A Two-Item Conjoint Screen for Alcohol and Other Drug Problems

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Background: **Although nonmedical use of illicit and prescription drugs is not uncommon among American adults, the currently recommended screens for substance use disorders focus only on alcohol. This study reports on the criterion validity of a two-item conjoint screen (TICS) for alcohol and other drug abuse or dependence for a split sample of primary care patients.**

Methods: **Two random samples of primary care patients aged 18 to 59 years responded to several screening items that emanated from a focus group process. The DSM-III-R criteria for substance use disorders, as codified by the Composite International Diagnostic Interview-Substance Abuse Module, served as the criterion standard.**

Results: **At least one positive response to the TICS (In the last year, have you ever drunk or used drugs more than you meant to? and Have you felt you wanted or needed to cut down on your drinking or drug use in the last year?) detected current substance use disorders with nearly 80% sensitivity and specificity. The TICS was particularly sensitive to polysubstance use disorders. Respondents who gave 0, 1, and 2 positive responses had a 7.3%, 36.5%, and 72.4% chance of a current substance use disorder, respectively; likelihood ratios were 0.27, 1.93, and 8.77. The results were consistent across split samples of 434 and 702 participants.**

Conclusions: **Current alcohol or other drug problems can be detected in nearly 80% of young and middle-aged patients by asking two questions that are easily integrated into a clinical interview.(J Am Board Fam Pract 2001;14:95–106.)**

Previous reports have documented the need for a brief, accurate screen for substance use disorders for health care settings.[1,2] Most patients provide accurate responses to direct questions regarding nicotine use,[3–5] but direct questions can frequently fail to elicit accurate information on the use of other drugs.[6] Screens are therefore needed, particularly for alcohol and other commonly abused drugs besides nicotine.

The screening protocols currently recommended for health care settings focus only on alcohol.[7–10] Screening protocols developed for other drugs are insufficiently accurate or too lengthy to garner widespread use in medical settings.[7,11–15] The need for a screen that addresses a wider scope of abused substances is evidenced by the proportion of persons who have substance use disorders involving drugs other than alcohol,[16,17] the large contribution of drug abuse to the spread of human immunodeficiency virus (HIV),[18] and the known effectiveness of certain forms of treatment for drug abuse and dependence.[19]

A particular advantage to screening for alcohol abuse is that this disorder can respond to relatively inexpensive and nonintrusive brief interventions.[20–22] Brief screens for drug abuse would facilitate studies of brief interventions for a wider range of substance use disorders in primary care and other medical settings.

Brown[23] initially advanced the concept of conjoint screening questions in 1992. A conjoint screening question is defined as a question that inquires simultaneously and in aggregate about experiences with alcohol and other drugs. An example of a conjoint screening question, derived from the first CAGE[8] question, is, "Have you ever thought you should cut down on your drinking or drug

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use?" Conjoint questionnaires might be preferable to separate questionnaires on individual substances for at least three reasons.[24] One reason is that patients who have problems related to multiple substances might more readily respond positively to a conjoint question than to separate questions on individual substances. For example, a person who gets into fights when drinking, who suffers exacerbation of asthma caused by smoking marijuana, and who is frequently absent from work because of cocaine withdrawal might perceive a need to decrease substance use in general rather than a need to decrease use of any particular substance.

A second reason is that patients might be less likely to conceal affirmative responses to conjoint questions than to other questions on the use of particular illicit substances. It is widely understood that patients are often reluctant to inform clinicians about their use of illicit drugs because of stigma, possible legal ramifications, and possible effects on obtaining health and life insurance. Patients can respond affirmatively to conjoint questions without necessarily indicating that they are using illicit drugs, because any affirmative responses could stem entirely from alcohol use.

A third reason is that conjoint screening questions would allow clinicians to screen for alcohol and drug problems as rapidly as they can screen for alcohol problems. Brevity is important for clinicians because of economic pressures for efficiency and recommendations to conduct many other screening and prevention activities in health care settings.[7]

There can be some disadvantages to conjoint questions, as well.[24] Persons who use alcohol only might avoid responding affirmatively, wishing to avoid the possibility of conveying that they are using other drugs. Also, conjoint questions do not detect particular substances of abuse.

