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Opportunistic screening for alcohol use disorders in primary care: comparative study

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Abstract

Objective To evaluate the efficacy and relative costs of different screening methods for the identification of alcohol use disorders in an opportunistic screening programme in primary care in the United Kingdom.

Design Comparative study.

Setting Six general practices in south Wales.

Participants 194 male primary care attendees aged 18 or over who completed an alcohol use disorders identification test (AUDIT) questionnaire.

Main outcome measures Scores on alcohol use disorders identification test and measures of γ -glutamyltransferase, aspartate aminotransferase, per cent carbohydrate deficient transferrin, and erythrocyte mean cell volume. Hazardous alcohol consumption, weekly binge consumption, and monthly binge consumption were ascertained using the time line follow back method over the previous 180 days. Alcohol dependence was determined using the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition. Unit costs were established from published resource references and from actual costs of analysing the biochemical tests.

Results A significant correlation was observed between alcohol consumption and score on the alcohol use disorders identification test (Pearson's correlation coefficient $r = 0.74$) and measures of γ -glutamyltransferase ($r = 0.20$) and per cent carbohydrate deficient transferrin ($r = 0.36$) but not aspartate aminotransferase ($r = 0.08$) or erythrocyte mean cell volume ($r = 0.02$). The alcohol use disorders identification test exhibited significantly higher sensitivity, specificity, and positive predictive value than all of the biochemical markers for hazardous consumption (69%, 98%, and 95%), weekly binge consumption (75%, 90%, and 71%), monthly binge consumption (66%, 97%, and 91%), and alcohol dependence (84%, 83%, and 41%). The questionnaire

was also more cost efficient, with a lower cost per true positive for all consumption outcomes.

Conclusion The alcohol use disorders identification test questionnaire is an efficient and cost efficient diagnostic tool for routine screening for alcohol use disorders in primary care.

Introduction

Primary care is viewed as the most promising location to offer brief interventions aimed at reducing excessive alcohol consumption,¹ yet to offer such interventions, general practitioners need access to screening instruments that are high in sensitivity and specificity, quick and easy to apply, and cost effective.

Several studies have questioned the value of measuring traditional biochemical markers of excessive alcohol consumption.^{2,3} The alcohol use disorders identification test (AUDIT) was developed as a short screening instrument for the identification of hazardous, harmful, or dependent alcohol users.^{4,5}

We evaluated the sensitivity, specificity, and positive predictive value of the test and biochemical markers in the context of an opportunistic screening programme in primary care. We also carried out an economic analysis to establish the relative costs per true positive for each of the screening methods.

Methods

Research nurses asked male attendees in primary care to complete an alcohol use disorders identification test questionnaire embedded within a general lifestyle questionnaire while awaiting appointments in six general practices in south west Wales.

All patients, irrespective of score, were invited to take part in a more detailed assessment. Those who

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consented were interviewed by a researcher for frequency and quantity of alcohol use in the previous 180 days using the time line follow back method.⁶ This established the number of weeks in the previous 180 days the patient had exceeded the “safe level” of alcohol consumption (>21 units of alcohol in any one week) and the frequency with which the patient engaged in binge alcohol consumption (>8 units of alcohol in any one day) in the past 180 days. This was used as a criterion for hazardous and binge alcohol consumption.

The researcher established a diagnosis of alcohol dependence by administering the alcohol dependence element of the short form composite international diagnostic interview.⁷ Blood samples were taken by venepuncture and assessed for γ -glutamyltransferase, aspartate aminotransferase, per cent carbohydrate deficient transferrin, and erythrocyte mean cell volume.

Instruments

The time line follow back method is a valid method for deriving quantity and frequency of alcohol consumption.⁶ Alcohol consumption is standardised into units of ethanol consumption.

The alcohol use disorders identification test is a 10 item self completed questionnaire that addresses frequency of alcohol consumption, alcohol related problems, and dependence symptoms.⁴⁻⁸ The questionnaire was embedded in a general lifestyle questionnaire. Each item is scored from 0-4. A score of ≥ 8 indicates hazardous alcohol consumption and has high levels of sensitivity (92%) and specificity (94%) for identifying alcohol use disorders.⁵

The alcohol dependence section of the short form composite international diagnostic interview assesses seven symptoms of alcohol dependence. A score of 3 or more indicates alcohol dependence.

