Detecting alcohol consumption as a cause of emergency general medical admissions

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Summary

In a general medical unit 27% of 104 admissions and 17% of bed occupancy were attributed to alcohol consumption, although only 10 of these 28 patients had classical alcohol-related conditions. Questioning on the amount of alcohol consumed was the most accurate method of screening for these patients. The brief MAST questionnaire, mean red cell volume, γ-glutamyl transferase, aspartate transaminase and urate were all inadequate as screening tests. Only 13% of the admissions were defined as 'problem drinkers' on the brief MAST questionnaire, suggesting that harmful effects of alcohol are not confined to 'alcoholics'. Clinical suspicion and questions on the level of alcohol consumption are more efficient than questionnaire, biochemical or haematological screening tests in detecting alcohol-related medical problems.

Introduction

There are two separate reasons for enquiring into alcohol consumption of patients admitted to hospital. First, the admission may have been due directly or indirectly to excess alcohol. Secondly, a doctor has the responsibility of questioning every patient for habits (alcohol, tobacco and other drugs) which may endanger life and health.

There have been several British studies of alcohol consumption or problem drinking in patients admitted to hospital[1-4] or seen in casualty[5]. It is more difficult to estimate the proportion of admissions actually due to excess alcohol[6,7] because of the uncertainty and subjectivity of clinical judgment. We have therefore re-examined this problem, not only by estimating the proportion of admissions (and bed occupancy) resulting from excess alcohol, but also by evaluating various screening tests.

Methods

A series of 104 consecutive, new and unselected emergency admissions to a general medical firm in an inner city district general hospital were studied. Two periods (November–December 1983 and March–June 1984) allowed participation by two pairs of house officers. On admission, or within a few hours, the admitting doctor completed, with the patient, a questionnaire containing a brief Michigan Alcoholism Screening Test (brief MAST)[8], sections on demographic and social details and questions on quantity and frequency of alcohol consumption. This questionnaire took less than 5 minutes to complete.

Patients were asked how often they drank alcohol (most days, 3–4 times in a week, 1–2 times in a week,

2–3 times in a month, rarely, never); and how many units they usually had on a drinking day (8 or more, 5–7, 3–4, 1–2, not applicable). A range of alcohol consumption was calculated and the whole number nearest the middle of this range was taken as the individual's alcohol consumption in units per week. For those taking at least 8 units on a drinking day, only a minimum value can be given. One unit equals half a pint (280 ml) of beer, one measure of spirits or a glass of wine or sherry, and contains approximately 8 g of ethanol.

Alcohol consumption was considered excessive if greater than 20 units per week and very excessive if greater than 50 units per week. The brief MAST is positive with a score of 6 or more. Within 24 hours blood was taken for γ-glutamyl transferase (γ-GT), aspartate transaminase (AST), urate, mean red cell volume (MCV) and alkaline phosphatase (AP) where possible. Abnormal values were γ-GT >50 U/l for males, >32 U/l for females, AST >40 U/l, urate >0.4 nmol/l, MCV >100 fl, AP >140 U/l. At the time of discharge or death the house officer recorded the diagnosis, together with an opinion on whether the admission was likely (possibly or probably) or unlikely to be due to alcohol consumption. They were encouraged to use all information available, including discussion with consultant and registrar. Examination of the notes by independent assessors was not carried out because it was felt that personal and detailed knowledge of the individual patient was paramount in this assessment.

Comparison of age and length of stay was made using the Kruskal-Wallis test, a non-parametric method[9]. Comparison of the incidence of self-poisoning between sexes amongst alcohol-related admissions was made using Fisher's exact probability test. Both tests were applied in a two-tailed fashion.

Results

Of 104 admissions, 28 (27%) were thought likely to have been due to alcohol consumption. Only 10 of the 28 patients had problems commonly considered to be alcohol-related: 2 had acute intoxication and one had alcohol withdrawal, 2 had haematemeses from Mallory–Weiss tears, one had relapsing pancreatitis, one had alcoholic hepatitis, one had alcoholic chronic liver disease (with exacerbation of chronic obstructive airways disease) and 2 had seizures. The other 18 patients had problems less commonly attributed to alcohol. Nine had taken deliberate overdoses of other drugs in combination with alcohol. Six had chest infections or exacerbations of chronic obstructive airways disease in

which self-neglect due to alcohol was thought to be contributory. One patient had cardiac neurosis and another had obscure abdominal pain, both thought to arise from alcohol-related psychological problems. One had a duodenal ulcer to which his alcoholic lifestyle was thought to contribute. Amongst the 76 patients whose admission was unlikely to be due to alcohol, only 4 had taken overdoses and 18 had chest infections or exacerbations of chronic obstructive airways disease.