Two previous studies have compared the accuracy of the original CAGE questions with the CAGE questions adapted to include drugs (CAGE-AID).[24] The CAGE-AID consists of the CAGE questions that have been altered by expanding the scope of the questions to include drug use, as described above. A study on a convenience sample of primary care patients found that the CAGE-AID was more sensitive but less specific than the CAGE for substance use disorders defined by the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised* (DSM-III-R).[24] A study on a random sample of medical, surgical, and orthopedic inpatients found that the CAGE-AID was more sensitive and specific than the CAGE for DSM-III-R substance use disorders.[17] A third study, on 434 randomly selected primary care patients, found that two conjoint screening questions detected substance use disorders with slightly greater than 80% sensitivity and specificity.[25] The current article reports on the criterion validity of conjoint screening questions for split samples of 434 and 702 participants.

Methods

Participants

The sites of this study were three community, faculty, and residency practices of the Department of Family Medicine at the University of Wisconsin Medical School in Madison. These clinics provide primary medical care to patients of all ages. Two of the clinics, Northeast and Wingra, are located near subsidized housing facilities in Madison, yet draw patients from many neighborhoods. The third is located in the suburb of Verona. During the year of study, the clinics provided care for 14,419 patients at 49,527 visits. Two thirds (66%) of these patients had private health insurance; 8%, Medicare; 19%, state or county assistance; and 6%, no insurance.

Prospective participants were randomly selected for recruitment from clinic schedules. Patients were eligible if they had a scheduled appointment on a randomly selected day that an interviewer was present, were between the ages of 18 and 59 years, had no mental or physical disability that prevented coherent communication, could converse in English, and were not pregnant. Older and pregnant patients were excluded because of the possibility that the screening questions might perform differently for these populations.

Initially, standard informed consent procedures were administered for each prospective participant. Complete confidentiality was promised. The prospective participants were informed that there would be a one-in-four chance, as determined by random draw, that they would be asked to undergo a urine drug-screening test after completing all other study procedures. Urine specimens, they were told, would be labeled by a code number only. The study protocol was approved by the Human Subjects Committee of the University of Wisconsin Center for Health Sciences.

Table 1. The Conjoint Screening Items Tested.

Item Number	Text	Brief Descriptor
1	In the last year, how many times have you not remembered things that happened while you were drinking or using drugs?	Blackouts
2	In the last year, have you ever drunk or used drugs more than you meant to?	Used more than intended
3	Have you felt you wanted or needed to cut down on your drinking or drug use in the last year?	Need to cut down
4	In the last year, have you drunk or used nonprescription drugs to deal with your feelings, stress, or frustration?	Use for feelings
5	As a result of your drinking or drug use, did anything happen in the last year that you wish didn't happen?	Regret

The study was planned in two phases, with the analysis of phase 1 guiding the selection of screening items for phase 2. In phase 1, 434 (87.9%) of 494 recruits participated. In phase 2, 702 (92.6%) of 758 recruits participated.

Measures

An exhaustive literature search selected prospective screening items. Such items, as well as ideas for new items, were discussed by three focus groups. There were separate groups of addiction clinicians and researchers, persons with current substance use disorders, and persons with such disorders in remission. The process resulted in nine conjoint items for administration to the participants in phase 1. Based on the data from phase 1,[25] four items were eliminated from consideration and not administered in phase 2. The five items that were administered to all participants are shown in Table 1.

All interviews were conducted at the participants' clinics. Initially, each participant responded to some warm-up questions on general health behaviors, including diet, exercise, and smoking. These questions were intended to allow the interviewer to establish some rapport about topics less sensitive than alcohol and illicit drug use, as typically occurs in clinical practice. Subsequently, each participant responded to conjoint screening items. Item 1, on blackouts, was asked in an open-ended fashion, with any response greater than 0 interpreted as positive. Four multiple-choice responses were provided for the other items: never, rarely, sometimes, and often. The latter three responses were interpreted as positive. This response scheme was chosen rather than a dichotomous yes-or-no scheme, so participants could minimize yet respond affirmatively. This scheme mimics the common clinical practice of interpreting minimizing responses, such as "not really, maybe just once," as positive.

