Automated Screening for At-Risk Drinking in a Primary Care Office Using Interactive Voice Response*

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ABSTRACT. Objective: Screening for alcohol misuse in primary care settings is strongly recommended but grossly underused. Using interactive voice response (IVR), we developed an automated screening tool (IVR Screen) for identifying alcohol misuse in outpatient primary care offices and evaluated its use rate and acceptability for both patients and providers. **Method:** Patients ($N = 101$) presenting to a primary care clinic for scheduled, nonemergent health care visits called the IVR Screen by using a dedicated telephone in the waiting room and answered five questions about their health. Results were printed immediately for patient and provider to review during the visit. Medical assistants interviewed patients about the IVR Screen in the examination room. **Results:** Ninety-six percent of patients who were invited to participate

in the study consented to do so. Of those, 26% met criteria for alcohol misuse. Feedback from patients and providers was positive and included constructive suggestions for revisions to the IVR Screen for future use. **Conclusions:** IVR-based screening for at-risk drinking was feasible and did not interfere with the provider-patient interaction. The proportion of heavy drinkers identified by the IVR Screen was comparable to that of published reports of screening with written questionnaires. Implications for behavioral health screening, treatment, and clinical research are considerable because IVR-based screening assessments can be customized and targeted to different populations. Results suggest that continued development of IVR as a tool for health and alcohol screening in primary care settings is warranted. (*J. Stud. Alcohol Drugs*, 71, 734-738, 2010)

SCREENING FOR UNRECOGNIZED health problems is an important aspect of primary care practice. In particular, screening for alcohol misuse is recommended by the U.S. Preventive Services Task Force (2004), the Institute of Medicine (1990), and the National Institute on Alcohol Abuse and Alcoholism (2005). The National Commission on Prevention Priorities ranked alcohol screening and brief intervention among the highest priority preventive services based on an index of cost effectiveness and clinically preventable burden (Maciosek et al., 2006). However, in a survey conducted by the National Center on Addiction and Substance Abuse (2000), only about one third of physicians reported administering standard screening instruments. A survey of community-dwelling adults about the quality of their health care experiences showed that alcohol dependence

was the condition for which the lowest number of patients received the recommended care (i.e., assessment, diagnosis, and referral; McGlynn et al., 2003).

To facilitate screening by primary care providers, the National Institute on Alcohol Abuse and Alcoholism (2005) recommends a specific, evidence-based screening process and offers guidelines for providing brief alcohol intervention for patients who screen positive. Such concrete guidelines are helpful for primary care providers who are inclined to screen; however, lack of time, primary care provider reluctance, and lack of systematic office systems appear to mitigate against screening by clinicians (Beich et al., 2002; Spandorfer et al., 1999).

A self-administered, automated screening tool could overcome most barriers to routine screening (Glasgow et al., 2004). Telephonic interactive voice response (IVR) systems are convenient and advantageous for screening; they allow individuals to self-enter data over a touch-tone telephone and require no specialized equipment. IVR programming can accommodate complex branching logic for follow-up interview questions or other messages in a seamless fashion that is transparent to the user. Also, there are fewer errors (e.g., missing data) with automated screening because the computer does not forget to ask questions. IVR screening can save clinic personnel time because the programs are easy to use and require no reading or writing, allowing persons with impaired vision or limited literacy to enter their data independently. Summary results can be generated

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automatically for the provider, and the data obtained from IVR-based screening can be stored readily for future use and/or integrated into an electronic medical record without further data entry. IVR screens offer greater patient privacy because others cannot see or hear the questions or responses, and many patients prefer to answer questions about potentially stigmatized behaviors via self-administered automated systems versus face-to-face interview (Perlis et al., 2004). IVR has been tested in primary care settings to screen for tobacco use (McDaniel et al., 2005), depression (Kim et al., 2007), and drug- and alcohol-use disorders (Dyches et al., 1999).