The prevalence of alcohol-related admissions was identical in the two sexes (16/60, 27%, in men; and 12/44, 27%, in women), but whereas 7 of 12 alcohol-related admissions in women were for self-poisoning with other drugs, only 2 of 16 men had this diagnosis ($P=0.03$). The median age was 65 years (mean 59, range 15–94) for admissions unlikely to be due to alcohol and 43 years (mean 43, range 15–72) for admissions likely to be due to alcohol ($P<0.002$). The median duration of stay was 7 days for patients whose admission was not attributed to alcohol, but only 3 days for those admitted with alcohol-related problems (mean values 9.8 and 5.5 days respectively, $P<0.002$). Thus although 27% of admissions were likely to be due to alcohol consumption, these patients occupied only 17% of bed-days.

Patients amongst the alcohol-related admissions taking overdoses will have biased the group to a younger age and shorter stay. However, even when patients admitted for self-poisoning are excluded, the median ages are 66 years for the non-alcohol-related admissions and 50 years for the alcohol-related admissions (means 60 and 49 years

respectively, $P<0.02$). The median lengths of stay, after excluding admissions for self-poisoning, were 7 days for non-alcohol-related admissions and 6 days for alcohol-related admissions (means 10.4 and 7.7 days respectively, $P<0.002$).

Screening tests have been compared with clinical judgment in Table 1. The single most efficient and most sensitive test was questioning on the level of consumption with a cut-off of 20 units per week. The brief MAST, MCV and questioning on consumption with a cut-off of 50 units per week are very specific, but of low sensitivity. Combining tests such that if either is positive the combination is said to be positive (Table 2) can improve sensitivity, but specificity is likely to fall. In an attempt to improve efficiency in this way the effect of various combinations of the most efficient tests, the brief MAST, questions on the amount of alcohol consumed and MCV, were examined. The efficiency is only marginally improved; γ-GT with a normal AP, even when combined with MCV, was not efficient.

The range of alcohol consumption is shown in Figure 1. The median was over 56 units per week for men and 18 units per week for women likely to have been admitted because of alcohol consumption. For those unlikely to have been admitted because of alcohol, the median was 2.5 units per week for men and 1 unit per week for women.

Twenty-six patients (25%) drank more than 20 units per week. The prevalence in male admissions was 17/60 (28%) and in females 9/44 (20%). Of these 26, 7 were not thought to have been admitted because of alcohol consumption. Twelve patients

Table 1. *Screening tests for alcohol-related general medical admissions*

Test		N	n	Sensitivity	Specificity	PPV	NPV	Efficiency
A	>20 units/week	104	28	0.91	0.75	0.75	0.91	0.87
B	>50 units/week	104	28	0.39	0.99	0.92	0.82	0.83
C	Brief MAST	104	28	0.46	0.99	0.92	0.83	0.85
D	MCV	94	21	0.43	0.96	0.75	0.85	0.84
E	AST	92	21	0.67	0.73	0.42	0.88	0.72
F	γ-GT	81	20	0.55	0.77	0.44	0.84	0.72
G	Urate	83	17	0.35	0.71	0.24	0.81	0.64

N = the number of patients tested with each method; n = number of those tested whose admission was, by the time of discharge or death, considered to be alcohol-related; sensitivity = frequency of positive test results in alcohol-related admissions; specificity = frequency of negative test results in non-alcohol-related admissions; PPV = predictive value of a positive test; NPV = predictive value of a negative test; efficiency = proportion of patients correctly classified by the test

Table 2. *Combinations of screening tests for alcohol-related general medical admissions compared to clinical judgment. For explanation see Table 1*

