A PRAGMATIC RANDOMISED CONTROLLED TRIAL OF REFERRAL FOR BRIEF INTERVENTION FOR PATIENTS MISUSING ALCOHOL IN AN ACCIDENT AND EMERGENCY DEPARTMENT

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ABSTRACT

Background*.* Over a third of patients in Accident and Emergency Departments (AED) have consumed excessive alcohol prior to their presentation. While screening and brief intervention for hazardous drinking have been shown to be effective in other health care settings, competing demands and high patient turnover in this busy environment make intervention in an a challenging task.

Aim. To examine the effects and cost-effectiveness of referral for brief intervention from an Alcohol Health Worker (AHW) compared to an information leaflet on alcohol and health among patients found to be consuming excessive alcohol during their attendance at an AED.

Method. A single-blind, parallel-arm, randomised controlled trial. Patients were randomised in the AED after their medical needs had been attended to. Outcome data was collected by patient interview and examination of hospital records at 6 and 12 months.

Results. Five-hundred and ninety-nine patients were randomised over a 12-month period. Of 287 referred to the AHW 84 (29%) attended the appointment. One year later 384 (64%) of the sample were interviewed. At six months, those referred for an appointment with an AHW were consuming a mean of 59.7 units of alcohol per week compared to 83.1 units among those in the control arm of the trial ($t = -2.4$, $p = 0.02$). At twelve months those referred to the AHW were drinking a mean of 57.2 units per week compared to 70.8 in the control arm ($t= -1.7$, $p=0.09$). Those referred to the AHW had fewer re-attendances to the AED during follow-up (1.2 visits over 12-months compared to 1.7, $t= -2.0$, $p=0.046$). Cost-effectiveness acceptability curves suggest that there is over a 70% probability that referral to an AHW is more cost-effective than the control intervention.

Conclusions. Opportunistic identification and referral for brief intervention for alcohol misuse in an AED is feasible, results in lower levels of alcohol consumption over the following six months and reduces re-attendance rates at the AED. Short-term reductions in alcohol consumption associated with referral for brief intervention for alcohol misuse may benefit patients and reduce demand for AED services.

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BACKGROUND

It is estimated that over 14 million people a year are treated in Accident and Emergency departments (AED) in England [1]. Given the strong association between alcohol use and health related problems such as accidental injury and violence, it is not surprising that the rate of alcohol misuse among people attending AEDs is higher than that in the general population. As many as one in three attendees have consumed alcohol in the period immediately prior to their presentation and over two-thirds of attendances to AEDs after midnight may be alcohol related [2,3].

Previous work has shown that a person's motivation to reduce their alcohol intake is increased if they are able to make a link between excessive consumption and harm to themselves or others [4]. Such a link may be made particularly clear during an attendance at an AED. This, together with high rates of alcohol misuse among attendees, has led to calls for selective screening of alcohol misuse among people in AEDs [5]. However several important barriers to screening and intervention exist in this setting. Foremost among these are the limited time that is available to manage patients in AED and staff attitudes to opportunistic identification of alcohol misuse. AEDs are busy environments with high patient turnover and national requirements to reduce waiting times in AEDs have added to pressures to treat people as quickly and efficiently as possible [6]. Identifying and managing alcohol misuse in this environment is therefore a challenging task.

Work conducted in the AED at St Mary's hospital since 1988 has sought to facilitate the opportunistic identification and management of people who misuse alcohol [7,8,9,10]. Screening is conducted by the AED clinician who managed the person's health problems at the end of the consultation. A short screening instrument, the Paddington Alcohol Test (PAT), is used to identify those who are consuming alcohol at a level that may be hazardous to their health [8,11]. Any man drinking more than eight units of alcohol in any one session at least once a week, any woman drinking more than six units of alcohol once a week and any person who believes their attendance in the AED could be related to alcohol is designated 'PAT positive' (i.e. drinking hazardously). The PAT usually takes less than a minute to complete [8] and has high sensitivity and specificity when compared with longer screening tools that have been used in AED [12]. Research at St Mary's has demonstrated that the level of screening can be improved by targeting the use of the PAT on those who present with conditions that are most often associated with hazardous drinking. While doctors are encouraged to screen anyone they feel may be consuming excessive amounts of alcohol, they are asked to screen all those who present with the following nine conditions; falls, collapse, head injury, assault, gastrointestinal problems, 'unwell', psychiatric problems, cardiac symptoms and accidents. Patients presenting with these problems account for over three-quarters of all those who attend the department and are misusing alcohol [10]. Through the combination of focussed screening and regular audit of levels of staff screening, the department aims to routinely screen as many as 35% of all those who attend [10].

