employment agencies, non-scholar youth work, criminal justice, and probation/rehabilitation services (including interventions for traffic offenders under the influence of alcohol), and community-based institutions, e.g., (drug) counseling centers;
B. Intervention: alcohol, brief intervention, alcohol therapy, counseling, and early intervention; and
C. Study design: primarily randomized controlled trials (RCTs).

Additional information and further sources obtained from experts in the field and websites of relevant organizations/networks and reference lists of included articles were considered. The selection of studies comprised, in a first step, screening of title and abstract, which was also achieved by identifying keywords for exclusion. Second, for potentially relevant articles, the full text was retrieved and examined in-depth against a detailed set of inclusion criteria.

Studies on the effectiveness of brief alcohol intervention in comparison to control conditions, which were delivered in either workplace or social service settings, and published between January 2002 and June 2013 in English, were eligible for inclusion. Primarily, we aimed to include RCTs and also searched for prospective observational studies to consider them subordinately, as an initial scoping search suggested that only a small number of RCTs in social service and workplace settings would be identified. ASBI was defined as a single session or up to a maximum of four sessions of engagement with a client or employee and the provision of information and advice that is designed to achieve a reduction in risky alcohol consumption or alcohol-related problems. Studies with single sessions longer than 40 min were excluded. Brief interventions were typically compared to control conditions of assessment only or treatment as usual.

Primary outcomes of interest included changes in self- or other-reports of drinking quantity and/or frequency, drinking intensity (e.g., number of drinks per drinking day), and drinking within recommended limits. Risky drinking was defined as drinking in excess of 60 g of alcohol per day for men and 40 g for women (30). Hazardous drinking is consumption at a level, or in such a pattern, that increases an individual's risk of physical or psychological consequences (31), while harmful drinking is defined by the presence of these consequences (32). While the concept of workplace setting is relatively well defined, the definition of the setting "social services" is more ambiguous. We included studies based in the following settings or populations: homeless people, offenders under the influence of alcohol, youth work/youth welfare services, employment agencies, and (drug) counseling centers. The methodological quality of included studies was assessed using the Cochrane risk-of-bias tool (33, 34).

Data were extracted from each eligible paper against a comprehensive data abstraction template with reference to the full article text. For the first review question (1), data were extracted on the delivery context, participant characteristics, study design, intervention details, outcome measures, and outcomes. The systematic review on the effectiveness of ASBI was part of the European Project BISTAIRS and can be read in detail elsewhere[1] (35).

For the second and third review questions (2 and 3), data were extracted on any barriers to ASBI implementation identified in each effectiveness study. Further, in order to supplement the results for questions (2) and (3), additional guided searches were carried out focused around the additional questions of setting-specific implementation barriers and needs for further research. Compared to the report published in 2012, the present study (a) updated the search strategy; (b) used the Cochrane risk-of-bias tool for quality assessment; (c) expanded the research question by the analysis of barriers/facilitators; and (d) reviewed the need for future research in these settings. No statistical analyses or meta-analyses were conducted. Instead, the existing analyses reported in the articles reviewed were extracted systematically, with the findings reported in a structured narrative synthesis in response to the three overarching review questions.

RESULTS

EVIDENCE OF EFFECTIVENESS OF ASBI IN WORKPLACE SETTINGS

In this section, we provide an update of the results of our systematic review conducted in the framework for the EU project BISTAIRS[2]. Compared to the report published in 2012, the present study retrieved one additional article (36) in the workplace setting, resulting in 9 out of 3037 studies meeting our inclusion criteria (see **Table 1**). Key reasons for exclusion concerned, e.g., intervention characteristics (too long duration or general prevention), lack of effectiveness analyses, or inappropriate setting. The methodological quality varied due to study design, measurements, inclusion criteria, and analysis. Quality appraisal based on the Cochrane collaboration's risk-of-bias tool revealed that most studies failed to describe in detail the approach to selection [random sequence generation (24, 36–40); allocation concealment (24, 37–42)] and performance biases [blinding of participants and personnel (24, 36–39, 41, 42)], resulting in the assessment of "unclear" in those areas. The random sequence generation of the study of Osilla et al. (41) was rated to have a "high risk-of-bias," the reporting of Michaud et al. (36) was regarded as incomplete.

The majority of included studies were conducted in the USA (24, 37, 38, 40, 41), with a further three in Europe (27, 36, 42), with one in Japan (39). The company employment sector varied significantly, including organizations based in the transportation, food, and retail or manufacturing sectors. Some authors did not reveal specific company information due to privacy agreements with the companies. All companies were either large employers (about 1000 employees or more) or the participants were draw from several companies. The companies' fields of activity and general description of the participants' work (blue collar or white collar) varied between studies. Araki et al. (39) surveyed factory workers and some of the remaining studies were conducted in the service sector (24, 37, 42). However, the rest of the studies did not describe the workplace characteristics of their participants.

Recruitment of participants was either via management referral or company occupational health services. Methods for the identification of potentially harmful drinkers included adapted screening tools (e.g., AUDIT-C) or blood tests with unspecific or specific markers like carbohydrate-deficient-transferrin (CDT). All studies excluded participants with more intensive treatment needs due potential alcohol dependence (e.g., AUDIT score >19) or with severe health problems. The included studies tested face-to-face ASBI delivered by a trained counselor (27, 37, 41, 42), or web-based interventions, either alone (38, 40) or combined with a face-to-face approach (24, 39).

All except one study (42) showed significant reductions on alcohol consumption for brief interventions at least in some of their primary outcomes such as alcohol intake or numbers of drinking days. Araki et al. (39) observed a reduction of alcohol intake from 24.8 to 12.1 g ethanol/day. Anderson et al. (37) found a reduction of drinking days per week (from 2.39 to 1.95), and Osilla et al. (41) reported a significant reduction of peak drinks per occasion from 7.56 to 4.78 in the intervention group that received ASBI within an employee assistance program (EAP). Significant reduction in the AUDIT score after 12 months (6.59 vs. 7.55; $p = 0.01$) were found by Michaud et al. (36), but without showing significant effects in reducing hazardous drinking. The face-to-face plus website intervention of Doumas and Hannah (24) reduced the number of drinks per weekend from 2.42 to 1.87. Face-to-face ASBI was as effective as the stand-alone web-based intervention.

Three out of four studies, which used web-based interventions reported some positive effects (24, 38, 40). The participants in the intervention group of Walters and Woodall (38) decreased their alcohol consumption by 0.87 drinks per week (DPW), whereas those in the control group increased their consumption by 1.75 DPW. The website intervention scrutinized by Matano et al. (40) reduced binge drinking in participants with a moderate risk for alcohol problems by 48%, but due the inadequate sample size a further evaluation of treatment effects is not possible. The web-based interventions (web-based feedback and web-based feedback plus 15 min motivational interviewing) by Doumas and Hannah (24) show significant reductions of alcohol drinking within 30 days in young "high-risk" binge drinkers (defined by binge drinking at least once in the past 2 weeks). In contrast to these studies, Araki et al. (39) indicated that face-to-face educational interventions are more effective to increase the knowledge about and attitude toward drinking than a comparable email intervention. Noteworthy are the small response rates to web-based services, for instance, the website of Matano et al. (43) was visited by only 2.7% of all employees.

Finally, only the study by Hermansson et al. (42) found no superiority effects of ASBI compared to controls, but showed significant reductions in both groups. Most studies used short durations for follow-up of up to 6 months, only two choose follow-up assessment after 12 month (36, 42).

[2]www.bistairs.eu

Table 1 | Evidence of effectiveness of ASBI, implementation barriers for ASBI, and future research needs for ASBI in workplace settings.

Reference	Evidence of effectiveness of ASBI	Implementation barriers for ASBI	Future research needs for ASBI
Hermansson et al. (42)	Comparable reductions in all groups over time		Long-term effectiveness of alcohol interventions
Araki et al. (39)	Reductions in alcohol intake (g/day) for face-to face intervention	Low participation rates and group imbalances between control- and test group	
Anderson et al. (37)	Effect for number of drinking days, not for (peak) BAC	Low participation rates of hazardous and harmful drinkers	Filling the knowledge gap in relation to the cost-related outcomes of workplace ASBI
Osilla et al. (41)	Improvements for peak drinks/day and peak BAC; work performance improved in both groups	Lack of therapeutic work	Understand gender differences for implementing ASBIs in EAPs
Michaud et al. (36)	ASBI superiority for alcohol intake (g/week) and AUDIT mean score; reduction in AUDIT category in both groups	High rates of "lost" patients in follow-up	Evaluate important worksite cost-related outcomes, such as health care utilization, absenteeism rates, job performance ratings, turnover, and reported accidents
Doumas and Hannah (24)	Web-based and face-to face interventions both reduced peak consumption and weekend drinking		Tailoring an established model to young adults in the workplace
Walters and Woodall (38)	(Partly) significant reductions in drinking levels	Low participation rates of hazardous and harmful drinkers	
Matano et al. (40)	ASBI superiority in binge-drinking only for moderate drinkers	Potentially negative consequences of self-disclosure	
Hagger et al. (27)	ASBI superiority in units per week, both groups reduced binge drinking	Low participation rates of hazardous and harmful drinkers	Does present mental simulation intervention would have greater efficacy in a sample with hazardous levels of alcohol consumption and higher rates of binge-drinking occasions?

AUDIT, alcohol use disorder identification test; BAC, blood alcohol concentration; EAP, employee assistance program.

IMPLEMENTATION BARRIERS FOR ASBI IN WORKPLACE SETTINGS

Effectiveness studies of ASBI in the workplace have mostly focused on the individual level obstacles experienced by both employers seeking to deliver alcohol prevention activities, and those employees who might benefit from such interventions. In contrast, there was no identified data illustrating organizational obstacles to routine ASBI delivery. In particular, as in other delivery settings, including PHC (44–46), the stigma associated with receiving an alcohol-related intervention impacts significantly on the implementation of ASBI in the workplace. Indeed, the reviewed studies suggest that this may be a reason for the low-participation rates of hazardous and harmful drinkers in this particular setting (37, 38). Employees may be anxious about participating in ASBI delivered at their workplace because of the potentially negative consequences of self-disclosure (43). Further, hazardous drinking is more prevalent in males, who are generally more inclined to reject therapeutic interventions for mental health conditions (47). In contrast to this, persons with a need of mental health service might more readily accept ASBI than those without (48, 49), which again might affect ASBI completion rates and outcome measures, and limit the generalizability of the results. Finally, the evidence also suggested that a lack of therapeutic work might be another reason for higher drop-out rates in ASBI groups (41).

FUTURE RESEARCH NEEDS FOR ASBI IN WORKPLACE SETTINGS

The low participation and high-drop-out rates suggest that a clear need for further research both to explore the *acceptability* and *feasibility* of ASBI in workplace settings; and to address questions around the effective implementation of alcohol prevention strategies in different working environments. Further, there is an identified knowledge gap in relation to the cost-related outcomes of workplace ASBI [such as health care utilization, absenteeism rates, job performance ratings, turnover rates, and rate of work-related accidents (37)]; alongside the long-term effectiveness of alcohol interventions delivered in this setting (42).

In terms of the actual *effectiveness* of ASBI in the workplace, due to the limited number of RCTs in this field, it is not possible to identify under which circumstances ASBI is likely to effective, and or whether employees who work in a certain field would be more likely to benefit from specific ASBIs. We found no studies with workers from smaller companies and respective ASBI approaches for those employees are missing. In addition, most of our reviewed studies in workplace settings (five out of nine) were carried out in the United States, and thus, their outcomes cannot easily be transferred to the different and highly variable European health care and occupational health systems. There was also an absence of studies of

workplace ASBI conducted in countries with a lower economic status.

EVIDENCE OF EFFECTIVENESS OF ASBI IN SOCIAL SERVICES

In this section, we refer to the results of our systematic review conducted in the framework for the EU project BISTAIRS[2], which can also be read in a critical commentary published in the BJSW (35). Six out of 1856 studies (seven publications) met our inclusion criteria (see **Table 2**). Reasons for exclusion included too long duration of intervention, lack of effectiveness analyses, or inappropriate setting. Two studies examine ASBI within homeless populations; two of which include homeless adolescents (50) and one study with homeless veterans (51). Another study has been conducted in a community-based drug and alcohol counseling center (52). In the criminal justice setting, we found three studies for inclusion, two of them conducted with participants arrested for driving while intoxicated (DWI) offenses (53, 54), and another among violent, alcohol-intoxicated offenders (55). These six studies show mixed results for the effectiveness of ASBI, and the heterogeneity of settings make it challenging to compare results. Compared to the report published in 2012, the updated search retrieved no additional studies to be included.

Peterson et al. (50) worked with homeless substance-using adolescents aged 14–19 years. Comparing brief motivational enhancement to one of two control groups (assessment only or assessment at follow-up), this study did not find any changes in alcohol measures (days of alcohol use, standard drink units, binge drinking), but demonstrated reductions in drug use (other than marijuana) at 1 month follow-up. In comparison, a study by Wain et al. (51) with alcohol-dependent homeless veterans measured the effectiveness of a single session of brief motivational interviewing upon treatment entry and completion. Treatment entry was significantly higher in the brief intervention group (95 vs. 71%; $p = 0.017$); and also length of stay, treatment completion, and graduation was higher, although these findings failed to reach significance (51). The study in a community-based drug and alcohol counseling center compared BI with the more intensive CBT. Here, the equal improvement of both BI and CBT participants in all drinking outcomes (weekly units, heavy drinking days, AUDIT scores) demonstrates a non-inferiority of ASBI, and the cost-effectiveness score was significantly better in the ASBI condition (52).

Among studies conducted in criminal justice settings, Watt et al. (51) conducted a study examining intervention with violent offenders comparing brief intervention against assessment only and found comparable reductions in both conditions for weekly units, number of drinking days, AUDIT scores, and heavy episodic drinking. Furthermore, no difference in recidivism rates could be determined during the 12-month follow-up period. However, significantly lower rates of injury (unintentional and self-harm) were reported in the brief intervention group (27.4 vs. 39.6%) (55). The two studies among DWI recidivists showed positive between-group findings on drinking levels favoring brief interventions, which approached significance (53, 54). Further, Wells-Parker and Williams (54) investigated differential effects on individuals with high- vs. low-depression scores (as measured by the sadness/depression subscale of the Mortimer-Filkins questionnaire). Although they failed to determine an overall superiority of adding two brief intervention sessions and a follow-up to standard treatment, rates of DWI recidivism were significantly lower among highly depressed participants receiving the extended brief intervention (16.7% extended brief intervention vs. 25.6% standard treatment) (54).

IMPLEMENTATION BARRIERS FOR ASBI IN SOCIAL SERVICES

As with alcohol prevention work delivered in workplace settings, research confirms that the participation rate in ASBI in social

Table 2 | Evidence of effectiveness of ASBI, implementation barriers for ASBI, and future research needs for ASBI in social services.

Reference	Evidence of effectiveness of ASBI	Implementation barriers for ASBI	Future research needs for ASBI
Peterson et al. (50)	No intervention effect on alcohol measures, but small effect on drug use	Low participation rates	To link ASBIs to others homeless services
Wain et al. (51)	Higher rates of treatment entry and completion		
Shakeshaft et al. (52)	Non-inferiority in drinking outcomes compared to CBT, better cost-effectiveness	Recruitment problems, as the majority did not know how to use a computer	Assessments of treatment outcome should measure actual behavior change, rather than perceptions of counseling alone
Wells-Parker and Williams (54)	Effect on DUI recidivism (60 months) for depressed subgroup	Social service providers might not feel responsible for alcohol-related interventions	
Brown et al. (53)	Reduction of risky drinking days in both groups	Low female participation rates	
Watt et al. (55)	Both groups improved in weekly units, no. of drinking days, and AUDIT score		Rather specialist referral, diagnostic assessments, and treatment than ASBI for high-bonded groups

AUDIT, alcohol use disorder identification test; CBT, cognitive behavioral therapy; DUI, driving under the influence of alcohol.

service and criminal justice settings is low, and the drop-out rate for follow-up is high. Further, compared to medical settings, which focus specifically on alcohol-related problems, the implementation of ASBI in these settings might result in additional personal challenges for social service providers, as they might not feel responsible for alcohol-related interventions (54). However, the lack of available evidence of ASBI in social services makes it challenging to draw firm conclusions in relation to the specific barriers and facilitators to their successful implementation in such settings. Moreover, the already identified heterogeneous nature of this setting, potentially suggests that approaches will need to be carefully tailored to the specific needs of different delivery contexts.