Next, the interviewer administered the Composite International Diagnostic Interview - Substance Abuse Module (CIDI-SAM).[26–29] The CIDI-SAM was chosen as the criterion standard for substance use disorders because of its excellent test-retest reliability, its agreement with expert diagnostic interviews, and its capacity for administration by persons without clinical expertise. The scoring algorithm for the CIDI-SAM was derived from the DSM-III-R criteria for substance abuse and dependence,[30] with current disorders connoting activity in the previous 12 months. The DSM-III-R criteria were used because the data were collected in 1995. There were 4 interviewers for the study. The interviewers underwent initial intensive training to administer the CIDI-SAM, and their performance was monitored periodically throughout the study.

The participants also responded to several demographic questions, questions on the occurrence of several specific health and social consequences of substance use, and the 13-item version of the Marlowe-Crowne Social Desirability Scale.[31,32] The Marlowe-Crowne scale was included to assess the degree to which the participants' responses might have been influenced by their perceptions of social desirability.

At the conclusion of the interview, the participants were asked to complete a brief, written questionnaire. On this questionnaire they indicated their level of comfort with the interviewer by endorsing one of four descriptors: "very uncomfortable," "mostly uncomfortable," "mostly comfortable," and "very comfortable." They also indicated whether they "told all," "held back a little," or "held back a lot" regarding the amount and frequency of their alcohol use, the amount and fre-

quency of their drug use, problems they might have had as a result of drinking alcohol, and problems they might have had as a result of using drugs. The participants completed this questionnaire and placed it in a sealed envelope. They were assured that the interviewers would never see their individual responses.

After completing the questionnaires, each participant blindly drew one of four colored marbles out of a pouch. The participants who drew the one blue marble were asked to submit urine for a drug-screening test. Urine specimens and reports were labeled using the participant's identification number only. A laboratory with certification by the US Substance Abuse and Mental Health Services Administration performed enzyme multiplied immunoassay tests to screen for amphetamines, barbiturates, benzodiazepines, cocaine, marijuana, methadone, methaqualone, opiates, phencyclidine, and propoxyphene. Introducing the chance of undergoing a drug-screening test was intended primarily to encourage the accuracy of the participants' responses to the CIDI-SAM. A greater proportion of participants were not asked to undergo urine drug-screening tests to avoid discouraging participation.

Analysis

All data were entered into a microcomputer database system and transferred to a Sun Sparcstation for analysis by SAS (SAS Institute, Cary, NC). Standard chi-square tests were used to assess for associations between two dichotomous variables. Standard logistic regression techniques[33] were used to guide the selection of screening items.

Sensitivity was defined as the proportion of those participants with current substance use disorders (abuse or dependence) according to the CIDI-SAM who had positive screening results. Specificity was defined as the proportion of participants with no current disorders according to the CIDI-SAM who had negative screening results.

At the three clinical sites, the prevalence rates for current substance use disorders were 19.6%, 21.4%, and 27.7%, and these differences were significant ($\chi^2 = 7.542$, $P < .05$). There were no significant differences in demographics between the participants of the two phases. With regard to the sensitivity and specificity of the two items that proved to be most accurate, there were no significant differences among the clinics, between the two phases, and among the different interviewers. Therefore, the data were pooled for most of this report.

Results

Participants

A total of 1,252 patients were recruited. Ninety-six (7.7%) patients declined. Twenty (1.6%) patients initially agreed to participate but repeatedly could not determine a satisfactory time for the interview. There were 1,136 participants, yielding a response rate of 90.7%. The response rate for women was 90.7%; men, 90.6%. The response rates for the four age deciles ranged from 89.7% to 92.4%. The response rate for whites was 89.7%; nonwhites, 96.0%. Response rates for participants with private, public, and no insurance were 88.5%, 94.6%, and 92.7%, respectively. The response rates for the three clinics ranged from 88.8% to 93.2%.

The demographic attributes of the participants and the nonparticipants are shown in Table 2. The differences in proportions of patients drawn from the three clinics mirror the number of eligible patients at each clinic. The preponderance of women is consistent with the well-described sex distribution of health care utilization. Each age cohort is well represented, although there were fewer participants in the oldest decile than the others. The distribution of race and ethnicity reflects more diversity than actually exists in Madison, because two of the clinics are located in particularly diverse neighborhoods. The sample was particularly diverse in educational level. Although publicly insured and uninsured patients are represented, most of the participants had private insurance. The nonparticipants were more likely than the participants to be white ($\chi^2 = 7.795$, $df = 1$, $P = .005$) and to have private insurance (Fisher's exact test, $P < .0001$).

