The Ability of Single Screening Questions for Unhealthy Alcohol and Other Drug Use to Identify Substance Dependence in Primary Care

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ABSTRACT. Objective: Single screening questions (SSQs) are recommended for the evaluation of unhealthy alcohol use and other drug use (risky use through dependence). In addition, SSQs could provide information on severity that is necessary for brief intervention, information thought to be available only from longer questionnaires. We assessed SSQ accuracy for identifying dependence. **Method:** In a cross-sectional study, 286 primary care patients were administered SSQs for alcohol and for other drugs (each asks how many times they were used in the past year), the Alcohol Use Disorders Identification Test–Consumption (AUDIT-C), the Drug Abuse Screening Test (DAST), and a diagnostic interview reference standard for dependence. For each test, we calculated area under the receiver operating characteristic (ROC) curve and the ability to discriminate dependence at an optimal cutoff. **Results:** The prevalence of alcohol and other drug dependence was 9% and 12%, respectively. Optimal cut points were eight or more times for the alcohol

SSQ, a score of three or more for AUDIT-C, three or more times for the other drug SSQ, and a score of four or more for the DAST. The areas under the ROC curve ranged from 0.87 to 0.96. Sensitivity, specificity, and positive and negative likelihood ratios at optimal cut points for the alcohol SSQ were 88%, 84%, 5.6, and 0.1, respectively; for the other drug SSQ were 97%, 79%, 4.6, 0.04, respectively; for the AUDIT-C were 92%, 71%, 3.2, 0.1, respectively; and for the DAST were 100%, 84%, 6.3, 0, respectively. Alcohol SSQ and AUDIT-C positive likelihood ratio 95% confidence intervals did not overlap. **Conclusions:** SSQs can identify substance dependence as well as and sometimes better than longer screening tools. SSQs may be useful for both screening and preliminary assessment, thus overcoming a barrier (seen with lengthy questionnaires) to dissemination of screening and brief intervention in primary care settings. (*J. Stud. Alcohol Drugs*, 75, 153–157, 2014)

SCREENING FOR UNHEALTHY ALCOHOL USE (the spectrum from risky use through dependence) is recommended in primary care settings (Jonas et al., 2012; U.S. Preventive Services Task Force, 2004). Screening for other drug use is not recommended universally but should be considered when patients are at high risk, when evaluating symptoms that could be related to drug use, and when prescribing medications, particularly psychoactive medications and medications likely to be misused (U.S. Preventive Services Task Force, 2008). Identification of unhealthy use should be followed by a brief counseling intervention aimed at decreasing use and consequences or aimed at referral to specialized care.

However, effective alcohol screening (i.e., with validated tests, the most accurate of which are questionnaires) has not been widely disseminated, and the first step in the clinical practice of screening and brief intervention often remains undone (Hingson et al., 2012). Among recognized barriers are questionnaires that are too long to be incorporated into routine practice (Survey Research Laboratory, University of Illinois at Chicago, 2000). To address that barrier, single screening questions (SSQs) have been developed and validated, and some are recommended by national organizations (Canagasaby and Vinson, 2005; Dawson et al., 2010; National Institute on Alcohol Abuse and Alcoholism, 2007; National Institute on Drug Abuse, n.d.; Seale et al., 2006; Smith et al., 2009, 2010; Taj et al., 1998; Williams and Vinson, 2001).

SSQs, however, are presumed to have an important disadvantage—a lack of information on risk level or severity. Some information regarding risk is necessary to inform the goals of brief intervention for people identified by screening as having unhealthy use. Such information is particularly useful if it can be obtained quickly, at the time of screening.

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For patients with a more severe disorder (i.e., dependence), abstinence is the goal most likely to lead to clinical improvement, and these patients could benefit from pharmacotherapies, referral to specialists, mutual help programs such as Alcoholics Anonymous, and more intensive follow-up. For patients at lower risk, brief counseling may suffice, and reducing consumption is a reasonable goal. To determine risk level/severity has generally required questionnaires containing 3 to more than 80 items with multiple response options (Rubinsky et al., 2010; WHO ASSIST Working Group, 2002; Yudko et al., 2007). These questionnaires have been referred to as screening tools because they can provide dichotomous answers (yes/no unhealthy use), but they also provide a continuous score that reflects risk/severity.