For example, looking at Peterson's study with homeless adolescents (42), given the multiple social, psychological, and health problems often experienced by homeless adolescents, one may conclude that a brief intervention of around 30 min is simply not sufficient to intervene with such needs. Moreover, instability and transience characterize the lives of homeless youth, resulting in intensive and sustained intervention being hard to achieve. In addition, the study by Watt et al. showed that alcohol-dependent clients are highly prevalent in services of criminal justice systems (55). More than one-third of the sample scored >20 in AUDIT, thus, exceeding the indicative cut-off points for alcohol dependence. As such, those clients need specialist referral, diagnostic assessments, and treatment, rather than ASBI. Both these examples, suggest that a stepped-care approach of the type discussed in relation to the Wells-Parker and Williams (54) study above, is likely to be an important consideration in designing ASBI implementation strategies within social service settings.

FUTURE RESEARCH NEEDS FOR ASBI IN SOCIAL SERVICES

Of all the potential delivery contexts for ASBI, the evidence base around social service settings remains arguably in its infancy. While it may well be possible to capitalize on the substantial progress made in this research field in other settings (and in particular in ASBI), the low-participation/high-drop-out rates and complex client needs suggest that a strong need for further work to explore the feasibility and acceptability of ASBI work in this varied and challenging delivery context.

DISCUSSION

In stark contrast to the robust and comprehensive literature supporting their effectiveness in PHC, the ASBI research field in non-medical settings paints a far more complex, patchy, and varied picture of what works best, in which contexts, and with whom. Since our previously published BISTAIRS project report (REF), this picture has changed little, with only one additional study retrieved in the search update. As such, the evidence base for ASBI in non-medical settings remains sparse.

While the results of this review provide some encouraging support for ASBI delivery in workplace settings, it also highlights the fact that there has been little attention paid to research based in this context to date, despite this being where millions of working-age adults spend most of their day. Currently, the development of ASBI workplace approaches has been restricted to occupational health services in large factories, and therefore, little is known about whether such strategies would be transferable to smaller organizations, or to businesses outside the manufacturing or construction sectors. Nevertheless, although the evidence does not yet suggest any clear recommendation for a widespread implementation of workplace ASBI, occupational health services could consider offering brief advice to employees who are considered as drinking in a risky or potentially harmful way. A useful toolkit and manual has been issued by the European workplace and alcohol (EWA) project (56). Further, the evidence does emphasize the importance of the existence of comprehensive alcohol at work policy, embedded within overall healthy living policies and actions at the workplace, that take into account the structural and working environments that increase risky drinking in the first place (57). Results of the Swedish Risk Drinking Project, which implemented tailored training courses around ASBI in a large number of primary, maternal, and occupational health services, demonstrated improvements in knowledge, self-efficacy, and alcohol-preventive activity in occupational health services, especially in nurses, who were afforded a key role in the project (58).

The evidence base for ASBI in social services is essentially non-existent, and although some reviews (59) and some trials (60) have included social service settings, it is difficult to identify a clear positive impact of brief advice programs. The UK criminal justice system – screening and intervention program for sensible drinking (SIPS) trial found evidence for an impact of receipt of a patient information leaflet, brief advice, and brief lifestyle counseling, with no differences between the three interventions (61). Thus, because of the paucity of evidence, rather than suggesting comprehensive delivery of roll-out of brief advice programs in social service settings, it might be more beneficial at this stage to gather further evidence as to the acceptability and feasibility of ASBI in social service settings, generating useful system readiness data, until more evidence for effectiveness is gathered.

In particular, for example, future studies need to consider what setting-specific differences exist (in terms of client–patient target groups, institutional characteristics, or acceptance among professionals), and to assess how these differences might influence the deliverability, acceptance, and potential effectiveness of ASBI. Receiving and delivering alcohol interventions in the types of non-medical settings described in this paper entails a range of client–provider relationships and expectations that are arguably not easily comparable to those evident in generalist medical settings. In PHC, for example, individual patients often build up long-term, positive relationships with their GP and practice nurse (62), and (crucially) are generally motivated to enter into such relationships for primarily health-related reasons. ASBI strategies that prove successful in PHC, therefore, may not be appropriate for implementation in the workplace, where employer and employee are necessarily financially committed to each other. However, in the framework of occupational health services, a setting, which is more comparable to PHC, this barrier might be reduced, as occupational health staff is supposed to keep confidentiality. Another difficulty to the acceptance of ASBI may arise in criminal justice systems, where offenders are engaged in an involuntary, legally binding relationship with their probation workers as a result of "deviant" behavior.

Further, and in particular, in respect of ASBI in social service settings, one might also question whether a focus on drinking

reductions is a realistic and achievable first-line goal for all target groups that social service professionals might come into contact with. The studies with homeless people (who generally have more needs and numerous impairments other than alcohol abuse), suggest that brief approaches may be unlikely to reduce drinking levels in certain patient populations (50, 51, 63), but that other factors might be successfully addressed, such as rates of entry in addiction treatment (51) and service utilization (63). Further, the results of Wells-Parker and Williams (54) in DWI offenders with high rates of depression and low self-efficacy, but high willingness to reduce consumption suggest that additional motivational components might not be necessary for all risky drinkers to achieve drinking reductions, but they may be of relevance for particular subgroups. Providing extended interventions only to those in need, is in line with stepped-care approaches (64). For certain client groups, BI approaches might thus more serve as a "door-opener," in the sense of enabling referral to other services, and should not be seen as a tool, which directly influences the amount of drinking.

At the same time, and while recognizing the heterogeneous nature of the social services evidence base, it was notable that in all except one study in these settings (homeless youth), control groups achieved comparable reductions in their drinking levels over time. This is in line with previous findings from ASBI studies in the medical field. For example, drinking reductions ranging between 10 and 40% among participants in control groups were shown in reviews by Jenkins et al. (65) and Bernstein et al. (66). A further review by McCambridge and Kypri (67) comparing longer vs. shorter (or no) assessment found reductions in weekly consumption levels attributable to interview procedures. In addition, the recent SIPS trials, conducted in primary care practices, could not determine a significant additional benefit of brief advice or lifestyle counseling over and above the provision of short personalized feedback and provision of a leaflet (68). This non-inferiority of "control" conditions might suggest that the implementation of any kind of very brief alcohol interventions may be of value, even in these challenging settings.

In conclusion, therefore, the overriding message is that "more research is needed," and in particular, that there is a strong need for more robust ASBI trials in non-medical settings in order to address the identified knowledge gaps on obstacles and difficulties in ASBI implementation in these settings. In tandem with outcome assessments, information on the acceptability and feasibility of ASBI in their various forms are needed to provide data on the system readiness for workplace and social care settings, rather than focusing solely on demonstrating ASBI effectiveness. However, given the large existing evidence base for ASBI in PHC and other health settings, which has taken decades to accrue, it is nevertheless to be hoped that alcohol prevention work in occupational and social service settings might gain from this substantial body of knowledge in order accelerate the evaluative process and achieve the potential benefits for clients and employees in a far shorter time-frame.

ACKNOWLEDGMENTS

This work was in part supported by the health program of the European Union as part of the BISTAIRS research project (Agreement number 2011_1204). The sole responsibility lies with the author and the Executive Agency is not responsible for any use that may be made of the information contained therein. For further information, visit the project website at www.bistairs.eu.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 16 June 2014; accepted: 05 September 2014; published online: 06 October 2014.
Citation: Schulte B, O'Donnell AJ, Kastner S, Schmidt CS, Schäfer I and Reimer J (2014) Alcohol screening and brief intervention in workplace settings and social services: a comparison of literature. Front. Psychiatry ***5****:131. doi: 10.3389/fpsyt.2014.00131*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in PSYCHIATRY

MINI REVIEW ARTICLE
published: 02 September 2014
doi: 10.3389/fpsyt.2014.00121

Screening and brief intervention for unhealthy drug use: little or no efficacy

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Unhealthy drug use ranges from use that risks health harms through severe drug use disorders. This narrative review addresses whether screening and brief intervention (SBI), efficacious for risky alcohol use, has efficacy for reducing other drug use and consequences. Brief intervention among those seeking help shows some promise. Screening tools have been validated though most are neither brief nor simple enough for use in general health settings. Several randomized trials have tested the efficacy of brief intervention for unhealthy drug use identified by screening in general health settings (i.e., in people not seeking help for their drug use). Substantial evidence now suggests that efficacy is limited or non-existent. Reasons likely include a range of actual and perceived severity (or lack of severity), concomitant unhealthy alcohol use and comorbid mental health conditions, and the wide range of types of unhealthy drug use (e.g., from marijuana, to prescription drugs, to heroin). Although brief intervention may have some efficacy for unhealthy drug users seeking help, the model of SBI that has effects in primary care settings on risky alcohol use may not be efficacious for other drug use.

Keywords: screening and brief intervention, unhealthy drug use, illicit drug, efficacy, randomized trials, counseling, identification, primary care

INTRODUCTION

Screening and brief intervention (SBI) for unhealthy alcohol use in primary care is among the most effective and cost-effective of preventive services (1). Unhealthy alcohol use is the target and is defined as the spectrum from use that increases the risk for health consequences through a diagnosable alcohol use disorder (2). No randomized trials have compared SBI to no SBI for alcohol. Numerous studies in primary care find efficacy for BI vs. no BI among patients identified by screening for modest reductions in self-reported alcohol consumption (3). Although efficacy has yet to be demonstrated for moderate to severe alcohol use disorders (also known as dependence) (4–6), the conceptual model includes referral to specialty treatment as one of the goals of brief intervention for those with more severe conditions.

Brief counseling has also been applied to other health behaviors, such as medication adherence, nutrition, tobacco use, and physical activity with some success (7). Since the principles may be the same regardless of the health behavior there has been optimism that SBI will have efficacy for other drugs. Unhealthy drug use is defined as use of illicit drugs or potentially addictive medications more than prescribed or without a prescription. The US government has spent approximately half a billion dollars in the past decade on clinical programs to screen and provide brief intervention for alcohol and other drugs (8). Given the impact of drug use on health and the need to address drug use in general health settings, knowing whether SBI has efficacy for preventing or reducing drug use and consequences takes on great importance.

Observational studies have suggested possible effectiveness of drug SBI. For example, Madras et al. (9) conducted a before/after study and 6 months after screening found a 68% decrease in self-reported drug use and improvements in overall health, employment, criminal justice involvement, and housing status. The effect size is much larger than any ever seen in a randomized trial of a similar intervention and is not plausibly attributable to SBI. A well-done observational study with matched controls found that exposure to SBI in the emergency department was associated with subsequent linkage to specialty addiction treatment (10). However, one must interpret these studies with great caution and not take them as evidence for efficacy because there are many explanations for decreased use besides SBI, such as regression to the mean, assessment reactivity, secular trends and natural history, self-change, and others.

EFFICACY OF BRIEF INTERVENTION FOR DRUG USE

Randomized trials of brief intervention in people seeking help can suggest possible efficacy, but they should not be taken as evidence for SBI in unselected patients identified by screening. In a meta-analysis that included interventions some consider longer than brief (e.g., 1–2 h, often multi-session), drug BI had an effect size of 0.29 in studies of motivational interviewing (11). In studies of treatment-seeking people, motivational interventions have often had efficacy (12–19), though at least one high-quality study found no efficacy (20). Several studies have found benefit in a focused area – reducing prescriptions for benzodiazepines (21–23). BI studies in special populations have had mixed results (24).

A computerized intervention and voucher decreased use of drugs, except marijuana, in postpartum women (25). A single feedback session decreased drug (though not alcohol or marijuana) use in homeless adolescents (26). Another study at youth agencies found no effect on ecstasy or cocaine use (27). But other studies have found some effects in youth in mandated treatment and high schools (28–30).

EFFICACY OF SBI FOR DRUG USE IN GENERAL HEALTH SETTINGS

Most people who use drugs and/or have drug use disorders neither seek nor receive treatment (31). As a result, interventions with the greatest potential to affect health in this area must have efficacy in general health settings, especially in primary and preventive care settings. Patients who receive these interventions should include those identified by screening, not only those who seek help for these conditions specifically. The US Preventive Services Task Force, a leading agency that rates and recommends preventive services based on the best evidence in the literature, reflects this view (32).

Few studies have tested the efficacy of SBI in general health settings compared with no-intervention control groups, and results are largely disappointing (see **Table 1**). Key issues are that to draw valid conclusions, adequate follow-up rates are needed, biological testing should confirm self-reports, and outcomes beyond use are of importance. These issues are also relevant to alcohol SBI and although numerous studies with self-report outcome in primary care for unhealthy alcohol use have confirmed efficacy, few have found effects on biological or clinical outcomes, raising questions about whether the evidence base for alcohol SBI is sufficient to suggest that efficacy for alcohol or other substances. One study of drug SBI compared computer to live human brief intervention for drugs in primary care and included biological outcomes. Results were similar in both groups, with some outcomes favoring the computer group, but drug use did not change much in either group [three points decrease in global alcohol, smoking, and substance involvement screening test (ASSIST) score], and with no control group, efficacy could not be determined (33).

Bernstein et al. (39) reported results of a randomized trial among adults with cocaine or heroin use identified by screening, in women's health, homeless, and urgent care clinics. Most (82%) had follow-up though one in five were excluded because they had no evidence of drug use by hair testing at study entry. Opioid abstinence was 9% greater and cocaine abstinence 5% greater in the brief intervention groups though there was no increase in receipt of addiction treatment.

In a small randomized trial ($n = 59$) among adolescents in primary care in Brazil, BI reduced marijuana and ecstasy related problems (42). In project CHAT ($n = 42$), teenagers with drug use consequences who had brief intervention reported less marijuana use than controls (43). In three randomized controlled trials among adolescents in the emergency department, BI decreased recidivism related to drug consequences, increased abstinence, or increased entry into treatment (44–46). One randomized trial in adults using psychoactive prescription drugs in a general hospital found two counseling sessions were associated with decreased

Table 1 | Randomized trial evidence regarding drug screening and brief intervention in adult general health settings[a] that include at least some primary care patients.

Citation	Intervention	Result (between group differences at follow-up)	Comment
Gelberg et al. (34)	Very brief advice, video doctor, and two booster sessions	Less frequent (4 days) drug use at 3 months; effect larger among more severe	78% Follow-up; attention control; no biological testing; excluded those with likely moderate to severe disorder
Roy-Byrne et al. (35, 48)	Single BI with 1 week phone booster done by social workers	3, 6, 9, and 12 months outcomes. No significant differences in days drug use or drug use severity	Biological testing; 87% follow-up
Saitz et al. (36, 37)	Single 10–15 min health promotion advocate/health educator BI 45-min psychologist BI with one booster	6-month outcomes. No differences in days drug use or drug use severity, health-related quality of life, emergency department or hospital utilization or HIV risk behaviors	Biological testing; 98% follow-up
Humeniuk et al. (38)	Single BI largely done by clinic staff (some by researchers in Brazil)	Seven points or smaller difference in drug use risk scale with 338 points theoretical maximum at most sites except US where control group had greater decrease in the score	86% Follow-up; no biological testing; excluded those likely to have moderate to severe disorder[b]
Bernstein et al. (39)	Single BI done by health promotion advocate	5% Absolute risk increase in cocaine abstinence; 9% risk increase in opioid abstinence	Biological testing; 82% follow-up[b]

[a] *Two additional studies have been done exclusively in emergency department settings. One had 58% loss to follow-up and found no benefit of SBI (40). The other, a multi-site trial, has not yet had results published (41).*

[b] *Some participants in primary care (see text for details).*

drug use though whether the use was misuse or appropriate use for pain was not clear (47).

Perhaps the most relevant study to the question at hand is the World Health Organization randomized trial in five countries in 731 adults reporting risky drug use (excluding those with more severe use). Patients were recruited from sexually transmitted disease clinics, dental and walk-in clinics, and community medical care sites. Very small differences were found favoring the BI group on a global scale of drug use risk of uncertain clinical importance and results at the US site were negative (point estimates favored the control group) (38). More specifically, both groups began at a global ASSIST score of 36; the BI group reduced to 30 while the control group reduced to 32, a 2-point difference in a scale with a maximum score of 338. In the US, the global score decreased by nine points in the control group and five points in the BI group ($p = 0.11$, $n = 218$). In India, decreases were 4 vs. 8 points, respectively ($p = < 0.005$, $n = 177$); Brazil 2 vs. 7 ($p < 0.005$, $n = 165$); and in Australia 0 vs. 8 ($p < 0.001$, $n = 170$).