The distribution of substance use disorders is displayed in Table 3. Slightly more than one half the participants had lifetime disorders. Slightly more than one third had a lifetime history of substance dependence. Most of the lifetime disorders involved only alcohol, with most of the remainder involving alcohol and other drugs. Only 4.2% of the participants had lifetime disorders that did not involve alcohol. After alcohol, marijuana was the most frequently problematic substance, followed in order by cocaine, stimulants, sedative-tranquilizers,

Table 2. Demographic Attributes of the Participants (n = 1,136) and Nonparticipants (n = 117).

Demographic Characteristic	Participants (%)	Nonparticipants (%)
Clinic		
Northeast Clinic	37.4	26.0
Verona Clinic	29.2	36.0
Wingra Clinic	33.4	38.0
Sex		
Male	32.1	32.0
Female	67.9	68.0
Age, years		
18–29	26.6	21.3
30–39	31.5	33.3
40–49	26.0	29.0
50–59	15.9	16.2
Race or ethnicity		
African-American	12.1	5.0
Asian-American	1.1	0.1
White	83.3	93.1
Hispanic-Latino	1.8	0.1
Native American	0.7	0.0
Other	1.0	0.0
Missing	0.1	0.0
Insurance status		
Private insurance	68.5	86.3
Public insurance	16.9	9.4
No insurance	5.5	4.2
Other	9.1	0.0
Level of education		
Less than high school	13.2	NA
High school graduate or equivalent	47.4	NA
Associate/vocational/technical degree	12.8	NA
Bachelor's degree	16.5	NA
Advanced Degree	9.9	NA
Missing	0.2	NA

NA = not available.

opioids, hallucinogens, and inhalants. More than 20% of the participants had lifetime disorders involving more than one substance.

Slightly less than one fourth (23.0%) of the participants had a current substance use disorder, including 17.3% of the sample who were currently dependent on at least one substance. Nearly 6% (5.8%) of the sample had problems with alcohol plus at least one other drug, and 3.1% had problems only with drugs other than alcohol. Thus, of those participants with current disorders, slightly more than one third had disorders involving drugs other than alcohol. After alcohol, marijuana was the most frequently problematic drug, followed by cocaine, opioids, sedative-tranquilizers, hallucinogens, stimulants, and inhalants. A small proportion (6.1%) of the participants had current disorders involving more than one substance.

Table 3. Description of the Substance Use Disorders in the Sample.

Substance Use Disorder	Lifetime Disorder (%)	Current Disorder (%)
None	47.4	77.0
Any	52.6	23.0
Alcohol	48.4	19.9
Sedative, tranquilizer	6.3	1.8
Stimulant	7.3	0.8
Marijuana	19.9	5.5
Cocaine	9.9	2.9
Hallucinogen	4.7	1.0
Opioid	5.6	2.4
Inhalant	0.9	0.1
Dependent on at least 1 substance	34.2	17.3
Abuse, but no dependence	18.4	5.6
Alcohol, but no drug	27.6	14.1
Drug, but no alcohol	4.2	3.1
Alcohol and at least 1 other drug	20.9	5.8
1 substance	30.9	16.9
2 substances	9.7	3.3
3 substances	4.0	1.6
More than 3 substances	8.0	1.2

Note: Disorder refers to a DSM-III-R diagnosis of substance abuse or substance dependence.[30]

Screening Performance

Independent item analyses for the five conjoint screening items administered to all participants are displayed in Table 4. For each item, chi-square tests produced $P < .0001$ for the comparisons of dichotomous item responses with the presence or absence of current substance use disorders.

Table 4. Item Performance.

Item	Sensitivity (%)	Specificity (%)
1. Blackouts	41.8	92.5
2. Used more than intended	70.1	80.9
3. Need to cut down	56.3	91.7
4. Use for feelings	54.4	86.9
5. Regret	41.0	96.0

Table 5. Performance of the Optimal Screening Strategy for the Split Samples and All Participants.