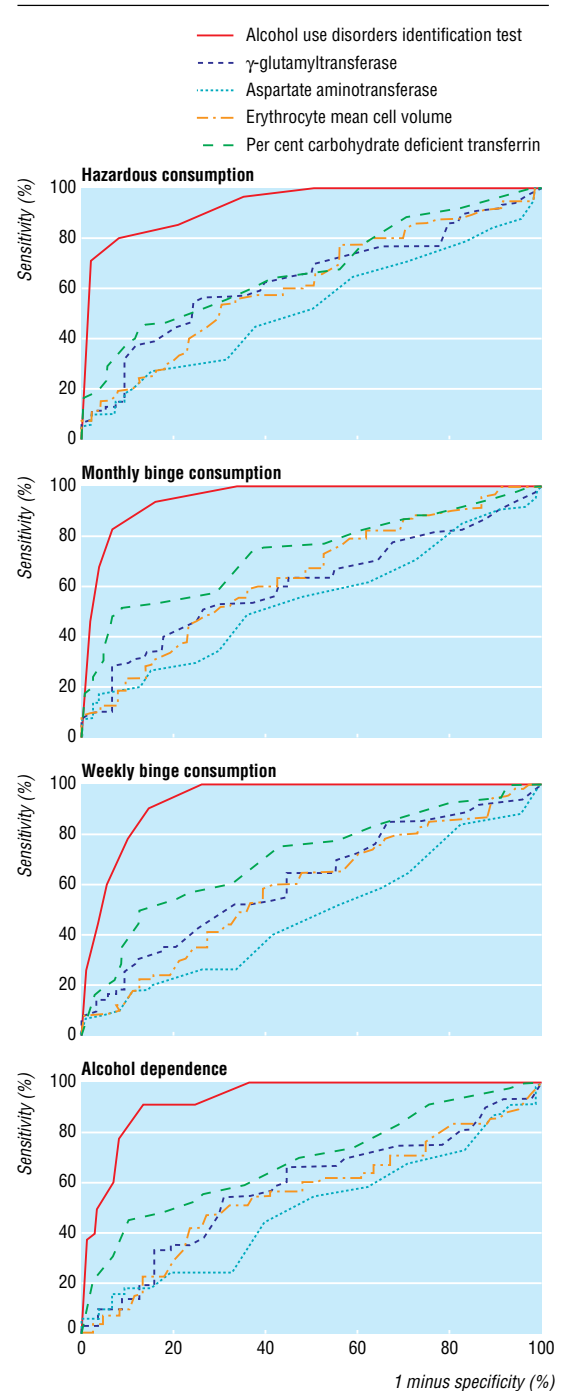
Statistical analysis

As the patients were stratified by whether their test score was < 8 or ≥ 8 , with different sampling fractions in the two strata, stratification was allowed for in the analysis using the svy commands of Stata. We used correlation after applying normalising transformations to compute linear associations between quantity of alcohol consumed, standard drinks consumed per drinking day and questionnaire score, γ -glutamyltransferase, aspartate aminotransferase, per cent carbohydrate deficient transferrin, and erythrocyte mean cell volume. The ability of tests to predict alcohol consumption was tested by logistic regression. We constructed receiver operating characteristic curves to explore the accuracy of the tests in identifying hazardous alcohol consumption, weekly or monthly binge consumption, and alcohol dependence. This was done by expanding the sample to give true proportions in each stratum. We investigated the accuracy of each test method in each scenario by calculating sensitivity, specificity, and positive and negative predictive values.

We carried out an economic analysis of each screening method by establishing unit costs and a cost per true positive for each screening method.

Results

Overall, 1794 men in six general practices in south west Wales completed the alcohol use disorders identification test questionnaire. Of these, 447 (24.9%) tested



Receiver operating characteristic curve indicating screening properties of alcohol use disorders identification test, γ -glutamyltransferase, aspartate aminotransferase, per cent carbohydrate deficient transferrin, and erythrocyte mean cell volume for hazardous alcohol consumption, monthly binge consumption, weekly binge consumption, and alcohol dependence in 194 male attendees in primary care

positive for alcohol use disorders and 112 (25% of patients with a positive test result) agreed to take part. We randomly sampled 450 of the 1347 patients with a negative result, of whom 82 (18% of patients with a negative result sampled) agreed to take part in the study.

Fifty patients (26%) fulfilled the criteria for alcohol dependence, 121 (62%) fulfilled the criteria for hazardous alcohol consumption, 117 (60%) engaged in binge

alcohol consumption at least monthly, and 4 (2%) were abstinent. See bmj.com for patients' personal and alcohol consumption variables.

The estimated prevalence of drinking behaviours in the general practice population for hazardous alcohol consumption was 34% (95% confidence interval 28% to 40%), monthly binge consumption 35% (29% to 42%), weekly binge consumption 24% (19% to 29%), and alcohol dependence 12% (9% to 16%).