Several recent studies provide information on the efficacy of SBI for drugs. Saitz et al. tested the efficacy of SBI for drugs randomizing 528 primary care patients identified by screening to one of two brief motivational interventions delivered by trained health educators or psychologists, the latter of which included a booster session (36, 37). At 6 months with 98% follow-up, there were no significant differences in drug use outcomes overall or in analyses stratified by drug type or drug use severity. This study used hair testing to corroborate self-report. Gelberg et al. have preliminarily reported a randomized trial of drug SBI in primary care, with 78% 3-month follow-up (34) (registered at www.clinicaltrials.gov NCT01942876). Patients with more severe risky use were excluded. The intervention was <5 min of brief advice, then a video doctor, and two follow-up counseling sessions. Results were a greater reduction in drug use days (by four) in the intervention vs. the control group, particularly among those who used drugs more frequently. Validity concerns include the absence of laboratory testing to corroborate outcomes, which leaves social desirability bias as a likely explanation for the results (given the largely negative findings in trials with biological outcomes and large changes in drug use in observational studies). In addition, the intervention was not particularly brief as it included several repeat contacts (and those with two or more such contacts had better outcomes).

Another large study in primary care also in the US has been published (35, 48), and outcomes were verified by laboratory testing. Roy-Byrne et al. (48) randomized 868 adults identified by screening to a single brief motivational intervention and a 10-min booster at 2 weeks by phone. At follow-up (≥87% at 3, 6, and 12 months), there were no significant differences in frequency of use or in drug use severity.

Although not in primary care, a large randomized trial of SBI in emergency department patients found no differences in drug use outcomes, though 58% of participants were lost to follow-up, substantially limiting the ability to draw firm conclusions from the results (40). A large multi-site study of SBI in emergency departments in the US with a minimal screening control group and a no-intervention control group is also underway (41). Both of these emergency department studies used biological testing to corroborate self-report outcomes.

CONCLUSION AND IMPLICATIONS

There is little evidence that SBI for drugs other than alcohol and tobacco will have efficacy in adult primary care settings. Three trials have been done exclusively in primary care. One with 98% follow-up of a large sample and biologically corroborated outcomes is entirely negative. Another with 87% follow-up and biologically corroborated outcomes also found no effects. Another trial, smaller and with short-term and substantially lower follow-up, has positive findings but no biological outcome confirmation. A large multi-site emergency department study is as yet unpublished. A single site study was negative and substantially limited methodologically. A study in mixed settings including urgent care did find small reductions in heroin and cocaine use corroborated by biological outcomes. A hospital study of prescription drug use was difficult to interpret. The WHO multi-site study found results of questionable clinical importance that were inconsistent across country (and negative in the US). In general, these results do not support the hypothesis that SBI has efficacy for drug use.

This narrative review may have some limitations. It is a narrative review based on searching Google scholar for randomized trials of drug SBI, attendance at national and international meetings where such research is likely to be presented, review of studies funded by the National Institute on Drug Abuse (nihreporter.gov) and search of the clinical trials.gov registry, and by review of a current systematic review that has full methodology published (49). While not a full systematic review, it is very unlikely that an important clinical trial of drug use SBI has been missed though that is a possibility.

If health behaviors are similar, why might SBI not have efficacy for drug use? Drug use may well be different from other health behaviors and from risky alcohol use specifically. First of all, drug use is often illegal and socially proscribed. As a result, when it is addressed in a health setting, the patient is using drugs despite this social sanction, whereas for a number of other health behaviors that respond to brief interventions, the patient's behavior may be normative; when they realize their personal risks they decide to make changes. Most people who use drugs are aware of some risks. Drug use may be more severe than some other health behaviors. Drug use could range from occasional marijuana use (perceived by patients as safe) to prescription opioid misuse (a very complex problem that often involves chronic difficult to treat pain), to injection heroin or cocaine use. It seems unlikely that single brief counseling sessions could adequately address this range, even if the goal is to link patients to further and more specialized treatment.

Future research should always include biological outcomes. New approaches might address multiple risk behaviors and involve prioritizing them for intervention. Such approaches might then focus on subgroups of patients, such as those with prescription drug misuse or marijuana use. New approaches will also very likely need to test multi-contact longitudinal interventions of the type known to be more efficacious for alcohol.

For clinicians, the absence of efficacy of drug SBI does *not* mean that identifying and addressing drug use in patients is not important. It simply means that doing so by screening using validated tools to detect unhealthy use may not immediately lead to reduced drug use and problems after a brief intervention. Patients with symptoms need to be asked about drug use just as they would

be asked about medication use, use of complementary therapies (e.g., herbal treatments), and dietary habits. Such information is critical both to appropriate diagnosis of medical and psychiatric conditions and to safe prescribing, particularly of psychoactive and addictive medications.

The evidence for efficacy of drug SBI is lacking. Editorialists, leaders at the US National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism, the largest supporters of substance use research in the world, say it is time to "go back to the drawing board" regarding screening and BI for drugs in primary care (50). Clinicians need to address drug use but cannot rely on SBI, a seemingly simple solution, to solve what is, in fact, a complex problem. Researchers need to find more effective means in general health settings to address what is a common preventable cause of death in the world.

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Conflict of Interest Statement: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 08 July 2014; accepted: 18 August 2014; published online: 02 September 2014.
*Citation: Saitz R (2014) Screening and brief intervention for unhealthy drug use: little or no efficacy. Front. Psychiatry **5**:121. doi: 10.3389/fpsyt.2014.00121*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in PSYCHIATRY

REVIEW ARTICLE
published: 01 September 2014
doi: 10.3389/fpsyt.2014.00114

What are the implications for policy makers? A systematic review of the cost-effectiveness of screening and brief interventions for alcohol misuse in primary care

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Introduction: The efficacy of screening and brief interventions (SBIs) for excessive alcohol use in primary care is well established; however, evidence on their cost-effectiveness is limited. A small number of previous reviews have concluded that SBI programs are likely to be cost-effective but these results are equivocal and important questions around the cost-effectiveness implications of key policy decisions such as staffing choices for delivery of SBIs and the intervention duration remain unanswered.

Methods: Studies reporting both the costs and a measure of health outcomes of programs combining SBIs in primary care were identified by searching MEDLINE, EMBASE, Econlit, the Cochrane Library Database (including NHS EED), CINAHL, PsycINFO, Assia and the Social Science Citation Index, and Science Citation Index via Web of Knowledge. Included studies have been stratified both by delivery staff and intervention duration and assessed for quality using the Drummond checklist for economic evaluations.

Results: The search yielded a total of 23 papers reporting the results of 22 distinct studies. There was significant heterogeneity in methods and outcome measures between studies; however, almost all studies reported SBI programs to be cost-effective. There was no clear evidence that either the duration of the intervention or the delivery staff used had a substantial impact on this result.

Conclusion: This review provides strong evidence that SBI programs in primary care are a cost-effective option for tackling alcohol misuse.

Keywords: alcohol drinking, screening and brief intervention, primary care, systematic review, policy making, resource allocation, brief alcohol intervention, brief intervention

INTRODUCTION

The misuse of alcohol is a substantial concern for public health policy makers across the world, with over 5% of the global burden of disease and injury estimated as being alcohol-attributable (1). In addition to these deleterious effects on health and the associated economic costs, excessive consumption of alcohol is also associated with a range of social harms such as increased crime, public nuisance, and reduced workplace productivity, which impact not just on the drinker, but on society as a whole (2).

Primary care provides an avenue through which a large proportion of the population can be reached by interventions aimed at reducing alcohol misuse and the related consequences. In particular, excessive drinkers attend primary care with greater frequency than moderate drinkers (3) and may therefore be more easily targeted through this channel. Programs of Screening and Brief Interventions (SBIs), in which patients are screened opportunistically for alcohol misuse and those screening positively are offered a brief session of advice can harness these properties to achieve broad coverage of the population at risk (4).

There is a substantial body of existing research into the effectiveness of SBI programs in primary care, with a recent review of reviews identifying 24 previous systematic reviews (5). The consistent finding of these studies is that SBIs are effective at reducing excessive alcohol consumption and this weight of evidence has led to the inclusion of SBIs in a range of international policy recommendations including the World Health Organisation's global strategy for tackling harmful alcohol use (6). However, in spite of these calls for the implementation of such policies, evidence on the cost-effectiveness of SBI programs is less equivocal. This is a key question for the policy makers and healthcare budget planners being urged to instigate or fund these programs and there have been few attempts to draw together the existing literature in order to inform their decisions.

There have been three major previous reviews of the cost-effectiveness evidence on SBIs in primary care (7–9). While all three conclude that they are cost-effective, none examine the impact that implementation decisions such as the staff used to deliver the SBI, or the duration of the intervention itself, have on overall program cost-effectiveness. These issues are critical as the use of general practitioners (GPs) to deliver SBIs is usually a substantially more expensive option than nursing staff and a lack of available time is the single greatest perceived barrier

to early intervention in alcohol problems in primary care (10). In addition, these existing reviews either predate several important studies or have a narrow scope which misses a number of key papers. This study updates and expands the 2008 review by Latimer et al. (8) in order to provide a systematic overview of the existing cost-effectiveness evidence for SBIs in primary care, together with an examination of the differential impact of alternative implementation options.

INTERVENTION	And	PROBLEM
Interven* (Early or Minimal or Brief) adj5 intervention* Counsel?ing Motivation* interview* Brief Advice		Alcohol (Hazard* or harmful or excess* or problem*) drink*

FIGURE 1 | Search strategy utilized in the review.

METHODS

The original search was undertaken in May 2008 (8) and refreshed on four subsequent occasions, with the latest update undertaken in April 2014. Searches were conducted on the following electronic databases:

Medline in Process and Other Non-Indexed Citations and Medline 1950-present via OVID SP
EMBASE via OVID SP
Science Citation Index via Web of Knowledge
Social Science Citation Index via Web of Knowledge
Cochrane Library Databases via Wiley
Assia via CSA
PsycINFO via OVID SP
Econlit via OVID SP

The original search undertaken in 2008 adopted an iterative emergent approach. Rather than developing an *a priori* search strategy, smaller individual searches were undertaken in order to develop understanding of the research area. The information specialist (Louise Preston) and lead reviewer (Nicholas Latimer) worked together to develop further iterations of the search strategy based on the findings of earlier searches. As a result, for this update, the use of a predetermined search strategy was possible as search terms had been tested and validated as part of the original searches. The search strategy is presented in **Figure 1**.

The title and abstracts of all retrieved studies were screened by one reviewer (Colin Angus) against a set of pre-defined inclusion and exclusion criteria. These criteria, listed in Supplementary Material, were piloted with a second reviewer (Jessica Li) on an initial subsample of 10 studies and subsequently refined, following discussions between both reviewers, to ensure clarity in their interpretation. Any study reporting the costs and health or other economic benefits of SBI programs in primary care were considered for inclusion. Studies were excluded which were not published in English, which examined multi-behavior interventions (e.g., combined drink and drugs education programs), which included components occurring outside of primary care, or which evaluated interventions comprising more than four patient contacts (on the grounds that these no longer constitute "brief" interventions). Studies examining SBI implementation strategies only (e.g., GP education programs to increase delivery rates of SBIs to patients) were excluded unless they presented a separate economic evaluation of the SBI delivery itself. Similarly, studies that examined only screening tools (e.g., AUDIT or CAGE) were excluded unless they also included a BI component.

Data from all included studies were extracted by one reviewer (Colin Angus) using a standard template (see Supplementary Material) adapted from that used by Latimer et al. (8). Studies were assessed for methodological quality using the Drummond checklist for economic evaluations (11) as recommended for use in Cochrane reviews (12). Five of the included studies were randomly selected and additionally assessed for quality by a second reviewer (Jessica Li) to ensure consistency (agreement was 100% between both reviewers).

RESULTS

Twenty-three papers reporting the results of 22 distinct studies that met the criteria for inclusion in the review were identified. These fall into two major categories: economic evaluations alongside clinical trials (EEACTs) (13–21) and stand-alone modeling evaluations (4, 7, 22–33). **Table 1** summarizes these studies, while excluded studies are reported in Supplementary Material. A glossary of relevant health economic terms is included in Supplementary Material.

These 23 studies examine the cost-effectiveness of SBIs in almost exclusively high-income countries (Chisholm et al. being the only exception (30)), with the majority of studies covering the USA (8 studies), UK (5 studies), or Australia (3 studies). There was considerable variation in the quality of the studies, with 7 rated as being of low quality, 10 of moderate quality, and 5 of high quality, although there are signs of an improving trend over time with more recent papers scoring more highly. The main issues encountered were an inadequate description of the intervention itself, poor reporting of the sources of cost data used in the studies, and insufficient sensitivity analysis.

Of the nine studies reporting evaluations alongside clinical trials, two compared different levels of brief intervention (13, 14), both concluding that a longer "stepped care" intervention was the most cost-effective option. Another six studies compared brief interventions with usual care (15, 17–21). The trials that these studies are associated with ran for between 6 and 48 months, while the full effect of changes in drinking behavior on health outcomes can take many years to develop (34). It is therefore perhaps unsurprising that these studies found few statistically significant results and do not allow any firm conclusions to be drawn around the cost-effectiveness of SBI programs.

All except one of the 14 modeling studies compared SBI provision to an alternative do-nothing scenario in which no SBIs are delivered. The other study (24) examined the cost-effectiveness of increasing the current uptake rate. Among these studies, the most common health outcome measures were QALYs (4, 23, 25, 26, 28, 31, 33), with two studies using DALYs (22, 30) and two using life years gained (7, 32). Almost all these studies found SBIs to be either cost-saving and health improving (i.e., they dominate a do-nothing scenario) or to have very low costs relative to health

Table 1 | Characteristics of included studies.