Study Phase	At Least One Affirmative Response to Items 2 or 3	Current DSM-III-R SUD Present*	Current DSM-III-R SUD Absent*	Totals	Sensitivity (%)	Specificity (%)
Phase 1	Yes	90	62	152	81.1	80.8
	No	21	261	282		
	Totals	111	323	434		
Phase 2	Yes	117	131	248	78.0	76.3
	No	33	421	454		
	Totals	150	552	702		
Total	Yes	207	193	400	79.3	77.9
	No	54	682	736		
	Totals	261	875	1,136		

Note: For equality of unconditional proportions of data from phases 1 and 2, $\chi^2 = 5.473$, 3 *df*, $P = .140$.
DSM-III-R—*Diagnostic and Statistical Manual of Mental Disorders, ed 3, Revised*, SUD—substance use disorder.
*As measured by the Composite International Diagnostic Interview—Substance Abuse Module.[26]

An exhaustive analysis of combinations of items found that the best two-item screening strategy is to regard as a positive screening result a positive response to item 2 or item 3. Table 5 shows that this strategy results in a sensitivity of 79.3% (207/261) and a specificity of 77.9% (682/875). It also shows that the screening performance of these items, henceforth called the two-item conjoint screen (TICS), was consistent across the two phases.

Table 6 displays the performance of the TICS for various subgroups of the sample. The TICS was not as specific for participants who have never been married compared with the others ($P < .01$). Otherwise, demographic variables were not associated with sensitivity or specificity of the TICS.

The TICS performed well across most substances of abuse. It was more sensitive to dependence than abuse. It performed particularly well for the participants who had disorders involving marijuana or cocaine.

With the 23.0% prevalence of current substance use disorders in this sample, the positive predictive value (the probability that a person with a positive screening result has a disorder) was 51.8%, and the negative predictive value (the probability that a person with a negative screening result does not have a disorder) was 92.7%. Figure 1 shows the probabilities of current disorders given particular numbers of positive responses to the TICS. Among the 736 participants with a negative TICS result, there was a 7.3% prevalence of disorders. Among the 230 participants who responded affirmatively to one but not both of the two items, there was a 36.5% prevalence of disorders. Among the 170 participants who responded affirmatively to both items, the prevalence of disorders was 72.4%.

In attempts to find a screen that is superior to the TICS, several logistic regressions were performed with additional items. Adding other screening items to the TICS, either singly or in combination, resulted either in minor, offsetting changes to the sensitivity and specificity or in very slight increases in both. Similar results were obtained when other clinical information was added to the logistic regressions, including episodes of drinking more than three drinks during the previous month, recent cigarette smoking, injuries from fights, stomach irritation or bleeding, long-lasting sadness or depression, and memory problems.

Validity Checks

When the Marlowe-Crowne social desirability score and a dichotomous TICS result were regressed against current substance use disorder, the regression term for social desirability was significant ($P = .0001$). Addition of the Marlowe-Crowne score to the regression equation, however, did not substantially improve the sensitivity and specificity in predicting a current disorder.

Table 7 shows the responses to the final questionnaire on comfort and candor. Most (84.1%) of the participants reported being very or mostly comfortable with the interviewer. Few (11.8%) reported withholding any information.

Of the 249 participants who were asked to undergo urine drug screening, 18 did not submit urine. Six of these 18 patients had just produced urine specimens as part of their office visits, 10 stated that they had urinated just before their ap-

Table 6. Sensitivity and Specificity of the Two-Item Screen for Demographic and Clinical Subgroups.

Subgroup	No.	Sensitivity (%)	Specificity (%)
Sex			
Male	365	82.6	74.2
Female	771	76.4	79.4
Age, years			
18–29	302	81.6	73.5
30–39	358	82.3	74.8
40–49	295	72.7	80.8
50–59	181	73.9	84.8
Race			
African-American	138	84.1	80.9
Asian-American	12	100.0	90.9
White	946	78.5	77.7
Hispanic, Latino	20	80.0	80.0
Native American	8	75.0	50.0
Other	11	50.0	55.6
Missing	1	—	100.0
Insurance status			
Private insurance	778	78.7	77.7
Public insurance	192	79.4	77.4
No insurance	63	85.0	79.1
Other	103	78.1	80.3
Level of education			
Less than high school	150	84.3	79.8
High school graduate or equivalent	538	77.6	78.0
Associate, vocational, technical degree	145	80.0	71.7
Bachelor's degree	188	81.3	78.8
Advanced degree	113	73.7	81.9
Missing	2	—	100.0
Marital status			
Never married	316	81.4	70.3
Currently in first marriage	515	76.9	81.2
Other	305	79.1	79.0
Presence of disorder			
Alcohol	226	81.0	NA
Sedative, tranquilizer	20	65.0	NA
Stimulant	9	77.8	NA
Marijuana	63	90.5	NA
Cocaine	33	90.9	NA
Hallucinogen	11	72.7	NA
Opioid	27	66.7	NA
Inhalant	1	100.0	NA
Any drug	101	82.2	NA
Severity of disorder			
Dependent on at least one substance	197	85.8	NA
Abuse, but no dependence	64	59.4	NA
Alcohol, drug involvement in disorder			
Alcohol, but no drug	160	77.5	NA
Drug, but no alcohol	35	68.6	NA
Alcohol and at least 1 other drug	66	89.4	NA
Number of disorders			
1 substance	192	75.5	NA
2 substances	37	94.6	NA
3 substances	18	88.9	NA
More than 3 substances	14	78.6	NA