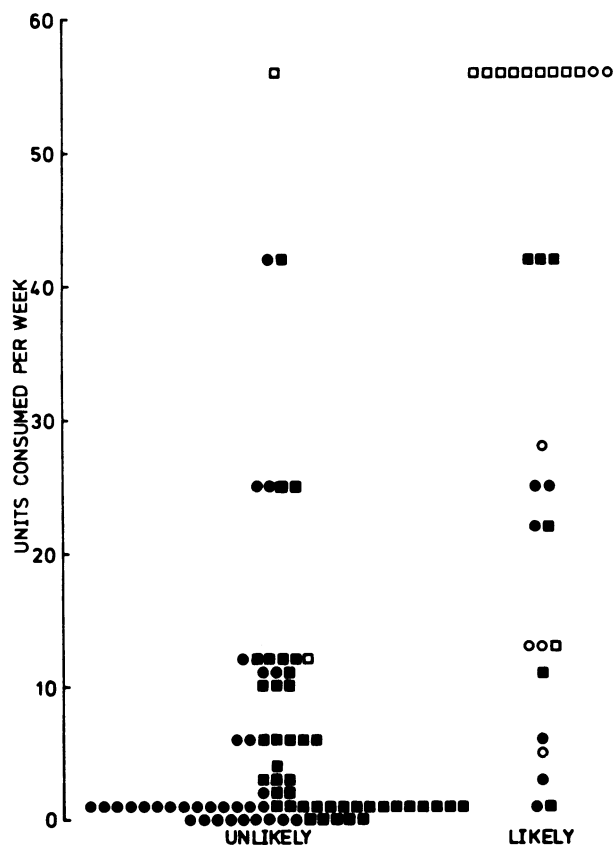| Test	N	n	Sensitivity	Specificity	PPV	NPV	Efficiency
A+C	104	28	0.79	0.92	0.79	0.92	0.88
A+D	94	21	0.86	0.86	0.64	0.95	0.86
A+C+D	94	21	0.86	0.84	0.62	0.95	0.85
B+C	104	28	0.60	0.97	0.89	0.87	0.88
B+D	94	21	0.71	0.96	0.83	0.92	0.90
B+C+D	94	21	0.81	0.93	0.77	0.94	0.90
C+D	94	21	0.66	0.94	0.77	0.90	0.88
F+normal AP	80	20	0.30	0.76	0.30	0.76	0.65
F+normal AP+D	80	20	0.65	0.73	0.45	0.86	0.71

Figure 1. Claimed alcohol consumption in patients admitted to a general medical unit, according to the likelihood of the admission being due to alcohol consumption. (Squares male, circles female. Open figures are lower estimates. See text for explanation)

drank very excessively, consuming over 50 units per week. The sex difference here was more marked with 10 of 60 (17%) male admissions and 2 of 44 (5%) female admissions falling into this group. Of those drinking very excessively, 5 had diagnoses often associated with alcohol consumption, 2 having Mallory–Weiss tears, one pancreatitis, one an alcoholic seizure and one alcohol withdrawal. Of the other 7, 3 were admitted with overdoses, 3 with chest infections and one had a duodenal ulcer. Only one of

these very excessive drinkers was not thought to have been admitted as a result of alcohol consumption, and he had a chest infection. Laboratory tests and the brief MAST were not sufficiently efficient to screen for these patients (Table 3), though the brief MAST was the most specific and efficient test.

The brief MAST is designed to detect 'problem drinkers'. Fourteen patients (13%) fell into this category. These included 9 of 60 male patients (15%) and 5 of 44 (11%) female admissions. The median age was 50 years (mean 50, range 15-76). Eight had diagnoses commonly associated with alcohol consumption: 2 with alcoholic seizures, 2 with acute intoxication, one with chronic liver disease (with chronic obstructive airways disease), one pancreatitis, one alcohol withdrawal and one Mallory–Weiss tear. Of the other 6, 4 were admitted because of an overdose, one with a chest infection and one with a duodenal ulcer. Laboratory tests and questions on alcohol consumption were not sufficiently efficient to screen for these patients (Table 4), though claimed alcohol consumption above 50 units/week was the most efficient.

Eleven patients who were thought to have been admitted as a result of alcohol consumption were negative on the brief MAST and claimed to drink less than 50 units/week. Of these patients, only one had a diagnosis commonly associated with alcohol consumption, viz., alcoholic hepatitis. Of the other 10, 4 had chest infections, 4 had taken overdoses, one had obscure abdominal pain and one had cardiac neurosis. The results of blood tests amongst this group are shown in Table 5.