Study	Country	Study type	Comparators	Costs included	Health outcomes included	Results	Quality	Duration of intervention	BI delivery staff
Angus et al. (28)	Italy	CUA	(1) Do-nothing scenario (2) Screening with AUDIT-C followed by 10 min brief intervention	Intervention costs and health and social care resource use over 30 years following start of program	QALYs gained over 30 years follow-up	SBI delivered at next GP registration has an ICER of €550 per QALY vs. do-nothing. SBI at next GP consultation has an ICER of €590 per QALY vs. do-nothing.	++	10 min	GP
Angus et al. (33)	Netherlands and Poland	CUA	(1) Do-nothing scenario (2) Screening with AUDIT-C followed by 10 min brief intervention	Intervention costs and health and social care resource use over 30 years following start of program	QALYs gained over 30 years follow-up	Netherlands: SBI delivered at next GP registration has an ICER of €6340 per QALY vs. do-nothing. SBI at next GP consultation has an ICER of €5748 per QALY vs. do-nothing. Poland: SBI delivered at next GP registration has an ICER of zł3696 per QALY vs. do-nothing. SBI at next GP consultation has an ICER of zł3269 per QALY vs. do-nothing.	++	10 min	GP
Babor et al. (15)	USA	EEACT/ CEA	Screening with AUDIT followed by either: (1) Treatment as usual (2) 3–5 min brief intervention	Intervention costs	SF-12 score and mean alcohol consumption at 12 months follow-up	Small but significant reduction in consumption for BI group vs. treatment as usual. No significant difference in SF-12 scores. No significant differences in either outcome between GP- and nurse-delivered intervention groups	–	3–5 min	GP or nurse
Chisholm et al. (30)	International	CUA	(1) Do-nothing scenario (2) Screening followed by brief intervention involving four primary care visits inside a year	Intervention costs	DALYs averted over a lifetime horizon	SBI varies from dominated by to dominating a do-nothing scenario depending on WHO region with 9/12 regions having an ICER of ≤5000I$ per QALY	+	Not stated	GP
Cobiac et al. (22)	Australia	CUA	(1) Do-nothing scenario (2) Screening followed by counseling, supportive written materials and follow-up consultations with further advice "if necessary"	Intervention costs, patient time/travel and health and social care resource use over lifetime horizon	DALYs averted over a lifetime horizon	ICER of $6800 per DALY averted vs. do-nothing	–	Not stated	GP

(Continued)

Table 1 | Continued

Study	Country	Study type	Comparators	Costs included	Health outcomes included	Results	Quality	Duration of intervention	BI delivery staff
Dillie et al. (16)	USA	EEACT/ Cost mini-mization analysis	Screening with self-reported alcohol consumption followed by either: (1) 2 × 15 min brief interventions each followed up with a 5 min telephone call (2) Additional screened with % CDT followed by 2 × 15 min brief interventions each followed up with a 5 min telephone call	Intervention costs, patient time/travel, health and social care resource use, motor vehicle crashes and legal/criminal costs over 4 years follow-up	N/A	Addition of % CDT screening saves $212 per patient screened	+	40 min	GP (nurse delivers follow-up phone calls)
Drummond et al. (14)	UK (Wales)	EEACT/ CUA	Screening with AUDIT followed by either: (1) 5-min nurse-led "minimal intervention" (2) "Stepped care" – 20 min behavioral change counseling session followed up with referral to motivational enhancement therapy and/or specialist alcohol services if indicated	Intervention costs, health and social care resource use costs and costs of crime at 6 months follow-up	QALYs gained at 6 months follow up	Stepped care 98% likely to be most cost-effective option at a threshold of £20,000–30,000 per QALY. No ICER presented	–	5 min (minimal intervention) or 20+ min (stepped care)	Practice nurse
Fleming et al. (17, 18)	USA	EEACT/ CBA	Screening with 7-day timeline follow back followed by either: (1) Patient information leaflet (2) 2 × 15 min brief interventions each followed up with a 5 min telephone call	Intervention costs, patient time/travel, health and social care resource use, motor vehicle crashes and legal/criminal costs over lifetime horizon	Mean alcohol consumption at various points up to 4 years follow-up	Significant reduction in consumption observed in SBI group (32% in men, 43% in women). SBI estimated to save $546 per patient from healthcare perspective and $7780 from a societal perspective vs. patient information leaflet	+	40 min	GP (nurse delivers follow-up phone calls)
Freeborn et al. (19)	USA	EEACT/ Resource utiliza-tion analysis	Screening with AUDIT followed by either: (1) Treatment as usual (2) Brief advice from GP then 15 min motivational session with trained counselor	Health and social care resource use over 2 years follow-up	N/A	No significant difference in health and social care resource use between BI and care as usual groups	–	15+ min	GP and trained counselor

(Continued)

Table 1 | Continued

Study	Country	Study type	Comparators	Costs included	Health outcomes included	Results	Quality	Duration of intervention	BI delivery staff
Freemantle et al. (29)	International	CEA	(1) Do-nothing scenario (2) Screening with AUDIT followed by 15 min brief intervention	Intervention costs	Mean alcohol consumption at 24 months follow-up	SBI costs £8–20 per patient, which equates to £18–47 per patient who reduces their drinking, with a mean reduction of 24% among those who cut down	–	15 min	GP
Kapoor et al. (23)	USA	CUA	(1) Do-nothing scenario (2) Screening with AUDIT followed by full clinical assessment of unhealthy alcohol use and 5–10 min brief intervention (3) Screening with AUDIT and % CDT followed by full clinical assessment of unhealthy alcohol use and 5–10 min brief intervention	Intervention costs, health and social care resource use over lifetime horizon	QALYs gained over lifetime horizon	Both screening strategies dominate vs. do-nothing. Incremental cost of adding % CDT to screening is $15,500 per QALY	+	5–10 min	Not stated
Lock et al. (20)	UK (England)	EEACT/ Cost mini-mization analysis	Screening with AUDIT followed by either: (1) Treatment as usual (2) 5–10 min nurse-led brief intervention	Intervention costs, health and social care resource use and personal costs at 12 months follow-up	SF-12 score at 12 months follow-up	No statistically significant difference in costs or health outcomes between arms	+	5–10 min	Nurse
Ludbrook et al. (7)	UK (Scotland)	CEA	(1) Do-nothing scenario (2) Screening using 7-day timeline follow back followed by 2 × 15 min brief interventions each followed up with a 5 min telephone call	Intervention costs, patient time/travel, health and social care resource use, motor vehicle crashes and legal/criminal costs over lifetime horizon	Life years gained over lifetime horizon	SBI dominates vs. do-nothing	–	40 min	GP (nurse delivers follow-up phone calls)
Mundt et al. (21)	USA	EEACT/ CBA	Screening with health screening survey and assessment interview followed by either: (1) Treatment as usual (2) 2 × 15 min bried interventions each followed up with a 5 min telephone call	Intervention costs, patient time/travel and health and social care resource use over 2 years follow-up	Life years lost (valued at $50,000 each) over 2 years follow-up	Non-significant cost savings of $467 from healthcare perspective and $812 from societal perspective for BI vs. treatment as usual	+	40 min	GP (nurse delivers follow-up phone calls)

(Continued)

Table 1 | Continued

Study	Country	Study type	Comparators	Costs included	Health outcomes included	Results	Quality	Duration of intervention	BI delivery staff
Navarro et al. (24)	Australia	CEA	(1) Current level of SBI provision (2) Increased levels of screening and brief intervention or combined SBI provision	Intervention costs (including training)	Number of risky drinkers who reduce their alcohol consumption	Additional cost of between $174–1041 per risky drinker who reduces their drinking, depending on the scenario	+	Not stated	GP
Purshouse et al. (4)	UK (England)	CUA	(1) Do-nothing scenario (2) Screening with AUDIT followed by 5 min brief intervention	Intervention costs and health and social care resource use over 30 years following start of program	QALYs gained over 30 years follow-up	SBI delivered at next GP registration dominates do-nothing scenario. SBI at next GP consultation has an ICER of £1175 per QALY vs. do-nothing	++	5 min	Practice nurse/GP (both modeled)
Rehm et al. (27)	Canada	CBA	(1) Do-nothing scenario (2) Screening followed by brief intervention	Health and social care resource use costs, costs of crime and productivity losses due to death and disability per annum. Unclear if intervention costs are included	Deaths, years of life lost and acute hospital days averted per annum	Introduction of BI would avoid 360 deaths, 9000 years of life lost, 56,000 acute care hospital days and would reduce alcohol-attributable costs by $602m per annum vs. do-nothing	+	Not stated	Not stated
Saitz et al. (31)	USA	CUA	(1) Do-nothing scenario (2) Screening followed by brief intervention	Intervention costs and health and social care resource use over lifetime horizon	QALYs gained over a lifetime horizon	SBI dominates vs. do-nothing	–	Not stated	Not stated
Solberg et al. (25)	USA	CUA	(1) Do-nothing scenario (2) Annual screening followed by 5 min BI	Intervention costs, patient time/travel and health and social care resource use over lifetime horizon	QALYs gained over lifetime horizon	ICER of $1750 per QALY vs. do-nothing with healthcare perspective. SBI dominates with societal perspective	+	5 min	GP
Tariq et al. (26)	Netherlands	CUA	(1) Do-nothing scenario (2) Screening with AUDIT followed by 10–15 min brief intervention	Intervention costs and health and social care resource use costs over a lifetime horizon	QALYs gained over lifetime horizon	ICER of €5400 per QALY gained for brief interventions vs. do-nothing	++	30–45 min	GP

(Continued)

Table 1 | Continued

Study	Country	Study type	Comparators	Costs included	Health outcomes included	Results	Quality	Duration of intervention	BI delivery staff
Watson et al. (13)	UK (England and Scotland)	EEACT/ CUA	Screening with AUDIT followed by either: (1) 5-min nurse-led "minimal intervention" (2) "Stepped care" – 20 min behavioral change counseling session followed up with referral to motivational enhancement therapy and/or specialist alcohol services if indicated	Intervention costs and health and social care resource use at 6 and 12 months follow-up	QALYs gained at 6 and 12 months follow-up	ICER of £1100 per QALY for stepped gain over minimal intervention at 6 months, stepped care dominates at 12 months	++	5 min (minimal intervention) or 20+ min (stepped care)	Practice nurse
Wutzke et al. (32)	Australia	CEA	(1) Do-nothing scenario (2) Screening with AUDIT followed by 5 min brief intervention	Intervention costs (including training and support for GPs)	Life years gained (time horizon not stated)	ICER of between $586–650 per life year gained for SBI vs. do-nothing	+	5 min	GP

CBA, cost–benefit analysis; CDT, carbohydrate deficient transferrin; CEA, cost-effectiveness analysis; CUA, cost-utility analysis; DALY, disability-adjusted life year; EEACT, economic evaluation alongside a controlled trial; GP, general practitioner; ICER, incremental cost–effectiveness ratio; N/A, not applicable; QALY, quality-adjusted life year; SBI, screening and brief interventions. For detailed definitions of terms see Supplementary Material.

gains, making SBI programs highly likely to be considered cost-effective under the relevant national guidelines. The sole exception was Chisholm et al. (30), who presented separate costs and benefits for each of 12 World Health Organization (WHO) sub-regions and found that SBI programs are dominated by current taxation in parts of Africa (region AfrE), although they estimated that they are either cost-effective or cost-saving in the remaining 11 sub-regions using the WHO's estimated cost-effectiveness thresholds (35). Of the remaining modeling studies, one (27) uses a burden of disease approach to estimate SBIs would be substantially cost-saving (Canadian $602m per annum). The remaining studies (24, 29) use intermediate end points (number of risky drinkers averted and change in mean alcohol consumption), which make the results unhelpful for the purpose of informing resource allocation decisions without additional modeling to estimate the impact of these end points on health outcomes. The majority of these modeling studies consider outcomes over a 30 year (4, 28, 33) or lifetime (7, 22, 23, 25, 26, 30, 31) time horizon, ensuring that the long-term impacts are reflected in the results.

Fifteen studies examine the cost-effectiveness of GP-delivered interventions (4, 7, 15, 16, 18, 21, 22, 24–26, 28–30, 32, 33), while only five examine nurse-delivered interventions (4, 13–15, 20). Owing to the substantial heterogeneity between studies both in terms of methods and outcomes it is difficult to draw any clear conclusions about the relative cost-effectiveness of using different staff to deliver SBI programs, although the lack of a clear difference between the two options may be of interest to policy makers. Only two studies directly compare both options: Purshouse et al. (4) assume *a priori* that delivery staff do not impact on the effectiveness of the BI but find that even the use of the more expensive GP-delivered BI option is unlikely to prevent the program from being cost-effective. Meanwhile, Babor et al. (15) conducted a trial with separate nurse-delivered and GP-delivered SBI arms. The authors found no significant difference in effectiveness of the intervention between these arms, while the nurse-delivered option was around 1/3 cheaper, indicating it to be a more cost-effective option.

With regards to the total duration of the intervention (i.e., the total contact time between patient and delivery staff, either face-to-face or over the telephone, aggregated over multiple contacts where appropriate), 12 studies evaluate interventions of 10 min or less (4, 13–15, 20, 23, 25, 28, 32, 33) and 11 consider interventions of over 10 min (with a maximum duration of 45 min) (4, 7, 13, 14, 16, 18, 21, 26, 28, 29). Again the heterogeneity of methods and outcomes makes direct comparison difficult, although there is no clear difference in terms of cost-effectiveness between shorter and longer interventions. Only five studies consider both longer and shorter interventions. Two of these (13, 14) report that the longer intervention is cost-effective relative to the shorter one, although this conclusion is difficult to make on the basis of the analysis presented in the studies, particularly given the short follow-up of the trials. The other three studies (4, 28, 33) assume no difference in effectiveness but find that longer, more expensive interventions are still highly likely to be considered cost-effective compared to no intervention.

In order to further explore the relationship between delivery staff, BI duration, and cost-effectiveness, **Figure 2** presents a direct

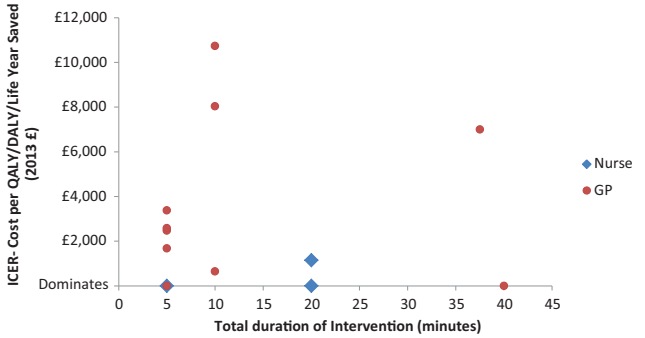

FIGURE 2 | Cost-effectiveness of SBI programs by SBI duration and delivery staff.

comparison of the cost-effectiveness results converted to 2013 UK £, for those studies which report delivery staff, intervention duration, and an Incremental Cost–Effectiveness Ratio (ICER) (4, 13, 25, 26, 28, 33, 36).

DISCUSSION

This systematic review provides strong evidence that SBIs in a primary care setting are a cost-effective policy option for tackling alcohol-related harms, at least in high-income countries. There is a paucity of evidence for lower- or middle-income countries and that does exist indicates that there may be substantial heterogeneity in both the expected costs and effectiveness of SBI programs depending on the local context in these areas (30).

There is also substantial heterogeneity in study methods, included costs, and reported health outcomes between the included studies, which makes it difficult to determine the implications of this diverse body of evidence for those making resource allocation decisions, although there is an apparent trend for more recent studies to use standardized measures such as QALYs or DALYs, which makes between-study comparison more meaningful. There are also significant differences in the national contexts between studies (for example the existing level of drinking or the current suite of alcohol policies in the country), which must be considered when making international comparisons.

Considering these differences, there is no clear evidence that the choice of delivery staff for SBI programs has a substantial impact on the program's cost-effectiveness. This may be because GP-delivered interventions are more effective but more costly than those delivered by nurses, although this would be at odds with existing literature, which suggests that the use of less costly nursing staff to conduct tasks that would otherwise be the responsibility of GPs is unlikely to impact negatively on the quality of care received by patients (37, 38). **Figure 2** also suggests that nurses may be a more cost-effective option, although heterogeneity in settings and methods between the included studies mean that the graph should be interpreted with caution.

It is also important to note that policy makers will need to consider the total budget impact of any policy options in addition to the potential cost-effectiveness, an issue highlighted in several of the included studies (28, 33, 39). This may suggest that nurse-led SBI programs, which are likely to be less costly overall, may be more appealing option, although consideration must be given to the existing primary care systems in each country. For example, in countries such as the UK or the Netherlands where practice nurses already undertake many primary care services such as vaccinations or health checks, nurse-led SBIs may be a more practical option than in other countries where care is currently delivered exclusively by the GP.

There is also no clear evidence that the duration of intervention delivered has a substantial impact on cost-effectiveness. Again this may indicate that longer interventions are more effective but more expensive, although studies on the effectiveness evidence have not found a consistent relationship between amount of patient contact and effectiveness (5, 40). While the studies by Watson and Drummond provide limited evidence that longer interventions may be more cost-effective in the short-term in the UK context, it is not clear that this translates to the longer term, or to other countries (13, 14).

In addition to the substantial heterogeneity between studies already mentioned, there are a number of limitations to this systematic review. Only studies published in the English language were included, something which may be at least partly responsible for the lack of included studies from the developing world. Some of the included studies are also of low methodological quality which makes it difficult to evaluate the robustness of their conclusions. Finally, there are two key issues, which no study of SBI effectiveness can escape. The first is that the estimates of effectiveness, which underpin the cost-effectiveness estimates examined here may be exaggerated by the impact of regression to the mean, caused by drinkers changing their consumption over time for reasons unrelated to the receipt of a brief intervention (e.g., public holidays or seasonal variation) (41). The second, countervailing issue is that of an intervention or Hawthorne effect, whereby the act of being enrolled into a trial acts as an intervention in itself, something which may at least partly explain why many SBI effectiveness studies observe a reduction in alcohol consumption over time in the control groups (42).

Limitations in the evidence base mean that this review is unable to address a number of other issues that may be of interest to policy makers such as the cost-effectiveness of SBI programs targeting specific groups within the general population. Further research to examine the differential effectiveness of, and the likely coverage by, SBI programs in these subgroups is important to allow this area to be explored further. The other key priority for further research to inform decision makers concerns the uptake among primary care providers of SBI programs. Difficulties in persuading GPs and nurses to fully deliver SBI programs could have a substantial impact on the effectiveness and cost-effectiveness of these programs. A recent international trial conducted as part of the optimizing delivery of healthcare interventions (ODHIN) project will go some way to addressing this challenge by examining the effectiveness and cost-effectiveness of different strategies at increasing SBI delivery rates in primary care (43).