Some SSQs that do not ask for a “yes” or “no” answer also can provide a numerical, continuous response (e.g., the number of days of use); therefore, they could provide information on severity necessary to inform brief intervention that is thought to be obtainable only from longer questionnaires. If they did provide that information, the use of SSQs could facilitate dissemination and implementation of screening and brief intervention by serving the dual function of screening and severity assessment, using a very brief tool. Previously, we reported on the accuracy of SSQs for identifying unhealthy alcohol (sensitivity = 82%, specificity = 79%) and other drug use (sensitivity 93%, specificity 94%) (Smith et al., 2009, 2010). In this study, we assessed SSQ accuracy for identifying patients with dependence.

Method

Participants

Participants were recruited from the waiting room of an urban academic hospital-based primary care clinic as previously described (Smith et al., 2009, 2010). People were asked to participate in a health survey study, and they provided oral consent to participate. People younger than age 18, people who were not patients of the clinic, and people who were unable to be interviewed because of limited English, acute illness, or cognitive impairment were excluded. Boston Medical Center’s institutional review board reviewed and approved the study; all participants provided informed consent.

Assessments

Research staff members interviewed participants privately and recorded responses anonymously. The participants were first asked the SSQs (Smith et al., 2009, 2010). For alcohol use, they were asked, “Do you sometimes drink alcoholic beverages?”, and then (regardless of the response) the SSQ, “How many times in the past year have you had X or more drinks in a day?” (where X is five for men and four for wom-

en, and a response of one or more is considered positive). If asked to clarify, the research assistant provided definitions of a standard drink (12 oz. of beer, 5 oz. of wine, or 1.5 oz. of 80 proof distilled spirits). Five or more (four or more for women) drinks in a day is considered heavy drinking (Dawson et al., 2005).

For other drug use, the participants were asked, “How many times in the past year have you used an illegal drug or used a prescription medication for nonmedical reasons?” (A response of more than one time was considered positive for drug use). If asked to clarify the meaning of “nonmedical reasons,” the research assistant added “for instance, because of the experience or feeling it caused.” This drug SSQ wording was based on (a) items in a national survey (Substance Abuse and Mental Health Services Administration, 2003), (b) pilot testing revealing that “illicit” was not understood, and (c) a desire to have similar form as the alcohol SSQ. Then the participants were given the three-item Alcohol Use Disorders Identification Test–consumption (AUDIT-C) items; the 10-item Drug Abuse Screening Test (DAST-10); and an assessment of alcohol use employing a validated calendar method, the 30-day Timeline Followback (Rubinsky et al., 2010; Sobell and Sobell, 1992; Yudko et al., 2007). *Risky amounts* were defined as average weekly intake over 30 days of more than 14 drinks per week for men and more than 7 drinks per week for women or more than 4 drinks for men or more than 3 drinks for women on any of the 30 days (Dawson et al., 2005). Then the participants completed the computerized version of the structured Composite International Diagnostic Interview (CIDI) Substance Abuse Module to determine the presence or absence of current (12-month) *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*, diagnosis of alcohol and other drug dependence, as well as past-12-month drug use (American Psychiatric Association, 2000; Kessler et al., 2004). CIDI-determined current alcohol and other drug dependence were the reference standards.

Analysis

We calculated the sensitivity, specificity, likelihood ratios, and area under the receiver operating curve (AUC) of the single-question screens, the AUDIT-C (possible scores: 0–12), and the DAST (possible scores: 0–10) for the detection of alcohol and other drug dependence (Hanley and McNeil, 1982; McGee, 2002). The AUC provides the probability—given one participant without dependence and one with dependence drawn at random from the population—that the person with dependence will score higher on the test. An AUC of 1.0 indicates perfect discrimination, an AUC ≥ 0.8 is good discrimination, and an AUC < 0.7 is poor discrimination. We compared alcohol screening questions with alcohol dependence reference standards as well as drug screening questions with drug dependence reference standards. We

TABLE 1. Test characteristics of screening tests for alcohol and other drug dependence in primary care patients