Significant correlations were found between alcohol consumption, measured as number of standard drinks consumed per drinking day (standard drink equates to 8 g of ethanol) over the previous 180 days, and questionnaire score (Pearson's correlation coefficient $r=0.74$; $P<0.001$), γ -glutamyltransferase ($r=0.20$; $P=0.04$), and per cent carbohydrate deficient transferrin ($r=0.36$; $P<0.001$) but not aspartate aminotransferase ($r=0.03$; $P=0.7$) or erythrocyte mean cell volume ($r=0.02$; $P=0.9$). Screening characteristics of the questionnaire and biochemical markers were tested against the criteria for hazardous alcohol consumption, monthly and weekly binge consumption, and alcohol dependence through the construction of receiver operating characteristic curves (table and figure) and the calculation of areas under the curve. The questionnaire was better than any of the biochemical predictors and had a highly significant relation with alcohol consumption for all classifications. None of the significant biochemical predictors remained significant after controlling for questionnaire score. The questionnaire score also produced far higher areas under the curve than any of the biochemical markers for all classifications. The test had

areas under the curve of 0.94 to 0.96 for all classifications, whereas only per cent carbohydrate deficient transferrin produced any area above 0.70, and aspartate aminotransferase produced some areas in the region of 0.50.

The questionnaire score cut-off of ≥ 8 had moderate sensitivity (69%) for identifying hazardous alcohol consumption, with high specificity (98%) and positive predictive value (95%). The questionnaire performed almost as well in identifying monthly binge consumption, although its sensitivity, specificity, and positive and negative predictive values were lower. For weekly binge consumption the specificity fell to 90% and positive predictive value fell correspondingly, although the sensitivity increased to 75%. For alcohol dependence, sensitivity was highest at 84%, but specificity was lowest at 83%, and the positive predictive value fell to 41%. Negative predictive value was highest for this classification, rising to 97%. Hence a positive questionnaire score is a good indication of hazardous alcohol consumption and a negative score is a good indication of no alcohol dependence.

Producing a copy of the test questionnaire embedded within a general lifestyle questionnaire cost 10p, and administering and analysing the questionnaire took five minutes of practice nurse time. Using 2000-1 prices, the cost of five minutes of practice nurse advice was £1.10. Assuming that a room measured 12 m² the cost of screening in such premises was 50p per patient. The total cost of administering the test was estimated at £1.70 per patient. The cost of taking and analysing the biochemical markers was estimated using a standard

Area under receiver operator curve, sensitivity, specificity, and positive predictive value of alcohol use disorders identification test (AUDIT), γ -glutamyltransferase (GGT), per cent carbohydrate deficient transferrin (%CDT), aspartate aminotransferase (ASAT), and erythrocyte mean cell volume (MCV) for hazardous alcohol use, monthly binge consumption, weekly binge consumption, and dependence in 194 male attendees in primary care

Variable	P value for logistic regression	P value after controlling for AUDIT score*	Area under curve	Sensitivity % (95% CI†)	Specificity % (95% CI†)	Positive predictive value % (95% CI†)	Negative predictive value % (95% CI†)
Hazardous alcohol use:							
AUDIT (≥ 8)	<0.001	—	0.94	69 (57 to 81)	98 (97 to 100)	95 (91 to 99)	86 (78 to 94)
GGT (>55 IU/l)	0.06	0.01	0.64	37 (26 to 47)	72 (62 to 83)	41 (28 to 54)	69 (61 to 77)
ASAT (>50 IU/l)	0.09	0.3	0.53	20 (11 to 29)	80 (71 to 89)	34 (19 to 50)	66 (59 to 73)
%CDT (>2.5%)	<0.001	0.7	0.68	47 (36 to 58)	71 (60 to 82)	46 (34 to 58)	72 (64 to 80)
MCV (≥ 95 fl)	0.03	1.0	0.62	32 (21 to 43)	71 (60 to 82)	36 (23 to 50)	67 (59 to 74)
Monthly binge consumption:							
AUDIT (≥ 8)	<0.001	—	0.96	66 (54 to 78)	97 (95 to 99)	91 (86 to 97)	84 (76 to 92)
GGT (>55 IU/l)	0.06	0.08	0.62	42 (31 to 54)	76 (65 to 86)	49 (34 to 63)	71 (63 to 78)
ASAT (>50 IU/l)	0.08	0.3	0.55	26 (16 to 37)	82 (73 to 92)	45 (27 to 63)	67 (60 to 74)
%CDT (>2.5%)	<0.001	0.3	0.73	59 (48 to 71)	76 (66 to 86)	57 (44 to 71)	78 (70 to 85)
MCV (≥ 95 fl)	0.002	0.2	0.64	36 (24 to 47)	71 (60 to 82)	40 (26 to 54)	67 (59 to 75)
Weekly binge consumption:							
AUDIT (≥ 8)	<0.001	—	0.94	75 (61 to 90)	90 (88 to 93)	71 (63 to 80)	92 (86 to 98)
GGT (>55 IU/l)	0.1	0.7	0.62	44 (32 to 57)	74 (64 to 83)	35 (22 to 47)	81 (75 to 86)
ASAT (>50 IU/l)	0.004	0.2	0.49	29 (16 to 42)	82 (74 to 90)	34 (17 to 50)	78 (73 to 84)
%CDT (>2.5%)	0.002	0.7	0.72	61 (49 to 74)	71 (62 to 81)	41 (29 to 53)	85 (80 to 91)
MCV (≥ 95 fl)	0.04	0.5	0.59	31 (19 to 43)	69 (59 to 79)	24 (14 to 35)	76 (69 to 82)
Alcohol dependence:							
AUDIT (≥ 8)	<0.001	—	0.94	84 (66 to 100)	83 (81 to 86)	41 (32 to 50)	97 (94 to 100)
GGT (>55 IU/l)	0.5	0.004	0.59	32 (18 to 45)	69 (61 to 78)	13 (7 to 18)	88 (83 to 93)
ASAT (>50 IU/l)	0.4	0.04	0.50	19 (8 to 30)	80 (72 to 88)	12 (5 to 19)	88 (83 to 92)
%CDT (>2.5%)	0.03	0.7	0.70	57 (41 to 73)	68 (59 to 76)	20 (12 to 28)	92 (88 to 96)
MCV (≥ 95 fl)	0.5	0.2	0.57	28 (15 to 41)	70 (61 to 79)	11 (6 to 17)	87 (83 to 93)