In conclusion, while there are significant differences between the studies included in this review, the overwhelming conclusion is

that SBIs in primary care are a cost-effective option, at least in high-income countries. There is no clear evidence that the duration of the intervention, or the type of staff used to deliver it, changes this conclusion. Policy makers should, however, be mindful of the differing budget implications that alternative implementation options may present.

AUTHOR CONTRIBUTIONS

Louise Preston undertook the literature searches. Colin Angus conducted the review, with assistance from Jessica Li, and drafted the article. Robin Purshouse and Nicholas Latimer provided guidance and expertise. All authors read and approved the final manuscript.

ACKNOWLEDGMENTS

The research leading to these results or outcomes has received funding from the European Union's Seventh Framework Program for research, technological development and demonstration under grant agreement no. 259268 – optimizing delivery of health care intervention (ODHIN). Participant organizations in ODHIN can be seen at www.odhinproject.eu/partners.html. The views expressed here reflect only the authors' and the European Union is not liable for any use that may be made of the information contained therein.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at http://www.frontiersin.org/Journal/10.3389/fpsyt.2014.00114/abstract

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 30 June 2014; accepted: 12 August 2014; published online: 01 September 2014.
*Citation: Angus C, Latimer N, Preston L, Li J and Purshouse R (2014) What are the implications for policy makers? A systematic review of the cost-effectiveness of screening and brief interventions for alcohol misuse in primary care. Front. Psychiatry **5**:114. doi: 10.3389/fpsyt.2014.00114*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in PSYCHIATRY

REVIEW ARTICLE
published: 11 November 2014
doi: 10.3389/fpsyt.2014.00161

Brief interventions implementation on alcohol from the European health systems perspective

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Alcohol-related health problems are important public health issues and alcohol remains one of the leading risk factors of chronic health conditions. In addition, only a small proportion of those who need treatment access it, with figures ranging from 1 in 25 to 1 in 7. In this context, screening and brief interventions (SBI) have proven to be effective in reducing alcohol consumption and alcohol-related problems in primary health care (PHC) and are very cost effective, or even cost-saving, in PHC. Even if the widespread implementation of SBI has been prioritized and encouraged by the World Health Organization, in the global alcohol strategy, the evidence on long term and population-level effects is still weak. This review study will summarize the SBI programs implemented by six European countries with different socio-economic contexts. Similar components at health professional level but differences at organizational level, especially on the measures to support clinical practice, incentives, and monitoring systems developed were adopted. In Italy, cost-effectiveness analyses and Internet trials shed new light on limits and facilitators of renewed, evidence-based approaches to better deal with brief intervention in PHC. The majority of the efforts were aimed at overcoming individual barriers and promoting health professionals' involvement. The population screened has been in general too low to be able to detect any population-level effect, with a negative impact on the acceptability of the program to all stakeholders. This paper will present a different point of view based on a strategic broadening of the implemented actions to real inter-sectoriality and a wider holistic approach. Effective alcohol policies should strive for quality provision of health services and the empowerment of the individuals in a health system approach.

Keywords: alcohol, brief interventions, health system, empowerment, resilience

INTRODUCTION AND METHODS

This is a review study to discuss how screening and brief interventions (SBI) for harmful alcohol use and alcohol dependence can be better embedded in health system (HSys) and implemented effectively. To do so, first the challenges for AUD treatment and the HS responses, as recommended by World Health Organization (WHO), are presented, followed by a review of the existing SBI evidence and the cases of SBI wide implementation and finally some future directions toward the achievement of this objective are proposed. Even if there is still considerable confusion in the literature regarding the SBI evidence, SBI programs have been implemented nation-wide in some countries with some positive results and could be seen as important cornerstones to implement more broaden national policies on alcohol risk reduction. There is, however, a long road ahead. The situation regarding alcohol use is changing dramatically, with the frequent presence of binge drinking in youths, the constant of poly abuse, typically of novel psychoactive substances (1), and the regular report of co-morbid psychiatric disorders (2). The results of the existing experiences urge HSys to move beyond a focus on individual (professional's and patient's) behavior toward implementing policies having into account a wide range of social and environmental interventions, the so-called health promotion, as defined by the WHO[1].

The novelty that this review will bring to the reader mainly refers to a point of view that focuses on "what works" and also on broadening future actions with real inter-sectorial strategies encompassing health services (HS) with other sectors of the society and addressing the individual alcohol user with SBI included into a broader, holistic, risk-reduction approach. As alcohol is a complex issue, the general idea is to move from a health service-centered to a broader HSys intervention.

HEALTH SERVICES IN RESPECT TO BRIEF INTERVENTIONS FOR ALCOHOL USE DISORDERS IN EUROPE: THE CHALLENGE OF THE TREATMENT GAP

According to the WHO, HS, the most visible functions of any HSys, include all services dealing with the diagnosis and treatment of disease or the promotion, maintenance, and restoration of health. In

[1]Health promotion is the process of enabling people to increase control over, and to improve, their health. It moves beyond a focus on individual behavior toward a wide range of social and environmental interventions (WHO definition).

this sense, WHO have stressed that HS for AUD have the following objectives:

- provide prevention and treatment interventions to individuals and families at risk of, or affected by, AUDs and associated conditions;
- inform societies about the public health and social consequences of hazardous and harmful alcohol consumption (HHAC);
- support communities in their efforts to reduce HHAC;
- advocate effective societal responses.

Despite the efforts made by WHO and all the countries to improve AUD treatment, evidence still shows that the so-called treatment gap is huge. From one side harmful alcohol users are still socially stigmatized and do not seek treatment and from another access to effective alcohol treatment services is limited in many European countries. It has been estimated that only 1 in 20 of those with HHAC are actually identified and offered brief advice by a primary care service provider. Similarly, <1 in 20 with a diagnosis of alcohol dependence has actually seen a specialist for treatment (3).

Taking into account this reality and the ambitious AUD treatment objectives, it is clear that a cultural change in the way alcohol problems are seen is needed. As a consequence of that we need to mobilize and involve of a broad range of players inside and outside the health sector, sufficiently strengthened and properly funded in a way that is commensurate with the magnitude of the public health problems caused by HHAC. This means broadening the horizon to a much wider HSys approach[2] (3).

The provision of early intervention and treatment services is a key part of any comprehensive policy framework to reduce alcohol harm (4). The WHO "Global Strategy to Reduce the Harmful Use of Alcohol," 2010, lists National HSys' response as one of its key priority policy areas (5): (1) leadership, awareness, and commitment; (2) HS's response; (3) community action; (4) drink–driving policies and countermeasures; (5) availability of alcohol; (6) marketing of alcoholic beverages; (7) pricing policies; (8) reducing the negative consequences of drinking and alcohol intoxication; (9) reducing the public health impact of illicit alcohol and informally produced alcohol; and (10) monitoring and surveillance.

The portfolio of policy options and interventions recommended by the WHO for HSys's response area include

(a) increasing capacity of health and social welfare systems to deliver prevention, treatment and care for AUDs, including support and treatment for affected families, and support for mutual help or self-help activities and programs;
(b) supporting initiatives for SBI for HHAC at primary health care (PHC) and other settings including initiatives among pregnant women and women of child-bearing age;
(c) improving capacity for prevention of, identification of, and interventions for individuals and families living with fetal alcohol syndrome and a spectrum of associated disorders;
(d) development and effective coordination of integrated and/or linked prevention, treatment, and care strategies and services for AUDs, including drug-use disorders, depression, suicides, HIV/AIDS, and tuberculosis;
(e) securing universal access to health, enhancing availability, accessibility, and affordability of treatment services for groups of low socio-economic status;
(f) establishing and maintaining a system of registration and monitoring of alcohol-attributable morbidity and mortality, reported on a regular basis;
(g) provision of culturally sensitive health and social services as appropriate (5).

In respect to SBI for alcohol-related problems, HS are central to tackling harm at individual level among those with AUDs and other conditions caused by HHAC. The outcome expected by the WHO action plan to reduce HHAC 2012–2020 is a progressive reduction in the gap between the number of people who would benefit from alcohol consumption advice to reduce or prevent harm, engagement in social rehabilitation programs or treatment for AUDs and the number who actually receive such advice or treatment to be monitored (using as indicators the proportion of the adult population with HHAC, and of the population with HHAC who have received therapy and advice from a primary care provider to reduce their alcohol consumption) (3).

The health sector and the social welfare, education, and workplace sectors have real opportunities to reap both health gain and financial savings through the widespread implementation of SBI programs that have been shown to reduce ill health and premature death subsequent to HHAC and the implementation of evidence-based treatment programs for AUDs (3).

It is estimated that of the total cost to the NHS from alcohol harm each year, only around 2% is spent on identifying and treating AUDs. Implementing SBI does not require extensive training and can be delivered in a variety of settings: emergency and hospital care, PHC, schools, job centers and pharmacies, social services, accident, workplace settings, and prisons (6).

There is a strong evidence to support the benefits of widespread implementation of SBI provided by Primary Care and other health or social care professionals while, for alcohol dependent subjects, access to effective treatment services can play a vital role in both recovery from and management of AUDs (6).

According to the WHO, Governments should support SBI programs and referral to specialist services by ensuring that

- clinical guidelines for such interventions are widely available;
- primary care providers receive the training, clinical materials/tools, and advice they need to set up such programs;
- primary care providers are adequately reimbursed for the interventions.

Furthermore, primary care providers should be encouraged to undertake this intervention when they are supported by specialist services to which they can refer problem drinkers. Thus, specialist services for AUDs should be available and evidence-based non-pharmacological and pharmacological treatments should also be offered to those who have been assessed as likely to benefit.

[2]A health system is the sum total of all the organizations, institutions, and resources whose primary purpose is to improve health.

Data from a number of recent European projects show that PHC providers considered resources currently allocated for training and delivery of early intervention and treatment not sufficient. The trend has been to move away from lengthy inpatient treatment toward outpatient and community-based one (3).

The current challenge for HS in Europe is how to stick to the values of universality, access to good quality care, equity, and solidarity taking into account the growing challenges (increased costs, population aging, rise of chronic diseases, and multimorbidity leading to growing demand for healthcare, shortages, and uneven distribution of health professionals, health inequalities and inequities in access to healthcare) and bearing in mind the economic crises that are putting endanger the HS's sustainability. EC stresses that HS reforms should focus on (1) strengthen their effectiveness, (2) increase their accessibility, and (3) improve their resilience meaning capable to adapt effectively to changing environments, tackling significant challenges with limited resources.

WIDESPREAD IMPLEMENTATION OF SBI PROGRAMS: WHAT THE EVIDENCE SAYS

Screening and brief intervention is an effective and cost-effective method for treating subjects with HHAC in PHC. Evidence on the reduction of alcohol consumption is consistent, but its impact on alcohol problems is less clear (7). There are, however, a lot of issues on SBI that need further research: identifying the effective components, their utility among dependent drinkers, assessing fidelity to contents, skills needed to implement SBI, and how professionals may best acquire them. SBI effectiveness in the context of chronic diseases should be tested and demand for alcohol SBI may also be potentiated (8).

Despite its effectiveness and strong research evidence to support its implementation in real-world clinical settings, widespread implementation of SBI has occurred in very few places and it is still unclear if the programs will be sustained. In addition, little is known about the most successful strategies for widespread SBI implementation. Babor et al. (9) found that the effectiveness of different implementation models depends on complex provider and organizational characteristics. Thus, the ability of PHC centers to implement SBI was correlated with prior SBI expertise, centers stability, and number of clinicians trained and negatively correlated with lack of provider time, staff turnover, and competing priorities. Authors suggest that the best option is to combine different methods or multi-faceted strategies (10). In his revision, Williams et al. (11) analyzed under the consolidated framework for implementation research (CFIR) (12) eight implementation programs in nine different countries. He found SBI rates varied a lot and were non-comparable because of the use of different measures, scopes, and durations. He concluded that the use of strategies related to inner setting ("features of the structural, political, and cultural context through which the implementation process proceeds"), outer setting ("economic, political, and social context in which an organization resides"), and process implementation domains could be positively associated with higher screening rates and thus to successful implementation.

So far, institutionalization of SBI, which is sustained and nation-wide extensive SBI activity, has only been reported by programs in Finland, Sweden, and Scotland. Seppänen et al. (13) found an increase over the years and a high percentage of physicians (78.5%) offering BI at least occasionally. Among the factors associated with high BI was long experience in PHC and being a PHC specialist.

Studies in Sweden and Finland have shown that only a minority of the population has been asked about their drinking by PHC professionals and a minority of risky drinkers has been advised to cut down. Nilsen et al. (14, 15) found that only 14–20% of the overall sample who had visited a physician in the last year recalled having received an alcohol enquiry. Reduced alcohol consumption was reported by 12% and especially among those who were exposed to a 1–10 min (versus 1 min) conversation on alcohol. In the case of Finland, only one-third recalled being asked, and 37% had been given advice (16).

In England, Kaner (17) claims that national alcohol strategies alone do not result in a wide-scale SBI activity and for that to happen it is needed to create necessary conditions (shaping the policy and commissioning) in which brief interventions become meaningful for those working in clinical practice. Authors also suggest considering system-level factors that influence drinking behavior and policy-level interventions (minimum price per unit for the alcohol sales, restrictions on the density of outlets, etc.) that can reinforce or complement practitioner-level interventions. It was recognized that SBI activity could not occur in public HSys without the prioritization, the support of senior management, or without appropriate resources, including training and support and the definition of integrated care pathways for alcohol prevention and treatment.

Heather (18) also advised that SBI alone, especially with such low levels of people screened and of risky drinkers advice, would be unlikely to result in public health benefits and recommends proposing opportunistic screening to ensure acceptability of SBI programs and to research population-level effects of SBI, especially in combination with other alcohol control measures.

In Scotland (19), where a specific 3-year target (HEAT H4) on brief intervention (149,449 from April 2008 to March 2011 and 61,081 from April 2011 to March 2012) was established to support population-wide implementation, it was proven to be possible to reach it nationally in all priority settings and healthcare staff saw SBI as a worthwhile activity. The reach and impact of the initiative was mixed across Scotland and gaps in coverage were noted, especially in rural and remote areas in relation to age/gender groups who less frequently attended mainstream services.

According to Angus et al. (20), SBI is highly cost-effective for brief intervention at next registration as well as at next general practitioner consultation. Thus, investments in SBI programs not only improve health and save lives but also save HSys money by two levels of action:

- Offering brief interventions to 60% of the population at risk. This ambitious target would require that every patient who receives primary care services would be offered these interventions, irrespective of the reason for the consultation, and a greater investment in training and supporting primary care providers.

- Offering early brief interventions to 30% of the population at risk of HHAC. It can be achieved by putting into place appropriate systems, including provider training, so that every patient who registers with a new primary care provider, receives a health check, consults a provider about particular disease categories (such as hypertension or tuberculosis) or goes to particular types of clinics is offered these interventions. At this level of action, as alternative to standard face-to-face interventions, web-based approaches and self-help guidance could be considered. In this regard, a number of studies are underway to test the effectiveness and the acceptability of this new approach to know if the provision of facilitated access by primary care providers to an alcohol reduction website could significantly increase brief intervention rates by offering a time-saving alternative to face-to-face intervention. These studies include the randomized controlled trial carried out in the Friuli Venezia Giulia Region, Italy (21).

CASE STUDIES PRESENTATION: HSys FOR BI IN SIX EUROPEAN COUNTRIES

A literature search showed that only six countries/regions in Europe have been working on the wide implementation of SBI on alcohol, i.e., they have invested intensive and continuous efforts aimed at institutionalizing that programs and their initiatives have been endorsed by national laws, policies, or guidelines. In other countries, such as Slovenia, Czech Republic information is missing. These countries are Finland, Sweden, Scotland, England, Italy, and Catalonia and in **Table 1** below, a summary of some health resources indicators is given. Sweden is the country that invests more in health and has the highest ratio in nurses and physicians. Finland is the one with the highest ratio in terms of hospital beds. The majority has a shared implementation model, but in Italy and Catalonia regions are fully responsible. Sweden, Finland, and Catalonia have a similar PHC organizational model, whereas in Italy, Scotland, and England PHC is organized as independent contractors. According to the ODHIN assessment report (22), the integration of the management of HHAC in the PHC system (scale 0–10) is best in Sweden, followed by Catalonia/Spain, and in secondary health care it is best in Catalonia/Spain, followed by England/UK.