Discussion

Alcohol was found to cause 27% of general medical admissions in Manchester 5 years ago[6], and 19% of male acute medical admissions in Glasgow 8 years ago[7]. Our estimate of 27% in London is similar, but because of their shorter stay our patients were responsible for 17% of bed occupancy. This shorter stay cannot be attributed to the young patients taking overdoses amongst the alcohol-related admissions, because even when these are excluded a significant difference remains. Our figures also gain

Table 3. Laboratory tests and the brief MAST questionnaire as screening tests in medical admissions for alcohol consumption greater than 20 units per week and greater than 50 units per week. For explanation see Table 1. In this table n = number of those tested whose alcohol consumption is greater than the cut-off

Test	N	n	Sensitivity	Specificity	PPV	NPV	Efficiency
> 20 units/week							
C	104	26	0.38	0.95	0.71	0.82	0.81
D	94	21	0.24	0.90	0.42	0.80	0.76
E	92	21	0.62	0.72	0.39	0.86	0.70
F	81	19	0.53	0.76	0.40	0.84	0.70
G	83	18	0.33	0.72	0.25	0.80	0.64
F + normal AP	80	18	0.33	0.85	0.40	0.82	0.74
> 50 units/week							
C	104	12	0.58	0.92	0.50	0.94	0.88
D	94	9	0.22	0.88	0.17	0.91	0.82
E	92	9	0.78	0.69	0.21	0.97	0.70
F	81	9	0.78	0.75	0.28	0.96	0.75
G	83	7	0.29	0.71	0.08	0.92	0.67
F + normal AP	80	8	0.50	0.85	0.27	0.94	0.81

Table 4. Laboratory tests and questions on amount of alcohol consumed as screening tests for 'problem drinkers' as defined by brief MAST. For explanation see Table 1. In this table n = number of people who were positive on the brief MAST

Test	N	n	Sensitivity	Specificity	PPV	NPV	Efficiency
A	104	14	0.71	0.82	0.38	0.95	0.81
B	104	14	0.50	0.94	0.58	0.92	0.88
D	94	10	0.40	0.90	0.33	0.93	0.85
E	92	10	0.80	0.70	0.24	0.97	0.71
F	81	10	0.50	0.72	0.20	0.91	0.69
G	83	10	0.25	0.71	0.08	0.89	0.66
F + normal AP	80	10	0.20	0.81	0.13	0.88	0.74

Table 5. The results of laboratory tests in patients thought to have been admitted as a result of alcohol consumption but who were negative on the brief MAST, claimed to drink less than 50 units/week and did not have a diagnosis typically associated with alcohol consumption

Test	No. positive	No. tested
D	4	8
E	3	8
F	3	7
G	3	8
Any of above	4	7

support from similar studies in London. In a general teaching hospital with a directly neighbouring catchment area, 16–27% of admissions were 'abnormal drinkers' using the CAGE questionnaire[1] compared to 13% in this study using the brief MAST. In a central London teaching hospital 25% of general medical admissions were 'problem drinkers', using a different questionnaire[2]. In Edinburgh 19–22% of admissions to a general medical unit, including gastroenterology and hepatology but not self-poisoning admissions, had current alcohol-related problems or previous treatment for alcoholism[3,4]. Thus, about one-quarter of the workload in acute general medicine arises from excess alcohol consumption, and despite regional variations in drinking behaviour this problem seems to be of a similar magnitude in Scottish and English cities.

Alcohol-related admissions are younger than other general medical patients[2,6]. This is partly due to admissions due to self-poisoning, though even when these are excluded a significant difference remains. In this study there was no male excess[5], probably because of the many women with deliberate self-poisoning with other drugs in combination with alcohol. There was, however, a marked male preponderance of those drinking over 50 units per week and a smaller male excess amongst those drinking over 20 units per week or defined as 'problem drinkers' by the brief MAST.

In this study 9 of 28 (32%) admissions which were thought to be due to alcohol consumption were cases of self-poisoning. This is similar to the figure of 43% found in Manchester[6]. Whilst self-poisoning is often ignored as an alcohol-related problem, there are several reasons why the relationship between alcohol consumption and self-poisoning should receive more attention. First, any alcohol-related admission represents a potentially preventable drain on the national health and the National Health Service, and identifying the problem may be the first step towards prevention. Secondly, it has sometimes been considered that such admissions are related to alcohol only as a 'once-off' consequence of heavy drinking, and that only heavy, regular drinkers develop medical problems. Even if that were the case, the common belief that heavy, regular drinkers do not take overdoses is untrue. Four of the 14 patients with a positive MAST questionnaire and 3 of the 12 patients drinking over 50 units/week had presented to the hospital as a result of self-poisoning. These patients are thus not only using limited health care resources, they are also providing us with an opportunity for intervention to prevent further medical, psychological and social consequences of their drinking[4].