*AUDIT $P<0.001$ in all regressions.

†Large sample estimates approximate for intervals including zero or 100%.

What is already known on this topic

The use of biochemical markers in identifying patients consuming alcohol at excessive levels has been questioned

A recent study highlights the low level of identification of alcohol use disorders in primary care

What this study adds

A short, self completed instrument in primary care—the alcohol use disorders identification test questionnaire—exhibited higher sensitivity, specificity, and positive predictive value, and cost less to apply than biochemical markers

cost of venepuncture of £9.00, using 2000-1 prices, divided by the number of tests ($n=4$) derived from a single sample and the real cost of analysis carried out in laboratories taking part in the study. The cost associated with each blood test was £5.25 for γ -glutamyltransferase and aspartate aminotransferase, £27.25 for per cent carbohydrate deficient transferrin, and £8.25 for erythrocyte mean cell volume.

The alcohol use disorders identification test questionnaire had the lowest costs associated with administration and interpretation. The test was the most cost efficient screening method for hazardous, monthly and weekly binge consumption, and dependent consumption. See bmj.com for the costs for screening 1000 men.

Discussion

A simple screening instrument, the alcohol use disorders identification test (AUDIT) questionnaire, is an effective and cost efficient means for identifying hazardous and harmful drinkers in the primary care setting who could benefit from brief interventions.

The test is a more efficient method for opportunistic screening in primary care than is measuring γ -glutamyltransferase, aspartate aminotransferase, per cent carbohydrate deficient transferrin, and erythrocyte mean cell volume, in terms of sensitivity, specificity, positive predictive value, and cost. Biochemical markers of alcohol consumption often have short half-lives and require sustained consumption of alcohol at high levels. As such they fail to address the underlying longer term drinking behaviours that constitute hazardous and harmful alcohol consumption.

A substantial evidence base exists for the efficacy of brief interventions in the primary care setting.⁹⁻¹⁵ A recent systematic review⁹ concluded that brief interventions are effective in reducing alcohol consumption at 12 months. Another study questioned the feasibility of opportunistic screening in primary care for excessive alcohol use,¹⁶ but our study indicates that the alcohol use disorders identification test questionnaire, completed by the patient and scored by a practice nurse, produces more true positive cases of excessive alcohol use than the studies included within their meta-analysis. Successfully implementing brief interventions in part depends on identifying those patients who are most likely to benefit.

We recognise that our study is limited by its focus on male attendees in primary care. We also recognise the possibility that those patients with a negative test

score had misreported their alcohol consumption and were less likely to consent to a more detailed examination. Although evidence suggests that this form of bias is limited,¹ our study was a pragmatic evaluation of screening instruments using real patients in a real NHS setting. In recruiting the sample for the study we stratified the population by alcohol use disorders identification test score. We took this stratification into account in the analysis.

The NHS should consider routine screening of all attendees in primary care. This requires appropriate training, resources, and incentives for staff. Identifying those patients who are likely to benefit from brief interventions will help to achieve targets set out in the national harm reduction strategy for England.¹⁷

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