During the last decade all of these countries undertook major reforms of their healthcare systems in the five key identified areas: strengthening health care financing, continuum of care, quality of HSs, linkage with community, and advances in public health. This process has slowed down or even stopped in Catalonia and Italy due to the recession and the cuts in the HSys.

CASE STUDIES ANALYSIS: WHAT HAS BEEN DONE

Interest in the SBI in the six countries started early, especially in Sweden and Scotland, where the first studies began in the early 80s. All the countries, except Sweden and Scotland, took part in the WHO Collaborative Study (**Table 2**). Countries joined in different phases, England in Phase II (SBI trial), Italy and Catalonia in Phase III (best ways to achieve wide implementation), and Finland in Phase IV (country-wide SBI implementation strategies).

Phase IV began in 1999 and ended in 2006. While participating countries shared the same objective the specific design and procedures varied among participating countries in order to take account of different country specific needs, factors, and policies and PHC organizational models (23). In **Table 2** below, you can find the main characteristics of the implementation that has taken place.

The so-called treatment gap, the proportion of people who actually access treatment out of those who need it, has been reported in the majority of the countries as one of the main motivations to implement SBI. In the study from Wolstenholme et al. (24) across six European countries studied, there was a great variation in the HSys and treatment provision for alcohol use disorders, with the proportion of people in need of treatment who actually access it ranging from 1 in 25 to 1 in 7. Italy was the country with highest access to treatment (23.3%) and England (7.1%) had one of the lowest. Interestingly, in Sweden the SBI project was launched against a backdrop of increasing alcohol consumption since the country's entry in the EU in 1995 (15). In Scotland, a substantial rise in alcohol-related harm is reported too (25).

As detailed in **Table 2**, SBI programs share some communalities (AUDIT as screening tool and FRAMES adapted brief intervention), especially among those that participated in the WHO Collaborative project, but its implementation has been adapted to the country HSys organization (PHC settings structure, professionals involved, referral pathways). An important issue is that regardless of the origins, governments have been involved in the SBI program implementation mainly by endorsing national guidelines or policies and providing specific funding for HHAC. As far as we know, only Scotland established a national target and incentivized accordingly. It is not clear, however, if sustainability actions are undertaken in order to maintain results obtained in the different countries.

Italy and Catalonia have based their evaluation more on continuous monitoring strategies than on specific research trials or studies; UK and other countries have followed a much more formal monitoring including a national Audit. Studies on fidelity to national guidelines in such countries do not exist.

Taking into consideration the main conclusions of the Odhin assessment exercise (22), success in the wide implementation of SBI depends on a number of factors: the presence of a formal partnership or coalition to support the process, the integration of the management of the SBI in the health care system, the provision of a formal, mandatory on-going training and medical education on SBI, the existence of written alcohol policies funded SBI research projects (cost-effectiveness, fidelity, quality of advice, evaluation surveys, performance records, etc.), available guidelines and protocols provision of materials and incentive measures, support by specialists services, etc. Furthermore, it is essential that specific activities should be devoted to the dissemination of available sources of knowledge, research results, and information to health care providers together with the provision of materials and tools as well as incentive measures aimed at ensuring that prevention, particularly SBI, is implemented in PHC and supported by specialist services according to a real networking of the available servicers and competencies.

Table 1 | Health system key characteristics.

	Finland	Sweden	UK	Italy	Spain
Population[a]	5,413,971	9,519,374	63,705,000	59,539,720	46,146,580
Total expenditure on health/capita, US$ purchasing power parity, 2011[a]	2,544.7	3,203.6	2,821.1	2,344.5	2,244.2
Health resources density per 1000 population (head counts)[a]	10.45 (Nurses) 2.72 (Physicians) – 2008 5.3 (Hospital beds)	11.09 (Nurses) 3.92 (Physicians) 2.62 (Hospital beds)	8.21 (Nurses) 2.75 (Physicians) 2.81 (Hospital beds)	(Nurses) 3.85 (Physicians) 3.4 (Hospital beds)	5.24 (Nurses) 3.82 (Physicians) 2.97 (Hospital beds)
Type	Compulsory tax-based	Compulsory tax-based	National taxation	General taxation	Tax-based
Planning/implementation	National planning, local (municipalities) implementation	Central state, regions and local health authorities (shared responsibility)	Country (England, NI, Scotland, and Wales) deliver services through public providers	Central state, regions, and local health authorities (shared responsibility)	Central state defines minimum requirements and coordinates, autonomous communities are fully responsible
Health care provision	PHC centers are multidisciplinary and public owned and provide (primary care, preventive care and public health services)	PHC services deliver both basic curative care and preventive services through local health centers	PHC is provided by GPs in group practices (three per practice)	GPs and pediatricians working as independent contractors provide primary health care	PHC centers are multidisciplinary and public owned and provide primary and preventive care
Self-declared unmet needs for medical examination (EU rate = 3.4%)[b]	Above	Below	Below	Above	Below
Integration of the management of hazardous and harmful alcohol consumption in the primary and secondary health care system (scale 0–10)[c]	5/5	10/4	5/6 (England only)	5/4	8/8

[a] *OECD Health Statistics, 2013 – http://stats.oecd.org/index.aspx?DataSetCode=SHA*

[b] *Eurostat statistics on income and living conditions, 2012.*

[c] *ODHIN assessment tool – report, 2013 – http:// www.odhinproject.eu/ project-structure/ wp6.html*

PROPOSAL FOR THE FUTURE: THE WHO-EURO STRATEGY ON HSys FOR BI

Alcohol, in contrast to other behaviors and lifestyles poses important challenges to the HSys, mainly because of moral prejudices existing in our society, to the fact that alcohol consumption is culturally and socially determined and to the fact that there in some cases it is associated to brain malfunctioning or a brain disease. This together with the barriers in every day practice to sustaining commitment such of lack of time, lack of training and resources, a belief that patients will not take advice to change drinking behavior and a fear of offending patients by discussing alcohol (26, 27) has resulted in HSys oriented toward an individualized, passive, and an illness-centered model of health care in which SBI implementation is utopic.

Coming to this point, it is clear that unless the HSys adopts more holistic and patient-centered implementation models, the SBI implementation on HHAC will not be achieved and sustained despite all the research and efforts done. In this direction, we would like to emphasize the relevance of the contributions made by:

TBLISI RESOLUTION

Behavior Change strategies and health: the role of HSys (6) that acknowledges the fact that behavior-related risk factors have become the leading causes of morbidity and mortality and that

Table 2 | SBI programs characteristics.

	Finland[a]	Sweden	Scotland[b]	England	Italy	Catalonia/Spain
Origin	Late 90s. Phase IV of the WHO Collaborative Project[c]. PHC and occupational health	Early 80s Malmö study. Risky drinking Project (2004–2010) in PHC, maternity and occupational health care	Early 80s DRAM Study. Scotland performance management target (H4:Heat target)[d]	Late 80s. Phase II of the WHO collaborative project. SIPS trials (PHC, emergency departments and criminal justice settings	Early 90s. Phase III strand I of the WHO Collaborative Project	Mid 90s. Phase III-strand III of the WHO Collaborative Project. Phase IV on implementation started in 2002
National guidelines	Yes. Part of other clinical care guidelines	Yes. Stand alone guidelines (GP)	Yes. Stand alone guidelines (GP and nurses). The management of harmful drinking and alcohol dependence in primary care[f]	Yes. Stand alone guidelines (GP and nurses) NICE guidance on the prevention of hazardous and harmful drinking plus a Nationally Directed Enhanced service	Yes. Stand alone guidelines (GP). PHEPA[e] adapted at national level	Yes. Stand alone guidelines (GP and nurses). PHEPA[e] adapted at national level and PAPPS[f]
Professionals	Both GP (1,000) and nurses (2,000)	Both GP, residents in family medicine and district nurses	GP and other PHC professionals (practice and community nurses and health visitors)	Both GP and nurses	GPs, psychiatrists, family advice bureau from PHC; psychologists, professional from the Ser.T.S. and workplace	Both GP and nurses
Screening	Opportunistic screening with AUDIT	AUDIT	Clinical presentations and new registrations. Abbreviated forms of AUDIT (e.g., FAST), or CAGE plus two consumption questions, should be used in primary care when alcohol is a possible contributory factor	Targeted screening with AUDIT and AUDIT-C	Targeted screening with AUDIT and AUDIT-C on a voluntary basis	Universal with existing tools (quantity and frequency) in medical records and AUDIT (voluntary)
Brief intervention	FRAMES adapted BI	Feedback and BI. MI-principles	FRAMES adapted BI (10 min)	Simple structured advice and brief behavioral counseling	Based on PHEPA guidelines (FRAMES adapted BI)	FRAMES adapted BI
Training[g]	Both vocational and continuing medical education (GP and nurses)	Only vocational training (GP). During the project: half and whole day information seminars and network meetings	Training of trainers (100). NHS health Scotland trained over 3200 practitioners (Training manual, DVD and a national competency	Partially available vocational training and continuing medical education (GP and nurses). During the project: training of trainers (How much is too much package)	Only vocational training (GP). During the project: training of trainers (PHEPA training manual) and continuing medical education (ECM)	Both vocational and continuing medical education (GP and nurses) Training by peers in the PHC (Beveu Menys package)

(Continued)

Table 2 | Continued

	Finland[a]	Sweden	Scotland[b]	England	Italy	Catalonia/Spain
Incentives or part of normal salary[g]	Part of normal salary	Incentives	Incentives	Part of normal salary	Part of normal salary	Small incentives
Support for managing SDA in specialized treatment facilities	Yes	Yes	Yes. Access to relapse prevention treatments	Yes. Evidence-based care pathway for different levels of alcohol-related risk harm and dependence	Yes	Yes. Strategy on coordination between PHC and specialist services for alcohol dependence
Monitoring and evaluation	Pre-post. Mailed questionnaire to all PHC physicians (2002–2007). Face-to-face interviews (2008) (self-report measures). 25% of Finnish population but concerted attempt to cover the whole country	Pre-post. Telephone-administered questionnaire to general population (2006–2009) (self-report measures)	Trials, case studies to assess extend of adoption and reach	National audit office report. annual care quality commission report	Not on SBI implementation but on alcohol consumption, mortality, attributable hospital discharges and on public specialist alcohol service activities (125/2001 law on alcohol)	Annual screening rates (contract with PHC providers)
Governmental funding for services for HHAC	Yes	Yes	Yes	No	Yes	Yes
Specific national policy	Yes. Finnish alcohol program (2004–2007)	Government initiative	Health service target of delivering 149,449 BI 2008/2009–2010/2011	National alcohol strategies (2 since 2004)	Frame law on alcohol 125/2001 National alcohol and health plan (PNAS) National prevention plan (PNP) National health plan (PSN)	No but included in the health Plan (2012–2016) and in the drug prevention plan
Presence of country coalition for the management of HHAC	Yes	Yes. Cooperation with 21 county councils. Supervision by the professional organizations, local authorities, Hospitals, etc	–	Yes	Yes. National Observatory on Alcohol – CNESPS, Istituto Superiore di Sanità (with funding from the MoH and the Presidency of the Council of the Ministries, Dept of antidrugs policies)	Yes. Program on Substance Abuse of the Department of Health (full time nurse and half time administration staff) in collaboration with PHC providers and Catalan Society of Family and Community Physicians and Nurses

(Continued)

Table 2 | Continued

	Finland[a]	Sweden	Scotland[b]	England	Italy	Catalonia/Spain
General and family practice availability and accessibility Mean = 6[g]	Mean	Mean	–	Below	Below	Above
Professionals accountability GP Mean = 5.4 Nurses Mean = 4.5[g]	Above/above	Below/below	–	Below/above	Below/below	Above/above

[a] *WHO-Phase IV, Finland report – http://www.gencat.cat/salut/phaseiv/finland.htm*

[b] *Alcohol Brief Interventions: communication and Guidance – http://www.healthscotland.com/topics/health/alcohol/alcohol-brief-interventions-communications-and-guidance.aspx*

[c] *WHO-Phase IV website: http://www.gencat.cat/salut/phaseiv/index.htm*

[d] *SIGN no. 74 (2003) – http://www.sign.ac.uk/guidelines/fulltext/74/index.html*

[e] *PHEPA guidelines: http://www.phepa.net/units/phepa/html/en/dir361/doc13210.html*

[f] *Programa de actividades preventivas y de promoción de la salud (PAPPS) – http://www.papps.org/upload/file/Grupo_Expertos_PAPPS_2_2.pdf*

[g] *ODHIN assessment tool – report – A description of the available services for the management of hazardous and harmful alcohol consumption (2013) – http://www.odhinproject.eu/project-structure/wp6.html*

they cannot be seen in isolation, as they mostly are inextricably connected with the social determinants of health.

TALLINN CHARTER

Health system for health and wealth (6) that stresses that effective primary care is essential to provide a platform for the interface of HSs with communities and families and for intersectoral cooperation and health promotion that HSys should integrate targeted disease-specific programs into existing structures and services and that HSys need to ensure a holistic approach to services, involving health promotion, disease prevention, and integrated disease management programs, as well as coordination among a variety of providers, institutions, and settings, irrespective of whether these are in the private or public sector and including primary care, acute, and extended care facilities and people's homes, among others.

Thus, talking specifically about the management of HHAC, the Tblisi resolution tells us that complex factors influencing alcohol behavior change should be taken into account in order to design proper interventions (see **Table 3**).

All the factors listed above are applicable to alcohol behavior change and to the design of alcohol interventions. The behavioral change model acknowledges the important role that, for example, the physical and social environments, the social relationships, and the social norms play on the alcohol consumption and as a result of this, alerts on the limit to a person's capacity to change, if the environment militates against the desired change; and the importance to create conditions and incentives for change, in addition to giving messages and advice and building personal skills. This model also stresses that some people are just physiologically incapable of drinking moderately and that in such cases actions to empower (29), to increase self-esteem (30) and resilience (31) of the harmful drinkers should also be implemented to increase effectiveness. Thus, behavior change could benefit from information, education, and capacity building interventions, at community and, especially, at individual level.

In addition to that, according to the Tallinn charter, it is clear that the implementation of SBI in PHC alone would not produce the effect we are aiming for.

From the model proposed (see **Table 4**), it is clear that in order to introduce such individually oriented strategies by PHC it is essential to embed them into settings and systems oriented strategies such as health promotion approaches and community and population strategies such as mass media campaigns regulation and legislation and capacity building.

Taking all this into account, the following considerations could be made.

- From a Public Health point of view, to increase the effectiveness of any alcohol risk reduction all these aspects need to be taken into consideration and the respective stakeholders need to be involved in a wide, holistic, intersectoral approach. Social and HSs, culture and education, pharma industry, local authorities, private sector, general population representatives, and the economic sector are only some of the participants that need to be involved.

Table 3 | Common factors influencing behavior change and their implications for intervention design [adapted from WHO European Ministerial Conference on Health Systems (28)].