Note: Disorder refers to a DSM-III-R diagnosis of substance abuse or substance dependence.[30]
NA = not applicable.

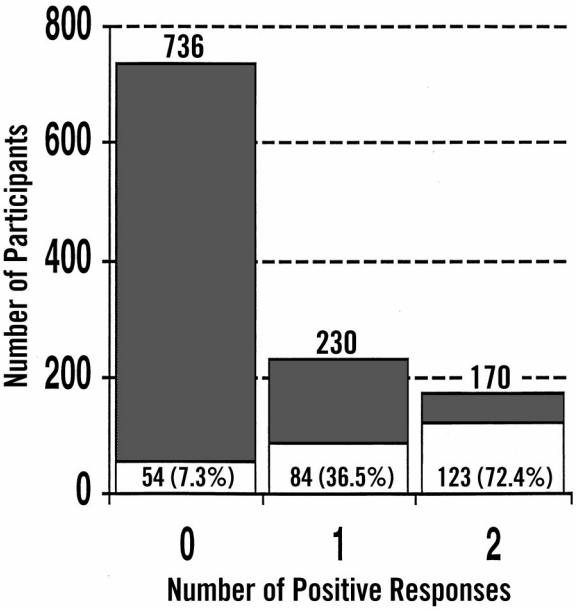

Figure 1. The probability of a current substance use disorder given responses to the two-item conjoint screen. Bar height indicates the number of participants who responded affirmatively to TICS items. The lower white portion of each bar and numbers within show participants who had a substance use disorder according to the Composite International Diagnostic Interview–Substance Abuse Module. Percentages are posttest probabilities of having a substance use disorder given the response pattern.

pointments, 2 were disabled and refused because of great inconvenience, and 1 refused without further explanation. Of the 231 participants who underwent drug screening, 195 (84.4%) had negative results, 33 (14.3%) were positive for one substance, and 3 (1.3%) were positive for two substances.

Eleven participants (4.8%) had positive screening results for prescribed medications that they reported having taken during the past month (benzodiazepine, opiates, propoxyphene, and amphetamines), and 4 of these participants had substance use disorders according to the CIDI-SAM. Eleven participants (4.8%) had positive urine-screening results for nonprescribed substances that they reported having taken during the past month (7 for marijuana, 3 for cocaine, and 1 for opiates), and 7 of these participants had disorders according to the CIDI-SAM. Seventeen participants (7.4%) had positive findings for nonprescribed substances that they did not report having taken during the past month (10 for marijuana, 2 for cocaine, 2 for opi-

Table 7. Participants' (n = 1136) Reports On Their Candidness When Responding to the Two-Item Conjoint Screen (TICS) and Associations with Current Substance Use Disorders (SUDs).