All those who are PAT positive are offered an appointment for brief intervention with an Alcohol Health Worker (AHW). It is estimated that as many as 60% of those offered an appointment attend [9]. AHWs have been employed at St Mary's AED since 1994 and currently work three mornings per week. All clients are booked in for 10.00 am and are seen in order of arrival. All AHWs are experienced mental health nurses who have undertaken specific training in counselling people who misuse alcohol and all have had at least 5 years experience of working with clients with alcohol problems. Each session with an AHW lasts approximately 30 minutes and takes place in a private room in the AED. AHWs interact with clients in a non-confrontational and client-centred way. Sessions include a review of the person's medical and alcohol history, their current alcohol consumption, previous attempts to reduce drinking, readiness to change and identification of possible methods for change. An assessment proforma is used to direct the session and facilitate note taking. A feed-back form is also completed for return to the referring AED clinician.

Randomised controlled trials conducted in general practices [13], hospital inpatient [14] and outpatient [15] settings have repeatedly demonstrated that brief interventions for alcohol misuse lead to decreases in the amount of alcohol that people consume. Meta-analysis of trials [16,17;18] conclude that brief interventions lead to reductions in alcohol consumption compared to no-treatment control groups. In addition to reducing levels of alcohol consumption, trials among hazardous drinkers have shown that brief interventions can lead to lower levels of hospital attendance related to injuries [14,19].

Several attempts have been made to evaluate the impact of brief interventions offered in AEDs. Two of these followed up small samples of people who received brief intervention for alcohol misuse following their presentation to an AED [9,20]. While both found that respondents stated they had reduced the amount of alcohol they consumed following their appointment, the rate of follow up was low and neither study included a control group so the impact that the intervention had was difficult to ascertain. A previous attempt to conduct a randomised control trial in an AED highlighted problems with screening and low rates of attendance for brief intervention among those found to be consuming excessive alcohol [21]. In this study only 2% of those found to be consuming excessive alcohol received the intervention. A randomised trial conducted in New England (USA) explored the efficacy of brief intervention among people attending an AED following an injury [22]. In this study research staff were employed to screen new patients who were then randomised to either brief intervention or standard care. One year later levels of alcohol consumption were lower in both groups but those randomised to brief intervention reported fewer negative consequences from drinking.

Evidence from primary care studies suggests that brief intervention for alcohol misuse may produce cost savings, including those associated with reduced attendance at AEDs [23,24]. However the cost and cost effectiveness of brief intervention in the AED have not been examined.

Available evidence suggests that brief intervention for alcohol misuse among people who attend AEDs may help to reduce the negative effects of excessive alcohol consumption. However the effect of routine screening and referral by people working in AEDs in the UK has not been tested in an controlled trial. At a time when there are numerous other pressures to improve care provided by AEDs, the effects and cost-effectiveness of referring people who misuse alcohol for brief intervention in this setting urgently needs to be quantified.

AIMS

Among people found to be drinking hazardously during an attendance at an AED we set out to;

1. Examine the effects of referral for brief intervention by an alcohol health worker (AHW) on levels of alcohol consumption at six and twelve months.
2. Examine the effects of referral on re-attendance in the AED, mental health and quality of life in the following year.
3. Calculate the direct and indirect costs and the cost-effectiveness of referral to an AHW as compared to no referral.

Primary hypothesis: Among those identified as hazardous drinkers in an Accident and Emergency Department, mean weekly alcohol consumption at 12 months would be lower among those referred for brief intervention from an Alcohol Health Worker than among those provided with a leaflet on alcohol and health.