Factors	Design implication
A desire for change must be present in the audience	There is a need both to create a demand for positive change and to create the conditions to enable people to make positive choices
Participatory involvement leads to greater behavioral change effects	Interactive engagement strategies and the development of coalition approaches to change should be part of all behavior change interventions
People are often motivated to do the "right thing" for the community as well as for themselves and their families	Programs should encourage and incentivize socially responsible behavior and penalize behaviors that are not socially responsible
Social relationships, social support, and social norms have a strong and persistent influence on behavior	Incorporating peer and family support strategies into individual risk change programs increases likely success
Change is usually a process not an event	Programs should be sustained over time and tailored to the needs of different groups
Psychological factors, beliefs, and values influence how people behave	Programs need to address values and beliefs, as well as information and knowledge acquisition
People can be "locked into" patterns of behavior and need practical help to break them	Policy and services need to be designed to meet the specific needs of different communities, in order to help them change engrained habits
Change is more likely if an undesired behavior is not part of an individual's life situation coping strategy	Create incentives, offer practical support for change, and give positive reinforcement. Provide alternative forms of support and reinforcement to aid behavior change
People's behavior is influenced by their physical and social environments	There is a limit to a person's capacity to change, if the environment militates against the desired change; conditions and incentives for change must therefore be created, in addition to giving messages and advice and building personal skills
People's perception of their vulnerability to a risk and of its severity is key to understanding behavior	There is a need to develop individual and community understanding of risk and vulnerability in relation to major threats
Perceptions of the effectiveness of the recommended behavior change are key factors affecting decisions to act	Programs should seek to ensure that people understand the scale of the rewards associated with positive behavior change
The more beneficial or rewarding an experience, the more likely it is to be repeated	Reinforcing and incentivizing positive behavior in the short term should be part of any change program
People are loss-averse: they will put more effort into retaining what they have than into acquiring new assets	Programs should emphasize the advantages of positive behaviors that enable a continuation of immediate benefits, rather than long-term gains
People often rely on mental short cuts and trial-and-error to make decisions, rather than on rational computation	Programs should develop a deep understanding about what will motivate people to change and how they perceive specific issues

- From an individual point of view, primary healthcare and general practitioners (GPs), in particular, need to participate because they can take care of all those issues and work for behavioral change in an effective way (32, 33). They provide life-long, continuing, co-ordinated, and community oriented care to their patients and are widely seen by them as their most trusted health providers. They are also recognized as being the gate-keepers in many European HSys and they are the only health professionals that have the formal role and possibility to recover information on every health determinant, educate, and provide support to their patients. Genetics, mental health, family situation, culture, religious beliefs, and socio-economic positions can be easily accessed by these experts assuring thus a holistic approach. In their everyday work, GPs should know that increasing awareness and knowledge is essential for behavioral change but they are seldom sufficient to promote a sustainable modification in health behaviors. The ability to change is also influenced by each citizen's values, attitudes and norms, self-perception and capacity for sustaining the change, expectations of success and failure before embarking on a change program.
- Apart from increasing health literacy and managing health issues, we need to influence individual attitudes and the level of confidence, which are more bound to health determinants such as culture, social models, economic, and working conditions. Individual health needs should be addressed and

Table 4 | Components of a comprehensive approach to health behavior change [adapted from WHO European Ministerial Conference on Health Systems (28)].

Community and whole of population strategies			
Legislation and regulation	Environmental Change (footpaths, cycleways, lighting)		Mass media campaigns
Community partnerships	Community capacity building	Existing community structures and leadership	Culturally and behaviorally tailored programs
Settings and systems oriented strategies			
Setting intervention: workplaces	Setting intervention: educational institutions	Setting intervention: primary health care	Setting intervention: home and family
Social support, e.g., walking group	Telephone counseling	Signs/cues at points of decision-making	Internet
Individually oriented strategies			
Personal goal-setting	Self-monitoring, e.g., daily–diary	1:1 or group counseling	Brief advice from GP or health professional

also individual resources, in a non-medical, positive, health promotion approach.

CONCLUSION

This review contextualizes the importance of the implementation of SBI in the context of effective alcohol policies, summarizes the main effectiveness and cost-effectiveness evidence, and describes the major accomplishments achieved with nation-wide SBI implementation programs in Europe. This review also provides the means to think of different approaches if more effective AUDs strategies are to be proposed at European level. Social, economic, and health promotion points of view are also presented as important aspects to be explored for the good outcome of any AUDs strategy.

Major and diverse issues were identified in this review:

- Implementation is still not Country- and Europe-wide. Pilot experiences should be generalized. The recent trial results strongly reinforce the already expressed suspicion that it is extremely difficult to get health professionals to deliver SBI; The ODHIN assessment tool shows that, in 2012, EIBI was still not the norm in daily consultation in PHC and that more resources are needed to overcome the main obstacles.
- Enduring behavior change and improvements on biochemical and biometric measures are unlikely after a single routine consultation with a clinician trained in behavior change counseling, without additional intervention.
- A tailored, implementation multi-faceted program aimed at improving general practitioner management of alcohol consumption showed little evidence to support the use of such an intensive implementation program to improve the management of harmful and hazardous alcohol consumption in primary care.
- Despite the efforts made toward the country-wide implementation of SBI programs, comparisons are difficult, not only due to the different context and implementation strategies used but also by the diversity of the outcome and output indicators used. Little can be said about what works, what does not and in what contexts.
- As stated by many authors (11, 34), further evaluation of all the programs under a common evaluation framework like the reach, effectiveness, adoption, implementation, and maintenance (RE-AIM) or the CFIR that go beyond the standard models of technology diffusion would be essential in order to extract more structured ideas on the implementation needs. Authors (8, 35) suggest that new modes of delivery such as via internet may help to surmount some of the challenges of wide dissemination, such as strains on expertise, time, and resources but still more research has to be done on its efficacy and effectiveness. In addition to that, in order to achieve a population-wide dissemination it is essential to involve other health and social settings and actors, thus, expanding SBI evidence is essential. In this sense, initiatives such as the "BISTAIRS project" – will provide useful information on how to foster the implementation of SBI for AUDs in a variety of settings (PHC, workplace HSs, emergency care, and social services) and extending best practices in Europe (36, 37).
- Implementing SBI through a PHC system approach is important because addressing risky drinking is a complex issue, involving different actors from different parts of the society. Families, local communities, and work environments are the usual settings where those risks are generated and PHC is the right place to understand the conditions that bring people to adopt unhealthy lifestyles.

Taking into account all these elements listed above, leads inevitable to the need to reframe SBI. The challenge is how to do it without impacting on its cost-effectiveness and practicability in PHC to reduce alcohol health risks (20, 38). Some suggestions will be:

- To broaden it to a brief motivational intervention, which could allow professionals to understand and evaluate individual health determinants and self-esteem and to determine people's motivations to change by addressing patient's importance and confidence to change and help them to understand the individual conditions underlying their risky drinking.

- To strengthen the links with territorial services as an essential way to provide structural support, when needed.
- To broaden brief interventions to allow a more traditional, pharmacological treatment, more in line with professional's (especially GPs) attitudes and views.
- To abandon simplistic and potentially unhelpful positions of putting on each individual patient the sole responsibility and decision to adopt healthier behaviors to avoid ill health.
- To integrate peer and family support strategies into individual risk modification in order to increase the SBI success (39).
- To propose alcohol SBI within the broader issues of all lifestyles and within the context of a global cardiovascular and cancer risk reduction. Asking about alcohol drinking, food intake or tobacco smoking, just like asking about blood pressure, can be an easy step forward to increase effectiveness.
- To integrate brief interventions with on-going practical support for structural changes performed by other actors (social services, community networks, psychologists, psychiatrists, etc.) could ease the work of primary healthcare and allow a better management of AUDs.
- To take advantage of new information and communications technologies (ICT) to help addressing the problem and enabling patients and health care providers to work as co-producers of health. Without abandoning completely the traditional face-to-face engagement, there is mounting evidence of the effectiveness of delivering aspects of healthcare using the Internet and mobile phone applications for the promotion of healthier lifestyles (smoking cessation, healthier drinking choices, and weight loss) (40, 41). Work is also underway on the development of digital technologies to enable patients with long-term conditions such as AUDs, obesity, and chronic obstructive airways disease to engage more actively in the management of their own health and trials are being undertaken to evaluate the potential of these applications to deliver benefits in relation to patient satisfaction and wellbeing as well as clinical outcomes (21).
- To work closely in connection with patients and the public as well as different stakeholders (medical and social, the pharmaceutical industry, public health authorities, ICT and m-health actors, health economists, health insurers) to understand people's attitudes and motivations, as well as barriers to change, perceived or real, in a real community holistic approach, to address health determinants and explore new, co-produced health models. Be involved in alcohol risk management considering the need to reduce stigma by including alcohol in usual care, with other lifestyle related risks and in the broader question of cardiovascular risk management.
- To create more appealing specialist services to help reducing stigma associated to AUD.
- The fact that it is difficult to effectively implement and maintain SBI strategies should bring policy makers to explore new possibilities, linking different stakeholders with different approaches, and trying new methodologies, including the provision of appropriate training, incentives, and implementation strategies.

In summary, alcohol use is a complex issue, at least as much so as hypertension or diabetes. Thus, thinking that a single intervention, even if effective, such as SBI, could solve the problem is, to our point of view, naïve, and restrictive. Future strategies should aim at broadening the perspective from an individual and a HSys point of view. HSs are important in addressing AUDs but only if individual tailored strategies are proposed, taking into consideration all the complexity of human being and his environment in a Health System approach (42).

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 30 June 2014; accepted: 28 October 2014; published online: 11 November 2014.

*Citation: Colom J, Scafato E, Segura L, Gandin C and Struzzo P (2014) Brief interventions implementation on alcohol from the European health systems perspective. Front. Psychiatry **5**:161. doi: 10.3389/fpsyt.2014.00161*

This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

frontiers in PSYCHIATRY

REVIEW ARTICLE
published: 30 October 2014
doi: 10.3389/fpsyt.2014.00151

Internet applications for screening and brief interventions for alcohol in primary care settings – implementation and sustainability

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Screening and brief interventions head the list of effective evidence-based interventions for the prevention and treatment of alcohol use disorders in healthcare settings. However, healthcare professionals have been reluctant to engage with this kind of activity both because of the sensitive nature of the subject and because delivery is potentially time-consuming. Digital technologies for behavioral change are becoming increasingly widespread and their low delivery costs make them highly attractive. Internet and mobile technologies have been shown to be effective for the treatment of depression, anxiety, and smoking cessation in healthcare settings, and have the potential to add substantial value to the delivery of brief intervention for alcohol. Online alcohol questionnaires have been shown to elicit reliable responses on alcohol consumption and compared with conventional prevention techniques, digital alcohol interventions delivered in various settings have been found to be as effective in preventing alcohol-related harms. The last decade has seen the emergence of a range of approaches to the implementation in health care settings of referral to Internet-based applications for screening and brief interventions (eSBI) for alcohol. Research in this area is in its infancy, but there is a small body of evidence providing early indications about implementation and sustainability, and a number of studies are currently underway. This paper examines some of the evidence emerging from these and other studies and assesses the implications for the future of eSBI delivery in primary care settings.

Keywords: eSBI, online interventions, alcohol, health care setting, Internet, digital

BACKGROUND

Screening and brief interventions have been demonstrated to be highly cost-effective but despite the strength of the evidence, implementation by healthcare professionals has been disappointingly low (1, 2). The delivery of a standard brief intervention can add up to 15 min to the primary consultation and thus constitutes a significant barrier to implementation. In primary health care settings, commonly <10% of hazardous and harmful drinkers are identified, and <5% of those who could benefit are offered brief interventions (3). Primary health care based interventions for hazardous and harmful alcohol consumption are among the most infrequently delivered interventions when compared with other cost-effective clinical preventive services (4).

Digital technologies for behavioral change are becoming increasingly widespread and their low delivery costs make them highly attractive. Internet and mobile technologies have been shown to be effective for the treatment of depression and anxiety (5–7). Similarly, digital smoking cessation intervention has shown promising results (8–10). Concerning risky alcohol use, there is also a growing evidence base on the effectiveness of electronic screening and brief interventions (eSBI), both in the general population and in university student populations where there is the largest body of evidence (11–16). A review of computer-based interventions (on- and offline) for college drinkers and a meta-analysis of trials on the same subject concluded that computer-delivered interventions reduce the quantity and frequency of drinking in student populations when compared with assessment-only controls, and that computer-based interventions are as effective as other alcohol-related interventions (16, 17).

Several systematic reviews have been undertaken to assess the effectiveness of digital interventions across a wider range of settings (18–20). All concluded that the weight of evidence suggests that users can benefit from online alcohol interventions and that this approach could be particularly useful for groups less likely to access traditional alcohol-related services. However, all also suggested that caution should be exercised in drawing conclusions given the limited number of studies allowing extraction of effect sizes and the heterogeneity of outcome measures and follow-up periods. A recent review by Donoghue et al. identified such a high level of diversity of interventions with regards to length, content, and theoretical basis that it was not practical to perform a meta-analysis of the effectiveness of eSBI (21). Although there is growing evidence for modest effectiveness of a broad range of internet-delivered interventions, a number of issues remain to be resolved (18, 19) with more research still needed into the nature of the active

elements of an Internet intervention and the support required to ensure effective use is made of the intervention (19, 20, 22).

So, what can health care staff do in order to facilitate patient referral and uptake of eSBI and to promote the intended use of the intervention? Research on referral of patients by health care professionals to Internet applications for screening and brief interventions for alcohol (eSBI) is still in its infancy, with early studies having been undertaken in Sweden and the UK, and a number of further studies currently underway. These include the ODHIN trial taking place in general practice settings in five European countries, and the EFAR trials, currently in progress in northern Italy and in the planning stages in Spain, Australia, and the UK (23, 24). This paper considers the development of eSBI for delivery in health care settings and the evidence emerging from studies on implementation and uptake, and assesses the implications for the role of eSBI in the future delivery of screening and brief interventions in primary care.

eSBI DELIVERED IN PRIMARY CARE SETTINGS: CASE STUDIES FROM SWEDEN AND THE UK

The majority of studies on eSBI have concentrated on population studies where individuals access these online facilities largely unprompted and of their own volition. These inevitably tend to recruit participants who are self-selected and motivated to engage, presumably because they are actively concerned about their drinking and keen to take action to reduce. There is substantial potential to increase the reach of eSBI beyond these populations by promoting their use in health care settings, particularly primary care where the great majority of health encounters take place. There is already an extensive literature on the effectiveness of face-to-face lifestyle interventions delivered by primary care professionals, which suggests that the interaction between the clinician and patient can be highly effective in bringing about lifestyle change in patients who may not necessarily have made any prior decision to change. There is also a growing literature on guided interventions and facilitated access by health care professionals to online resources for anxiety and depression and risky drinking (5, 25). In a recent meta-review, Riper et al. pointed out that most studies on alcohol eSBI are delivered as stand-alone interventions accessible to the community at large and to a far lesser extent are guided interventions initiated via primary care (25). In the review, no differences in effectiveness were seen between guided and unguided low-intensity eSBI. As has been pointed out by Kohl et al., "one of the most substantial problems in online prevention is the low use of the interventions" (19), and although Brouwer et al. found indications that counselor support may facilitate the uptake of referral to an eSBI (20), more studies are needed on how best to combine face-to-face support with eSBI. We describe below two early initiatives in Sweden and the UK, which were designed to test the feasibility and acceptability of referral to eSBI in primary care settings as an alternative to traditional face-to-face screening and brief interventions.

EXPERIENCES FROM SWEDEN

In a series of implementation projects undertaken in Sweden during 2007–2010, the use of stand-alone computers to facilitate automated alcohol screening and personalized feedback to patients was tested in a total of 28 primary care centers (PHCs). For the purposes of the study, a computer-based alcohol screening and brief intervention (eSBI) module was developed. In short, the single-session intervention offered a two pages simple text and graphical based feedback on the persons drinking pattern comparing this with the recommend official sensible drinking limits in Sweden. Suggestions on how to cut down were given based on the person's motivation to change. A drinking diary for self-monitoring of drinking level was also included in the feedback. While the primary aim of the study was to evaluate the uptake and usefulness of the Internet-based intervention (eBI) module for alcohol, an additional module on physical activity was developed in order to limit stigmatizing patients using the computer (26).

PILOTING THE INTERVENTION AND IMPLEMENTATION

In the initial pilot phase, the managers and health coordinators at 9 PHC units were informed in a meeting about the computerized system. Staff in each PHC center was encouraged to decide for themselves, which patients to refer to the computerized test. The 9 PHC units were provided with a stand-alone computer in an integrated IT-kiosk with a touch screen and a printer. The kiosks were placed in the waiting rooms, suitable corridors, or more private rooms at the PHC unit. The staff was given weekly statistics about the number of tests performed and the risk profiles of their patients. All tests were anonymous, but the patients were given two copies of the two pages written feedback in case they wanted to share a copy with the caregiver.

Although the prime objective of the implementation project was for staff members to actively refer patients to the computerized intervention, patients were also free to perform the test without referral. One question in the program asked whether the patients had been referred by a staff member to the computer or had done the test by themselves, and this information was used in the feedback to the staff.

After the first year, a total of 3027 patients had completed the computerized screening module, comprising on average 5.7% of all visitors to the PHC during the period (range 3.6–11.1%). The proportion of patients referred to the intervention by the staff in relation to the total number of tests varied by PHC unit from 11 to 87% of all interventions. A total of 28% of the men and 14% of the women who completed the computer-based screening module had a risky drinking profile. No differences were seen in the proportions of patients with risky drinking between those who had been referred and those who undertook the computer-based screening on their own initiative (26).