The reliability and validity of IVR methodology for assessment of alcohol consumption-related problems have been established. Perrine et al. (1995) reported strong correlations between IVR reports of drinking compared with other assessment methods (i.e., blood alcohol concentration, Timeline Followback, and collateral reports). Dyches et al. (1999) reported 85% concordance between IVR- and clinician-administered CAGE, with sensitivity and specificity coefficients of .67 and .89, respectively, for the IVR administration. Mundt et al. (2002) compared IVR and paper-and-pencil versions of several alcohol consumption-related instruments and found significant intermethod and test-retest correlations for all of them; however, scores of the Alcohol Dependence Scale obtained by IVR were lower than those obtained by the paper-and-pencil method. Alemagno et al. (1996) found that an IVR-based interview of homeless persons' needs for alcohol and other drug treatment was comparable to the face-to-face interview in reliability and validity and, furthermore, that the IVR interview yielded higher self-reported levels of drug use. Searles et al. (2000, 2002) and Helzer et al. (2002) have also found significantly higher reports of alcohol consumption with IVR compared with Timeline Followback. Further evidence of incremental validity of IVR compared with other methods comes from a primary care study in which the diagnosis of alcohol-use disorders was made at twice the rate when patients were assessed by IVR compared with clinician-administered interview; patients more often responded affirmatively to the criteria in that format, even though they knew the clinician would be seeing the IVR results (Kobak et al., 1997). In that study, the IVR and clinician-administered interviews yielded roughly equivalent rates of sensitivity and specificity.

The goal of this study was to develop and test an IVR-based previsit screening interview (IVR Screen). Although our ultimate research agenda is to develop IVR-based interventions specifically for alcohol misuse, we wanted the IVR Screen to be relevant for all patients and all providers. Thus, unlike other disease-specific primary care IVR screening tools that have been tested, the IVR Screen asks about a variety of health conditions and, thus, is relevant to every patient. We hypothesized that the IVR Screen would be feasible to implement, acceptable to patients, and useful to

primary care providers. Implementation of such a tool into primary care practice could support physician efforts to address heavy drinking and other health-risk behaviors that are given inadequate attention because of time and other barriers in the primary care setting (Glasgow et al., 2004).

Method

Recruitment procedures

The study took place in a suburban outpatient university-affiliated primary care internal-medicine office with eight primary care providers (seven physicians and one nurse practitioner). Potential subjects were identified the previous day by the practice supervisor, who selected in advance a maximum of five patients per half-day clinic session from the daily schedule. Selection of patients was based on clinic flow considerations only, not on presumed willingness to participate or any other personal factor. All preselected patients were invited to participate by the receptionist, who followed a script stating the clinic was conducting a research project that involved making a brief call to an automated phone system. Patients were told they would use the telephone key pad to answer a few questions about their current health, and that they would receive a printout of their answers to discuss with the provider.

Consenting patients called the IVR Screen using a dedicated telephone in the waiting room, then remained in the waiting room until called for the appointment. At the conclusion of the call, patients were told their provider would automatically receive a copy of the screening results, but they could press a key to cancel the provider printout. Unless the patient declined, a report of the patient's responses was automatically printed in duplicate. One copy of the report was attached to the patient's chart for the primary care provider to review at the visit. The other was given to the patient in the examination room, where the medical assistant obtained informed consent. Consenting patients were asked to complete a confidential questionnaire regarding personal demographic characteristics, a report of any difficulty with any of the items included on the IVR Screen, and suggestions for improvement. All study procedures were approved by The University of Vermont Committee for Human Research in the Medical Sciences.

IVR Screen script development

Before the study, primary care providers in the target practice provided advice regarding potential screening items they would find informative, time saving, and/or necessary for most clinic visits. Five topics were identified as most relevant: pain, smoking, drinking, physical activity, and depressed mood. To maintain a balanced number of questions per topic, there was just one question for each; however, the

pain, smoking, and alcohol items had follow-up questions if the first one was answered positively. To assess alcohol consumption, we used the three-item Alcohol Use Disorders Identification Test–Consumption (AUDIT-C) questions (i.e., the first three items of the AUDIT), which measures quantity, frequency, and episodic heavy drinking and is a validated screening test for alcohol misuse and/or current alcohol abuse or dependence (Bradley et al., 2007; Bush et al., 1998). The first AUDIT-C item served as the initial screen. If the patient indicated he or she never drank, the program skipped to the next screening item. Current drinkers were asked the other two AUDIT-C items before proceeding to the next topic.

At the conclusion of the study, we interviewed all eight primary care providers to obtain feedback on the IVR Screen that might be useful for modification of the script.