Test	AUC	Sensitivity [95% CI]	Specificity [95% CI]	Positive predictive value [95% CI]	Likelihood ratio positive [95% CI]	Likelihood ratio negative [95% CI]
Single screening question, alcohol	0.88	88% [69%, 97%]	84% [79%, 89%]	35% [23%, 48%]	5.6 [4.1, 7.7]	0.1 [0.05, 0.4]
AUDIT-C	0.87	92% [74%, 99%]	71% [65%, 76%]	23% [15%, 33%]	3.2 [2.5, 3.9]	0.1 [0.02, 0.4]
Single screening question, other drug	0.93	97% [85%, 99.9%]	79% [73%, 84%]	38% [21%, 50%]	4.6 [3.6, 5.9]	0.04 [0.01, 0.2]
DAST	0.96	100% [90%, 100%]	84% [79%, 88%]	46% [34%, 58%]	6.3 [4.7, 8.3]	0

Notes: AUC = area under the receiver operating characteristic curve; CI = confidence interval; AUDIT-C = Alcohol Use Disorders Identification Test, consumption items; DAST = Drug Abuse Screening Test. The cutoff for the alcohol single screening question is ≥ 8 , for the AUDIT-C, ≥ 3 . The reference standard for the alcohol single screening question and the AUDIT-C is Composite International Diagnostic Interview (CIDI)-determined current alcohol dependence. The cutoff for the drug single screening question is ≥ 3 , for the DAST, ≥ 4 . The reference standard for the drug single screening question and the DAST is CIDI-determined current drug dependence.

evaluated all possible cutoffs by receiver operating characteristic (ROC) curves. We assessed sensitivity (the proportion of people with dependence who have a positive test), specificity (the proportion of people without dependence who have a negative test), positive predictive value (the proportion of people with a positive test who have dependence), and likelihood ratios positive and negative (and 95% confidence intervals, calculated using published formulas) (Altman and Gardner, 1992) at cut points maximizing the sum of sensitivity and specificity (i.e., giving equal weight to each measure). Likelihood ratios represent the likelihood that a given test result (positive or negative) would be expected in a patient with dependence compared with the likelihood that that same result would be expected in a patient without dependence. Statistical analyses were performed using SAS software (Version 9.1, SAS Institute Inc., Cary, NC).

Results

Of 903 people screened, 394 (44%) were eligible and 303 (76% of those eligible) participated. Of those eligible who did not participate, 4 refused, 3 were unable to complete the interview, and 87 were lost between determination of eligibility and the interview (which was done in a busy clinical setting with one research assistant). Reasons for ineligibility were as follows: 302 did not speak English and 207 were not clinic patients. Data for 14 participants were lost because of a computer error, leaving a sample of 286 participants for analysis. The mean age of participants was 49 years ($SD = 12$), and the range was 21–86 years. More than half (54%) were female, 37% were high school graduates, and 14% were college graduates. Most (78%) reported English as their first language; 63% were Black, 17% were White, 2% were Asian, and 18% were of another race; 16% reported Hispanic ethnicity.

More than a third (35%) reported other drug use, and 29% reported risky amounts of alcohol use; 9% met criteria for alcohol dependence and 12% for other drug dependence. The proportion of participants reporting drug use 0, ≥ 1 , ≥ 3 ,

≥ 8 , and >12 times was 64%, 36%, 30%, 22%, and 20%, respectively. Corresponding proportions for heavy drinking were 55%, 45%, 31%, 22%, and 17%.

Based on ROC analyses, the optimal cutoffs balancing sensitivity and specificity for dependence were eight or more times in the past year for heavy alcohol use and three or more times in the past year for other drug use. The optimal cutoffs in the data for the AUDIT-C and the DAST were ≥ 3 and ≥ 4 points, respectively. See Table 1 for SSQ, AUDIT-C, and DAST test characteristics for detecting dependence. The AUC for all four tests was consistent with good discrimination, and sensitivities and specificities were generally high at the optimal cutoffs that were identified. Although positive predictive values for the SSQs were moderate (35%–38%), they were similar to those yielded by the longer tests, and likelihood ratios were associated with substantial changes from pre- (9% for alcohol, 12% for other drug) to post-test probabilities; the positive likelihood ratio for the alcohol SSQ (5.6, 95% CI [4.1, 7.7]) was significantly better than that associated with the longer, more complex AUDIT-C (3.2, 95% CI [2.5, 3.9]).