FURTHER IMPLEMENTATION AND EVALUATIONS

A number of evaluations and reports have been published on the pilot study, a subsequent experimental implementation study on 6 PHC units and lastly a larger scale implementation study involving 28 PHC units in the region (26–29). These showed that the patients found the computer-based eSBI module easy to use, irrespective of gender and age, and only 3% of the referred patients expressed negative views about having been referred to the intervention (27). In a follow-up study, 3,169 risky drinkers were invited to participate in a 3 months follow-up after having performed the intervention. Of the 587 patients who agreed to be contacted after 3 months, 347

patients were eventually contacted for follow-up. Of the responders, 84% confirmed that they had read the written feedback that they received on completion of the eSBI module, and 77% stated that they remembered the content. Eighty-two percent agreed that the feedback was relevant, 45% had discussed the feedback with a friend or relative, and 26% had talked about it with someone at the PHC unit. Nearly all (92%) found the information easy to understand (27).

In a sub study on six PHC units, interviews were performed with managers and health care professionals. The managers were unanimously positive about the computerized intervention and saw openness among their staff for this innovation. However, they also indicated more negative attitudes among certain groups of staff, especially the GPs. Interviews with GPs confirmed that there was less enthusiasm in this group, and some pointed out that they had enough to do without the tool. Commonly, the GPs stated that they did not need a new tool as they integrated lifestyle advice into their consultations. This stood in contrast to much more positive attitudes from nurses to the computerized intervention (28).

A follow-up study undertaken 2 years subsequent to the introduction of the computerized intervention into the six PHC units showed that levels of maintenance/sustainability were low. However, most staff agreed that computerized or Internet-based interventions could facilitate healthy lifestyle promotion and that using computers is an important tool for increasing healthy lifestyle promotion (29).

In summary

The Swedish experience tells us that the stand-alone computerized intervention may be implemented within the PHC settings in the short term, and succeeded in reaching large numbers of patients. Many patients and some staff expressed generally positive attitudes about the eSBI module. However, there was less enthusiasm among the GPs and importantly usage decreased over time even though many of the staff considered the computerized tool as an important part of the healthy life style promotion. It therefore seems unlikely that this model could be sustainable in routine practice not least due to the low levels of interest among staff in promoting a healthy life style among patient with no obvious risk factors.

EXPERIENCES FROM THE UK

An implementation study was designed to test the feasibility of offering an online self-help alcohol reduction program [Down Your Drink (DYD)] and support from a trained alcohol worker to general practice patients found to have hazardous or harmful drinking (30). The project was carried out in Kingston Primary Care Trust, which is situated on the outskirts of London, UK. For the duration of the study, an alcohol project co-ordinator (APC) was employed to work with the risky drinkers identified by GPs and nurses in the participating practices, and to help them use DYD in order to reduce their drinking. Once the GPs and practice nurses identified a patient with hazardous or harmful consumption, they referred the patient to the APC, who then contacted the patient and arranged an appointment. The APC explained the nature of DYD to the patient, provided an introduction to the various sections of the intervention, and gave the patient personalized login details. The patient was then invited to log in to the intervention from their own computer. On average, this appointment lasted just over 40 min. Patients were able to call the APC if they experienced any difficulties using the web site, and the APC arranged three follow-up phone calls at fortnightly intervals in order to ensure that patients were succeeding in using the website. They did not engage in counseling.

A total of 18 of 28 practices expressed an interest in referring patients to the web-based intervention, but after 12 months, only 31 patients had been referred to the service of whom 19 attended the appointment with the APC. Only 6 of these 19 patients seen by the APC subsequently logged on to the web-based intervention. However, those who chose to use the web site did this to a high degree, with a mean of eight log-ins per patient and a mean of 13 pages visited per session. Interviews were subsequently performed with patients and the health care staff in the participating practices, and these suggested that both staff and patients found the service highly acceptable. They also reported that the service worked smoothly and that it was convenient being able to access the intervention in their own time.

In summary

The English experience of referring patients to a web-based self-help alcohol intervention suggested that where practices are willing to innovate, implementation is feasible and it is generally acceptable to both staff and patients. There were, however, few referrals, probably in part as a consequence of low levels of screening for hazardous and harmful drinking, which is typical of primary care. The cost of running the service was high due to the amount of time that the APC spent with each patient, and it seems unlikely that this model could be sustainable in routine practice.

FACILITATED ACCESS TO eSBI IN PRIMARY CARE SETTINGS: THE ODHIN STUDY AND EFAR STUDIES

These early studies in Sweden and the UK suggested that while eSBI might have potential to supplement conventional face-to-face approaches to SBI in primary care settings, more attention clearly needed to be given to make the technology sustainable. Research was also required to determine whether eBI was as effective as face-to-face intervention in these settings. The following section examines two sets of studies designed to determine how simple referral of patients by GPs and nurses to an eSBI website ("facilitated access") might affect screening and brief intervention activity in primary care settings (the ODHIN study), and whether this approach could be as effective as face-to-face intervention (the EFAR studies).

THE ODHIN STUDY

The ODHIN Study (Optimizing Delivery of Health Care Interventions) is a Europe wide project designed to help to optimize the delivery of health care interventions by understanding how better to translate the results of clinical research into every day practice (23). ODHIN uses hazardous and harmful alcohol consumption in primary health care as a case study to investigate the implementation of identification and brief intervention program.

The ODHIN study is being undertaken in Spain, England, the Netherlands, Poland, and Sweden. In each country, 24 PHCs are participating in a cluster randomized study with eight arms.

The aim is to study the effectiveness of training and support, financial reimbursement, and referral to an eBI targeted singly or in combination. Each country referred to existing Internet-based interventions already in use in the particular country. This meant that in Sweden, the patients were referred to a single-session intervention similar to the one described previously in this paper. In the UK, the patients were referred to a modified version of "DYD." In the Netherlands, the "Minderdrinken.nl" web site was used. In Spain, the patients were referred to an existing web site run by the Ministry of Health. In Poland, a new web site developed by the WHO was used.

For all arms of the trial, staff in participating practices are encouraged to use a short screening questionnaire administered face-to-face to screen their patients for hazardous and harmful drinking and to subsequently deliver brief interventions to those who screen positive. In the eBI condition, the health care professionals have the option to actively refer patients who screen positive to the online resource as an alternative to offering a face-to-face intervention. In this case, the health care professional is asked to spend 2–3 min providing the patient with facilitated access to the alcohol reduction website, including a short conversation and the offer of a leaflet offering information about the website, encouragement to log-on, and a personalized login code. The doctors and nurses participating in the study participating in the study are instructed to follow a script when offering facilitated access, including a negotiation on when the patient thinks that he/she would have time to log-on. The patients are handed a short leaflet informing them why they have been referred, and on this leaflet there are also given a personal login code, which can subsequently be used to track log in activity.

The study is still in progress and the definitive results are expected to be available in 2015. However, the preliminary data indicate that facilitated access activity was highly variable across the participating practices randomized to this arm of the trial. Furthermore, it appears that while for some staff a high proportion of the patients they refer to eBI complete the log-in process, for others only a few do so. Such variability is almost certainly due at least in part to the nature of the facilitated access provided by each individual health care professional to their patients.

In summary

This model appears to hold significant promise as it has the advantage that it does not require any additional staff. However, effective implementation will probably depend critically on ensuring consistency among staff in the delivery of facilitated access to the web-based intervention. Furthermore, studies need to be performed in order to explore whether facilitated access at the index consultation is sufficient to ensure that patients to make adequate use of the service, or whether active follow-up is needed. Also, it is unclear to what extent staff want or need a feedback on the effects of the web-based intervention in order to sustain motivated to the use of the referral system.

THE EFAR STUDIES

The EFAR studies form part of a multi-country initiative involving a series of randomized controlled non-inferiority trials of primary care based facilitated access to an alcohol reduction website, which are at various stages of development in Italy, Spain, Australia, and the UK. The EFAR-FVG trial is being undertaken in general practices in the Friuli Venezia Giulia Region of Italy and is the first in the series (24). EFAR-FVG compares delivery by GPs of facilitated access to a dedicated website for risky drinkers with standard face-to-face brief intervention. The trial website is an Italian language online facility, which includes modules for all the key trial components including screening, consent, assessment, randomization, and follow-up. It also incorporates the alcohol reduction website for the patients in the experimental group. The site has been adapted from the website developed for the DYD-RCT trial. Details of the DYD website and the psychological theory, which has underpinned its development, have been reported elsewhere (31). The EFAR-FVG trial website additionally incorporates a menu-driven facility to enable the GPs to personalize the automated patient messages by adding a photograph of themselves and/or an audio/video recorded message.

All patients aged 18 years or over who attend the participating practices are offered facilitated access to the eSBI facility by their GP or another staff member. This consists of a 2–3 min discussion followed by the offer of a trial brochure providing a unique access number enabling the patient to log on to the trial website from their own computer. Once online, patients are asked to complete the three-question short Alcohol Use Disorders Identification Test (AUDIT-C) and to provide agreement for the results of the test to be sent to their practice. For the purposes of the trial, cut points of four for women and five for men have been used. Those scoring at or above the cut points receive personalized feedback advising that their stated drinking patterns indicate that they are at risk from their drinking and inviting them to take part in the study. They are then invited to complete the online EFAR-FVG trial consent module before being invited to complete the online baseline assessment, which includes the full AUDIT, and two brief questionnaires on demographics and quality of life. Completion of the questionnaires leads to automated online randomization to either online (experimental) or face-to-face (reference) intervention.

Those in the experimental group are greeted by a personalized online message from their GP with tailored feedback about their responses to the questionnaires and encouragement to spend some time online to consider their alcohol consumption and ways to reduce. Patients receive an email 1 week later encouraging them to log on again. They are also asked online to review their alcohol consumption and are invited to discuss their website experience when they next see their GP. Patients allocated to the standard intervention group are invited to check a box online, which automatically generates an email to their practice requesting a GP appointment for a face-to-face brief intervention within the next 7–10 days.

The findings of the pilot study indicated that this approach was acceptable both to the participating GPs and the patients receiving facilitated access (unpublished data). The numbers of brochures distributed by each GP ranged between 22 and 280, and on average 42% of the patients receiving a brochure subsequently logged on to the website. Of these, 93% completed the screening questionnaire, and of the 20% who screened positive, 84% went on to randomization. The main trial, which commenced in January

2014, has recruited in excess of 500 patients and is due to report in 2015.

In summary

The facilitated access approach adopted in the EFAR-FVG study appears to have been generally effective in achieving relatively high rates of online screening in the participating practices, though the rates varied considerably between GPs. The results of the relative effectiveness of facilitated access to eSBI compared with face-to-face intervention are yet to be published. The other EFAR trials will examine additional approaches to practice based eSBI, such as the use of a digital tablet in the practice and whether the GP personalization facility in the alcohol reduction website adds to the effectiveness of the online intervention. The results of these trials will give an indication about whether GP facilitated access to an alcohol reduction website is as effective as face-to-face, and while the issue of sustainability will not be directly addressed, useful indications about this might well emerge from add-on studies conducted after the conclusion of the trials.

DISCUSSION

The last decade has seen the emergence of a range of approaches to the delivery of eSBI as an integrated part of primary health care settings as outlined in this paper, most of which have been undertaken in European settings. Experimentation of this approach is also being undertaken in other settings (32, 33) and we are aware of at least one study of electronic screening currently taking place in accident and emergency departments in the UK as part of the SIPS Junior study (http://www.sipsjunior.net/).

To date, the literature on evaluation of implementation of referral to eSBI is limited, but in our view there are grounds for cautious optimism about the potential for implementation and sustainability in primary health care settings. For example, there is reasonable evidence about the potential for internet applications to increase alcohol screening rates. This includes the findings from the Swedish study where more than 3000 primary health care patients (5.7% of all visitors to the PHC) used the computerized screening facility in the space of year (26), and from the DYD trial in the general population where high screening rates were achieved with more than 10,000 screen positive subjects identified over the course of the trial. (31) Additionally, in the EFAR trial more than 40% of all the patients who received facilitated access from their GP went on to complete the online alcohol screening module (unpublished data). There thus appears to be real potential for internet applications substantially to increase alcohol screening rates. Given the consistently low screening rates, which have been achieved by conventional approaches, it would appear to be reasonable to advocate the more widespread implementation of online screening in primary health care settings. This might be achieved either through the direct provision in the clinic of access to a screening module using a computer or a tablet, or by the GP or other health professional facilitating their patients' access to a suitable internet application through provision of website details and/or log-on codes. There are as yet unanswered questions about how the results of each patient's alcohol screening test should best be fed back to the relevant health care professional, though in any case, patients will need to be reassured that their data will be treated in strict confidence and notification should be conditional on provision of consent. Ideally automated electronic transmission should be used to transfer the screening results direct to the patient's care record, but the wide variety of primary health care systems providers operating in most countries poses significant technical challenges to this approach, and thus more simple procedures using printout maybe more practical.

While we believe that the evidence on internet applications for screening in primary healthcare settings is encouraging, we feel that the case for using these applications for brief intervention (eBI) is currently less clear cut. Overall, there appears to be evidence that internet applications may be as effective as face-to-face intervention for risky drinkers, especially for student populations. (16, 17) However, a number of authors of systematic reviews have cautioned over-interpretation of the findings from the literature, given the predominance of small-scale studies of variable quality. The evidence for the use of eBI in health care settings is certainly not yet convincing, but as highlighted in this paper, there are some indications of promise for this approach, and a number of important studies are now underway, which should provide better evidence. The UK study of referral to eBI following face-to-face screening was too small to enable firm conclusions to be drawn (30). The results from the ODHIN study, which are still to be published, should provide more robust evidence on the impact of providing health care professionals with the option to use facilitated access to an internet application for patients who have screened positive on direct testing with the AUDIT-C. However, the study will not provide any evidence of effectiveness of eBI relative to face-to-face intervention, and in the absence of other studies in this area, we will need to await the results of the EFAR trials before this question can be answered.

Taking all of these factors into account, we believe that there is a good case for advocating the more widespread use of or referral to internet applications for alcohol screening in primary healthcare settings. We think that the same is likely to be true for internet applications for brief intervention, though robust evidence on this is still awaited. Whatever the case, it is clear that sustainability will depend on appropriate configuration to meet the needs and wishes of both patients and healthcare professionals, and the degree to which these interventions become embedded in everyday practice will depend critically on the way in which their implementation is configured. Although many patients appear to respond positively to advice from their health care professional to undertake eSBI, the professionals themselves demonstrate much more variable levels of engagement. Effective mechanisms will therefore be needed to enable referral to internet applications for screening and brief intervention to become embedded in professional practice. The challenges involved are complex and relate not only to considerations of whether patients and healthcare professionals are prepared to place their trust in internet applications but also to the general attitude of healthcare professionals toward working with alcohol and other life style areas.

CONCLUSION

If an appropriate balance can be identified between the use of referral to the internet and the personal engagement of the healthcare

professional, it is likely that the use of internet applications for alcohol screening and brief advice will prove increasingly successful. Indeed, this approach may well find a growing range of applications beyond alcohol not only for other lifestyle behaviors but also for the management of long term conditions such as asthma, diabetes, and arthritis. There is thus real potential to develop integrated virtual healthcare environments designed to complement face-to-face delivery of health care and capable of providing patients with access to internet applications for a growing range of their health care needs. As with eSBI, their success will depend critically on our ability to identify the key elements, which contribute not only to effectiveness but also to sustainability.

AUTHOR CONTRIBUTIONS

Both authors contributed to the design and content of the manuscript as well as the first draft of the manuscript and all subsequent revisions. Both authors have approved the final version of the manuscript.

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Conflict of Interest Statement: Preben Bendtsen partly owns a private company that distributes alcohol and other life style online interventions. Paul Wallace has intellectual property rights for www.downyourdrink.org.uk, is PI in the EFAR and ODHIN studies and provides private consultancy on the topic of screening and brief interventions.

Received: 15 June 2014; accepted: 15 October 2014; published online: 30 October 2014.
Citation: Wallace P and Bendtsen P (2014) Internet applications for screening and brief interventions for alcohol in primary care settings – implementation and sustainability. Front. Psychiatry ***5****:151. doi: 10.3389/fpsyt.2014.00151*
This article was submitted to Addictive Disorders and Behavioral Dyscontrol, a section of the journal Frontiers in Psychiatry.

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