Results

Feasibility of recruitment

Of the 105 subjects invited to complete the IVR Screen, 101 (96%) did so. Only one patient requested that the results not be shared with the primary care provider. Demographics of participants reflected the characteristics of the clinic population. The mean age of the subjects was 51.3 years, and 58% were male. Most participants (73%) had more than a high school education, and the self-identified racial composition was 99% White, also reflecting the population of the region. Callers were told they could skip any question and/or terminate the phone call before finishing the script. One patient skipped the item about depressed mood and one skipped the question about frequency of heavy drinking. None of the patients ended the call early.

The mean duration of the IVR Screen was 3 minutes, including approximately 45 seconds of introduction, much of which was to satisfy informed consent requirements. In a nonresearch context, the average call duration could be shortened considerably.

Results of screening

Alcohol consumption. Of the 101 subjects, 87 (86%) reported they drank alcohol. Mean drinks reported on a “typical drinking day” were 1.7 ($SD = 1.0$, range: 1–6). The frequencies of drinking occasions and of heavy drinking occasions are shown in Table 1. The National Institute on Alcohol Abuse and Alcoholism criterion for alcohol misuse based on one or more episodes of heavy drinking in the past year was met by 30% of drinkers (or 26% of all patients screened). The average AUDIT-C score for subjects who reported drinking was 3.1, and 46% met criteria for alcohol misuse based on the cut-points of Bradley et al. (2007) (i.e., a score of 4 or more for men and 3 or more for women).

TABLE 1. Participant responses to Items 1 and 3 of the AUDIT-C ($N = 101$)

AUDIT-C item	Frequency
1. Frequency of any drinking	
Never	14
1 time/month or less	24
2–4 times/month	27
2–3 times/week	14
≥4 times/week	22
3. Frequency of heavy drinking ^a	
Never	74
<Once/month	15
Monthly	8
Weekly	2
Daily or almost daily	1
(Missing data)	(1)

Notes: AUDIT-C = Alcohol Use Disorders Identification Test–Consumption questions. ^aAs defined in the AUDIT-C: six or more drinks on one occasion.

Including all subjects, the average AUDIT-C score was 2.7, with 39% meeting misuse criteria.

Other screening items. Thirty-seven patients reported having pain that day, with an average pain rating of 4.0 on a scale of 1 to 10. Smoking was reported by 9% of the respondents, who smoked an average of 11.4 cigarettes per day. Physical activity was rated as “not very active” (12%), “moderately active” (67%), or “very active” (21%). A total of 23 subjects responded that they had felt “down, depressed, or hopeless” in the past 2 weeks. There was no association between problem drinking and the other health items.

Subjective experiences related to screening

Patients. On the examination-room feedback questionnaire, the majority of patients (63%) voiced no complaints or had positive feedback about the IVR Screen (e.g., questions were clear, process was simple and straightforward); the remaining 38 patients (37%) offered one or more suggestions for improvement. Three patients suggested that the survey could be expanded to cover additional content. Thirteen patients had concerns about the alcohol questions; in particular, 10 of these patients indicated the response options for the AUDIT-C did not allow them to accurately represent their drinking (e.g., one patient commented he had stopped drinking 3 weeks ago; others indicated their consumption patterns were not regular enough to fit into the categories offered). Patients made suggestions for clarifying or rewording the questions about physical activity ($n = 11$), pain ($n = 3$), and depression ($n = 1$). Three stated a preference for more than “yes/no” response options for the questions in general. One patient doubted the honesty of others’ answers; in contrast, another patient responded affirmatively to the IVR Screen question about feeling depressed, then noted on the feedback questionnaire that it was difficult to admit that, even to herself. Seven patients had questions or suggestions about the procedural aspects of the survey administration. Only one patient objected to the survey entirely, calling it “dehumanizing.”

Providers. Primary care providers gave feedback via informal interview; half indicated the IVR Screen results were helpful to the patient encounter and half were neutral. They did not note any instances in which the IVR Screen detracted from the encounter. In fact, two primary care providers indicated the screening identified some unexpected health problems that were then discussed with their patients.

Discussion

As hypothesized, we found that previsit IVR screening for heavy drinking was feasible in a primary care office setting. We implemented this system in a busy clinic without disruption to patient flow or provider–patient interaction and achieved a 96% response rate. The IVR format was acceptable to patients and providers.