Secondary Hypotheses: Levels of re-attendance in the AED with be lower and quality of life will be higher among those referred for brief intervention from an AHW. Referral to an AHW will be more cost -effective than provision of written information on alcohol and health.

METHOD

Study design

A single-blind, parallel group, pragmatic randomised controlled trial.

Sample

The sample was selected from those attending St Mary's AED between April 2001 and March 2002 and were identified as drinking hazardously according to the Paddington Alcohol Test [11]. Patients were selectively screened for hazardous drinking as part of routine clinical practice in the department (see background to the study). Study participants had to be conscious, aged 18 or over, able to speak English sufficiently well to complete study questionnaires and resident within Greater London. Those already in contact with alcohol services, those already included in the study and those who specifically requested help with alcohol problems were excluded from the study. All those who were ineligible to take part in the study were offered an appointment with the Alcohol Health Worker as per normal practice.

Recruitment

All those who were 'PAT positive' and met eligibility criteria for the study were informed that they were consuming alcohol at a level that may be harmful to their health and asked if they would be willing to receive a brief intervention aimed at helping them to reduce their current consumption. Those willing to accept brief intervention were then given verbal and written information about the trial. Written information consisted of a patient information sheet which provided details about the aims and methods of the study and details of a project helpline where further information could be obtained. Those who agreed to provide verbal consent were then randomised to experimental or control conditions.

During the planning stages of the study concerns were expressed about the context in which people were being asked to consent to take part in the trial. The amount of time people were given between being informed about the study and being asked whether or not they would take part was limited and a proportion of those who were recruited were likely to have consumed alcohol or other drugs prior to their treatment in the department. We therefore decided to attempt to contact all study participants within one week of their entry into the study in order to answer any queries they may have about the study and confirm that they were willing to participate. Participants who told us that they did not want to continue with the study at this point were excluded from follow-up assessments, however their details were included at baseline as part of our intention to treat analysis.

Local Research Ethics Committee approval was obtained prior to the start of data collection.

Randomisation

Allocation to experimental or control treatment was made using randomisation lists derived from a computer program. Equal numbers of participants were randomised to experimental and control treatment. Opaque envelopes marked with a unique patient identification number were prepared according to the randomisation list. Each envelope contained a copy of the health information leaflet and either; an appointment card asking the participant to re-attend for an appointment with the AHW (experimental treatment) or a blank card of the same dimensions and weight as the appointment card (control treatment).

Supplies of envelopes were maintained in box files throughout the AED. Regular training sessions for AED staff emphasised the importance of selecting the next available envelope on every occasion that a person was entered into the study.

Experimental and control treatment

All those who agreed to participate in the trial were given a copy of a leaflet "Think About Drink" [25] which describes what alcohol is and what it does, discusses the risks and benefits of drinking alcohol, and offers general advice on the consumption of alcohol including daily benchmark guides for men and women. A space on the back of the leaflet provides information about national organisations and help lines to which we added contact details for local alcohol support agencies.

In addition to this those randomised to the experimental arm of the trial were given an appointment card with the time and date of an appointment to see an AHW. AHWs visit the AED three mornings a week (Mondays, Wednesdays and Fridays), so the appointment was usually within 36 hours, and always within 72 hours of the patient's assessment in the AED. Those who attended the appointment received brief intervention from the worker. This consisted of approximately 30 minutes of assessment and discussion of current and previous drinking. AHWs take a client-centred and non-confrontational approach. During the course of the assessment clients may resolve ambivalence regarding their drinking and determine appropriate action. However in cases where the client does not display insight into the consequences of their use of alcohol, the AHW may offer feedback about safe levels of drinking and suggest a range of strategies aimed at reducing levels of consumption

In order to assess treatment fidelity during the course of the trial a researcher who was not involved in collecting follow-up data examined a random sample of 50 sets of notes made by AHWs. Evidence of assessment of drinking history, current patterns of consumption and information on / referral to other services was determined.