Discussion

These data suggest that, in primary care, SSQs that are recommended to identify unhealthy use also can identify alcohol and other drug dependence, with test characteristics similar to longer, more complex screening tools. In one case, a single question (regarding alcohol) was better than the more complex AUDIT-C based on one measure of accuracy (the positive likelihood ratio). Likelihood ratios indicate that, in a primary care setting, SSQ accuracy is consistent with moderate to large changes in pre- to post-test probability of alcohol and other drug dependence (e.g., from 9% to 35% for alcohol dependence). As is true for all screening tests regardless of length and complexity, further assessment would be required to make a definitive diagnosis. At the optimal cutoffs we identified, the four screening tests we evaluated provide strong evidence for ruling out dependence when they

are negative, with negative likelihood ratios ranging from 0 to 0.1.

The areas under the ROC curve we found in the current study are similar to those in past single-item studies that tested detection of alcohol use disorders (Canagasaby and Vinson, 2005; Williams and Vinson, 2001) that did not specifically report on dependence. Two studies of two-item assessments found similar specificities to our single items (Kelly et al., 2009; Vinson et al., 2007), but these were compared with disorders, not dependence. Studies of the DAST have been done in specialty care settings, and few data are available with which to compare cutoffs for dependence (Yudko et al., 2007).

We can compare the current findings to those in prior studies. The area under the ROC curve for the AUDIT-C was better than that reported by Johnson et al. (2013) and similar (also for SSQ) to that reported by Rubinsky et al. (2010). The former reported a probability of dependence of 40% for men and 21% for women with positive AUDIT-C scores (≥ 5 for men, ≥ 3 for women). Rubinsky et al. (2010) reported that AUDIT-C scores of 5 or greater among men were associated with a probability of dependence ranging from 22% to 75%, the higher probability for a score of 10–12. An SSQ that queried frequency of heavy drinking in the past month among men also was associated with dependence, with greater frequency associated with a greater likelihood of dependence (e.g., 3–10 times in the past month associated with a likelihood ratio of 5.21 and a probability of dependence of 42%; 14–30 times associated with a likelihood ratio 35.83 and a probability of 83%). Dawson et al. (2010) used an alcohol SSQ to detect drug use and disorders. Areas under the ROC curve showed good discrimination for drug dependence, and, for example, the optimal cutoff was once a month or more heavy alcohol use for the detection of cocaine dependence, but positive predictive value was poor ($<1\%$).

Although the current study supports the ability of SSQs to both detect unhealthy use and identify dependence, we caution against widespread use of these results in practice until they can be confirmed. We are confident that these SSQs will be able to provide risk information, but data are insufficient to provide confidence regarding cut points. Strengths of the current study include anonymous data collection, a reference standard interview administered to all, and a wide spectrum of use. However, these data are from one clinic with a high prevalence of use. The identified cutoffs in our data may turn out to be the best for use in practice; they are in fact what patients reported, and they provided the best balance of sensitivity and specificity. Yet, the frequency of use reported on screening is likely a great underestimate of actual frequency for people with dependence.

Other limitations of the study should be considered. As is the case in most screening test validation studies, screening was done anonymously. In real clinical practice where results

are shared with clinicians, the screening questions might be less sensitive. But this observation is unlikely to affect the ability of the questions to distinguish between nondependent and dependent use. This is an area for future study (to study the SSQs sharing results with clinicians to assess optimal cutoffs).

Last, biological testing was not part of the reference standard. We note this as a possible limitation; however, diagnostic criteria for dependence do not include biological testing (American Psychiatric Association, 2000). Questionnaires are generally better screening tests for alcohol use disorders (Coulton et al., 2006), and drug testing is limited by short windows of detection and variable utility depending on the substance (Moeller et al., 2008).

Not only can SSQs identify unhealthy alcohol and other drug use, but their numerical responses can be used as indicators of severity to identify the presence or absence of substance dependence. If these findings are confirmed in other studies, SSQs might be useful for both screening and severity assessment (to identify substance dependence). Using SSQs for both screening and brief assessments (by providing information on the presence and absence of unhealthy use and risk of dependence from the same response) could help overcome a barrier to the dissemination of screening and brief intervention for these conditions in time-strapped primary care settings (questionnaires that are too long and complex).

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