Compared with other studies, our exceptionally high response rate may have been a result of the brevity of our assessment, its coverage of a range of topics with broad applicability, and/or our recruitment procedures (i.e., in-person invitation from the receptionist in the waiting room). A depression screening study with similar recruitment procedures also obtained a relatively high (86%) completion rate (Kim et al., 2007). However, a smoking prescreen that placed outbound IVR calls a few days before the visit reported 53% completion (McDaniel et al., 2005). Finally, Dyches et al. (1999) made live previsit telephone invitations for a longer assessment of alcohol and drugs only and reported a 42% completion rate.

There are advantages and disadvantages to each screening venue. Screening in the clinic at the time of the visit has the advantages of salience, proximity, and the absence of competing demands. That is, patients are focused on their medical visit and are anticipating discussing their health with the provider. Patients are aware that the information obtained on the screening examination is highly relevant to the moment. Furthermore, patients typically are asked to wait at least a few minutes before being seen by the provider and have few other demands on their time. For these reasons, in-clinic screening is ideal. However, screening in-clinic may limit the ability of IVR systems to augment the screening with relevant assessment, feedback, advice, and/or self-directed treatment. Such enhanced systems would require more time from the patient and have the potential to disrupt patient flow. Thus, for more elaborate treatment-oriented IVR systems, in-home screening may be advantageous. It should be noted, however, that IVR systems can be built with the flexibility to allow the screening to be done either at home or in the clinic, depending on the practice and/or patient's preference. The primary disadvantage of a home-based previsit IVR Screen is that it may not have immediate relevance and may come in at an inopportune moment.

The prevalence of heavy drinking (26% using the quantity–frequency assessment and 39% by AUDIT-C score) com-

pares with rates found by others in large samples of primary care patients. Kaner et al. (2001) reported that among 12,841 patients in 84 primary care provider practices, 32% scored in the “at-risk” range or above on the AUDIT. Using the same criteria, Lock and Kaner (2004) reported 27% prevalence among 5,541 patients in 128 practices. Finally, of nearly 7,000 respondents to the 2005 National Alcohol Survey, 32% of those who had visited a primary care provider in the past year met criteria for risky drinking, problem drinking, or alcohol dependence (Cherpitel and Ye, 2008). Our slightly higher prevalence rates are consistent with findings that participants tend to admit heavier drinking to an IVR than to written questionnaires or personal interview (Corkrey and Parkinson, 2002; Kobak et al., 1997).

For screening in this study we used the AUDIT-C as a substitute for the full AUDIT screen. However, the updated 2005 National Institute on Alcohol Abuse and Alcoholism Clinician's Guide recommends the following single screening question as an alternative to the full AUDIT: How many times in the past year have you had five or more (men) or four or more (women) drinks in a day? This single item is a validated screen for unhealthy alcohol use in primary care (Dawson et al., 2010; Smith et al., 2009). Because 10% of subjects in our study had complaints about the AUDIT-C questions, we plan to replace those three items with this National Institute on Alcohol Abuse and Alcoholism single screening question in subsequent versions of the IVR Screen.

Limitations

A limitation of this study is the demographics of the patient population (suburban, educated, mostly White). This study should be replicated in diverse settings in order to demonstrate generalizability. However, feasibility of using IVR to prescreen for specific conditions has been supported by other studies conducted in urban settings with predominantly African American, single, unemployed, and/or indigent participants (Dyches et al., 1999; Kim et al., 2007; McDaniel et al., 2005). This suggests that replicability in more diverse settings is likely.

This was a feasibility study designed to test hypotheses about user rate and acceptability. We used a single-group design with a small sample size and recruited from only one clinic site. For this reason, the results should be considered preliminary.

Implications

Our results support the further development of IVR as a tool for prescreening of primary care patients. A patient-directed, inexpensive, flexible, customizable system that relies on hardware (a telephone) readily available in all clinic settings can be a valuable means of supporting the efforts of primary care providers to address prevention and behavioral

health in the extremely limited time available during the typical office visit. IVR systems could be adapted to other clinical uses such as identifying candidates for clinical research trials or to other settings such as schools, workplaces, or community locations. Indeed, the development of an IVR-based mental health assessment and intervention system for the workplace was recently described by Farzanfar et al. (2007). Based on the promising preliminary findings reported here, our own research team is currently planning a randomized controlled trial of IVR screening coupled with an IVR-delivered brief alcohol intervention in a larger and more diverse sample of primary care patients.

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