There is no consensus on the cut-off level for excessive drinking. When a group of those involved in clinical alcohol research were asked what they felt was a safe upper limit for alcohol consumption, the median value quoted was 28–34 units/week for men and 14–20 units/week for women[10]. Asked the same question, general practitioners gave even lower values, 14–20 units/week for men and 7–13 units/week for women[11]. We have selected a relatively low level of 20 units per week for both sexes, similar to that quoted by the Health Education Council. The range of alcohol consumption shown in Figure 1 suggests that this is a reasonable figure, but the numbers are small around this middle range. How do our figures compare with the general population? In England and Wales 27% of men but only 3% of women consume more than 20 units of alcohol per week[12]. Amongst our general medical patients, 28% of men and 20% of women were imbibing at least this amount. Whilst there are many pitfalls in comparing figures from such disparate sources, the over-representation of women drinking this amount amongst medical admissions suggests that women consuming more than 20 units per week are at a greater risk of illness than their more abstemious counterparts. Conversely, the similar proportion of men consuming 20 units per week in the general population and amongst general medical admissions might suggest that this limit is too low for men. Some 6% of men and 1% of women consume more than 50 units per week[12] compared to 17% of men and 5% of women amongst our patients. The over-representation of these very excessive consumers amongst medical admissions confirms that such a large intake of alcohol is harmful. Further studies of this nature would be helpful in establishing an objective limit to advise patients and would be

better performed upon a less selected population, such as patients attending general practitioners or screening clinics.

None of the potential screening tests was efficient enough to be recommended for routine use. Urate, AST, MCV and γ-GT are correlated with alcohol consumption[13], but are an inadequate screen in psychiatric patients[14]. MCV and γ-GT are correlated with alcohol consumption in the normal male population[15] but have been shown to have poor sensitivity for alcohol-related problems in general medical patients[3]. It is not surprising that metabolic markers are inadequate as there are many routes to physical damage from alcohol, though metabolic routes have received most attention. The brief MAST is a good screening test in psychiatric patients[14], but was not so useful for detecting alcohol-related admissions in our patients. This emphasizes that physical harm from alcohol is not limited to 'alcoholics'. Questions on the level of alcohol consumption with a cut-off of 20 units per week came closest to being a good screening test, confirming the importance of a thorough alcohol history. It is possible that the decision to regard a person's admission as due to alcohol consumption may have been influenced by the declared amount of alcohol consumed. This would bias the apparent value of questions on alcohol consumption as a screening test for alcohol-related admissions. From Figure 1, however, it appears that the housemen were not readily deceived. They suspected many patients claiming low consumption and were ready to accept that some heavy drinkers had escaped the ravages of alcohol.

Combining tests with a reasonable specificity but generally poor sensitivity may raise the sensitivity, leading to an improvement in overall efficiency. Combining questions on alcohol consumption with a cut-off of 20 units per week with the brief MAST gave marginal improvement, and the brief MAST combined with MCV was also slightly better. The most efficient combination was questioning on consumption with a cut-off of 50 units per week, brief MAST and MCV. When more tests are combined the sensitivity may be brought a little higher but at the cost of reduced specificity, so combinations of larger numbers of tests were not explored. Similarly combinations in which each test must be positive for the combination to be positive were not examined, because the sensitivity, already poor for the individual tests, will tend to fall. The use of raised γ-GT with normal AP as a screening test was not useful, contrary to a previous report[16], and was improved by the additional use of MCV[16] but was still inadequate. Patients thought to have been admitted as a result of alcohol consumption but who are negative on the brief MAST, who claim to drink less than 50 units/week and do not have a typical alcohol-related diagnosis, are a group requiring particular consideration. It may be argued that clinical judgment has been mistaken and this cannot be disproved. However, in Table 5 it can be seen that half of these patients had at least one positive screening test, suggesting that they were suffering from the effects of alcohol consumption. The other reason for paying particular attention to this group of patients is that they may easily be missed. Table 5 shows that, although laboratory tests may not be useful in screening for alcohol-related admissions, they may still help the clinical judgment of the critical physician.

In summary, about one-sixth of bed occupancy but one-quarter of admissions to a general medical firm were likely to be due to alcohol consumption. They were all counselled, we hope with the benefit recently demonstrated[4]. It is more important than ever before that they should be detected. There is no good screening test; although questions on the level of alcohol consumption come closest, clinical suspicion remains paramount.

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