Response	Frequency No. (%)	Frequency of Current SUDs No. (%)	Sensitivity of the TICS %
Comfort with the interviewer			
Very comfortable	612 (53.9)	129 (21.1)	79.1
Mostly comfortable	343 (30.2)	99 (28.9)	80.8
Mostly uncomfortable	24 (2.1)	4 (16.7)	100.0
Very uncomfortable	152 (13.4)	28 (18.4)	71.4
Openness about alcohol use			
Told all	1,062 (93.5)	239 (22.5)	77.4
Held back a little	65 (5.7)	20 (30.8)	100.0
Held back a lot	2 (0.2)	1 (50.0)	100.0
Openness about alcohol-related problems			
Told all	1,080 (95.1)	236 (21.9)	77.5
Held back a little	47 (4.1)	23 (48.9)	95.7
Held back a lot	2 (0.2)	1 (50.0)	100.0
Openness about drug use			
Told all	1,087 (95.7)	241 (22.2)	78.0
Held back a little	38 (3.3)	17 (44.7)	94.1
Held back a lot	4 (0.4)	2 (50.0)	100.0
Openness about drug-related problems			
Told all	1,091 (96.0)	239 (21.9)	78.2
Held back a little	34 (3.0)	20 (58.8)	90.0
Held back a lot	3 (0.3)	1 (33.3)	100.0
Aggregate groups on openness			
Told all for each content area	994 (87.5)	203 (20.4)	74.4
Held back a little for at least one content area, but did not hold back a lot for any item	129 (11.4)	55 (42.6)	96.4
Held back a lot for at least one content area	5 (0.4)	2 (40.0)	100.0

Note: Four to 7 participants provided no response for each item. Interpretation of first row of table is as follows: 612, or 53.9%, of the 1,136 participants reported being very comfortable with interviewer; 129 of 612 had a current substance use disorder as ascertained by the CIDI-SAM. For those participants who reported being very comfortable with the interview, sensitivity of TICS was 79.1%.

ates, and 1 for barbiturates, 1 for propoxyphene, and 1 for amphetamines), and 3 of these had disorders according to the CIDI-SAM. Of the 231 participants who underwent urine drug screening, 14 participants had discrepancies between their urine drug-screening results and their reported recent substance use and, according to the CIDI-SAM, did not have a current substance use disorder. Thus, there were 217 participants whose urine drug-screening results did not suggest the possibility of a disorder that was unrecognized by the CIDI-SAM. For these 217 participants, the two-item screen was 83.0% sensitive and 82.3% specific, which is similar to the results for all participants.

Next, the 232 participants were removed from the analysis who had negative CIDI-SAM findings but either had positive urine-screening results for drugs they did not report taking, were asked but refused to undergo a drug screening test, reported being mostly or very uncomfortable with the interviewer, or reported having held back any information. For the 904 remaining participants, for whom there was no suggestion of withholding information, the TICS was 80.1% specific, which is similar to the results for all participants.

Discussion

In previous studies of conjoint screening questionnaires on a convenience sample of primary care patients[24] and a random sample of medical, surgical, and orthopedic inpatients,[17] three of the CAGE questions adapted to include drugs (CAGE-AID) exhibited sensitivity and specificity rates of approximately 70%. The current study tested the

criterion validity of conjoint items developed de novo with the assistance of focus groups of addiction professionals, patients with substance use disorders in remission, and patients with current disorders. With one positive response taken as a positive screening result, two of the items yielded a sensitivity and specificity of nearly 80% for current alcohol or drug abuse or dependence, excluding nicotine. These two questions—"In the last year, have you ever drunk or used drugs more than you meant to?" and "Have you felt you wanted or needed to cut down on your drinking or drug use in the last year?"—can be integrated quickly and easily into routine clinical interviews. Adding other items or pieces of clinical information to the screen did not result in substantial improvement.

There were several strengths regarding the internal validity of this study. The sample was drawn randomly from a population of primary care patients, and the response rate was high. The criterion standard for substance use disorders was a state-of-the-art, well-validated diagnostic interview, administered by trained and monitored interviewers. Although self-report can be susceptible to some inaccuracy, it has been found to be the best indicator of substance use disorders.[34–39] It is thought to be particularly valid when confidentiality is likely, when the participants have no reason to believe that providing accurate information could hurt or help them, and when there might be subsequent substantiation of some of their information,[39] as in the current study.

Several findings of this study lend credence to the main results. The similarity of findings between the split samples is reassuring. The prevalence of disorders affords some confidence that few diagnoses were missed by the criterion standard. Most of the participants reported, by a questionnaire not seen by their interviewers, that they were comfortable with the interviewers, and very few reported having withheld information on their substance use and related consequences. Few participants had urine drug-screening results that suggested the possibility of an unrecognized disorder. The results on the performance of the TICS were not substantially changed when the analysis was repeated without participants who might have withheld information.

The generalizability of these results remains unknown. When the sensitivity and specificity of a screening test are constant, the predictive values of the test will vary among populations with different prevalence rates of disorders. Lower prevalence rates translate to lower positive predictive values and higher negative predictive values. For populations with higher prevalence rates, the inverse is true. Furthermore, sensitivity and specificity rates, themselves, can vary among populations. Generalizability is supported but not assured by the similar performance of the TICS across many demographic subgroups in the one city from which participants were drawn. Nevertheless, replicating this study on other clinical populations would be useful.

It is instructive to compare TICS with other substance abuse screening devices. The original 25-item Michigan Alcoholism Screening Test (MAST) and its shortened analogs of 10 to 13 items were among the first alcohol screens developed. Despite their length, studies have suggested that they are no more accurate than the four CAGE questions at detecting current alcohol disorders.[24,40,41] Reports of the absolute accuracy of the CAGE, however, are variable, with sensitivity rates ranging from 60% to 95%, and specificity rates ranging from 40% to 95%.[21]

In 1988, two alcohol-screening items were recommended: "Have you ever had a drinking problem?" and "When was your last drink?," with a recency of 24 hours or less considered a positive response to the latter question.[42] These two items were reported to be highly sensitive and specific for lifetime alcohol problems. The criterion standard for this study was the MAST, however, which is itself a screen with only limited validity. The accuracy of this two-item alcohol screen relative to a more acceptable criterion standard is unknown.

The length of the 10-item Alcohol Use Disorders Identification Test (AUDIT) and the need to administer it in writing are potential reasons for the unpopularity of the AUDIT in the United States relative to the CAGE questions. For detecting current alcohol disorders in a primary care sample, the accuracy of the AUDIT is comparable to that of the TICS.[43,44] The AUDIT is touted as especially useful in detecting mild, early alcohol problems because of its direct questions on the quantity and frequency of alcohol use. These direct questions, however, might not serve as a useful prototype for a conjoint screen because of the demonstrated lack of sensitivity of direct questions on drug use.[6] Interestingly, when a measure of recent binge drink-

ing was added to the TICS, there was no substantial improvement in sensitivity or specificity.

Like the CAGE, the TICS can easily be administered verbally from memory and incorporated into medical interviews. Compared with the CAGE, the TICS has similar accuracy, is briefer, and is intended to screen for current alcohol and drug disorders rather than lifetime alcohol disorders. Compared with other screens for drug problems,[11–15] the TICS is briefer, includes a focus on alcohol, and has similar or better sensitivity and specificity.

The clinical utility of screening devices is best characterized, not by the sensitivity or specificity, but by predictive values and likelihood ratios. In this study, with a 23.0% current prevalence of substance use disorders, the negative predictive value of the TICS was 92.7%, indicating that only 7.3% of those with a negative screening result have a substance use disorder. The positive predictive value was 51.8%, indicating that slightly more than one half of persons with a positive TICS actually have a disorder. More specifically, one positive response indicated a 36.5% chance of a disorder, whereas two positive responses indicated a 72.4% chance. Another way to interpret the TICS involves likelihood ratios, which provide a ratio of the odds of having the condition to the odds of not having the condition, given the test result. Multiplying the pretest odds and the likelihood ratio yields the posttest odds. For 0, 1, and 2 positive responses to the TICS, the respective likelihood ratios are 0.2654, 1.93, and 8.77. Thus the TICS allows the rapid classification of primary care patients of ages 18 through 59 years into three distinct risk groups for alcohol and drug problems.

It is important to emphasize that the TICS can produce false-positive results. Thus, clinicians must not assume that all patients with positive screening results have current substance use disorders. Positive screening findings are useful as prompts to perform diagnostic assessments, as described elsewhere[22,23] or to refer patients for such assessments. To reduce the false-positive rate of the TICS, one might wish to regard two affirmative responses as the criterion for a positive screening test. Although doing so would result in an improved specificity of 94.6%, the corresponding drop in sensitivity, to 47.1%, means that more than one half of those patients with alcohol or drug problems would be missed. Thus, clinicians are advised to regard one or more affirmative responses as a positive screening result and to pursue more detailed diagnostic assessments for patients whose test results are positive.

In summary, this study suggests that two screening questions can select for nearly 80% of young and middle-aged adults who have substance abuse or dependence. Further studies would help to determine whether these results generalize to populations of different regions and cultures, whether the accuracy of the TICS would differ when administered in clinical practice rather than a confidential study, and whether conjoint screening for alcohol and drug problems can result in improved health, social, and economic outcomes.

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