Assessment

Baseline assessment

In order to recruit study participants without impeding the work of clinicians in the AED we had to limit our collection of baseline data to demographic and clinical data collected as part of routine clinical practice. This comprised demographic data (the persons age, gender, their time and reason for presenting to the AED) and data collected as part of PAT screening (the number of units of alcohol consumed during a drinking session, and whether or not the person believed their attendance in the AED was related to alcohol use). While PAT data provided an indication of baseline alcohol consumption we were unable to measure drinking patterns, mental health or quality of life prior to or immediately after randomisation.

Six month follow up

Follow up interviews were conducted either by telephone or in person by a researcher blind to allocation status six months after the date of entry into the trial. Participants were told at the start of the interview that it was important that information about what type of treatment they had been offered in the AED was not discussed during the course of the interview. The following questionnaires were administered in the order listed below;

i) Paddington Alcohol Test. A four item questionnaire designed to identify hazardous alcohol consumption [8]

ii) Form 90 AQ. A 7-item questionnaire used to quantify alcohol consumption during the previous three months [26]

iii) General Health Questionnaire (GHQ-12). A widely used measure of general mental health status [27]

iv) Suicidal ideation and behaviour. We used three questions on suicidal ideation and behaviour, based on those used in the general household survey of psychiatric morbidity [28] to establish whether or not participants had thought that life was not worth living and/ or deliberately harmed themselves during the previous six months.

v) Service Utilisation Questionnaire. A service-use questionnaire was designed for the purpose of the study but based on a questionnaire designed for use in similar populations [29]. This was used to collect data on the use of all health, social and voluntary sector services, fire and criminal justice services, accommodation and productivity losses (time off work) during the six months following entry into the study.

Twelve month follow up

The PAT, Form 90-AQ, questions on suicidal ideation and behaviour and the service-use questionnaire were repeated at the 12-month follow-up. The following data were additionally collected at final follow-up:

i) Time Line Follow Back [30] and the *Steady Pattern Grid* [26] were used to obtain detailed information on alcohol consumption during the previous three months.

ii) Quality of Life. The EQ-5D [31], a five item questionnaire measuring mobility, self-care, usual activity, pain / discomfort and anxiety / depression, was used to assess participants quality of life.
iii) Re-attendance at the AED. Local AED records were examined to identify any evidence of study participants re-attending the department in the 12 months following randomisation.
iv) Attendance at appointment with AHW. Once all other data had been collected and prepared for data analysis, electronic and paper records of AHWs were examined in order to ascertain whether or not participants had attended an appointment with the AHW in the AED.

Sample size

Our sample size calculation was based on our primary hypothesis – differences in mean weekly alcohol consumption at 12 months. In the absence of reliable data on the impact of brief interventions in AEDs we used data from the primary care trial conducted by Wallace and colleagues [13]. This trial reported mean alcohol consumption at 12 months of 44.0 units (SD = 28.5) among those offered brief intervention and 55.6 units (SD = 32.2) among controls. However in this study the majority of those offered brief intervention received it, with 57.2% receiving at least half of the planned intervention that was offered. In the present study we estimated that 45% would receive the intervention. In order to take account of the smaller proportion of those in the experimental arm of the trial who would receive the intervention we decided that we needed sufficient numbers to detect a smaller difference in alcohol consumption at 12 months of 9.4 units per week (55.6 among controls and 46.2 among those in the experimental arm of the trial, with SD of 28.5).

A total sample of 388 patients would be required to have 90% power of detecting a difference of this magnitude using a 0.05% level of statistical significance. In order to take account of 30% loss to follow up we increased the sample size to 555.

Data management and analysis

Baseline data on alcohol consumption (measured using the PAT) and other routine clinical and demographic data were used to ascertain whether study groups differed. Next we examined the distribution of primary and secondary outcomes. We used data from the steady pattern grid and Form 90 AQ to calculate levels of alcohol consumption at 6 and 12 months. Our primary outcome measure was mean weekly alcohol consumption over a 12 week period measured at 12 month follow-up. Secondary outcome measures included mean weekly alcohol consumption over a 12 week period measured at 6 months, drinks per drinking day (measured at six and 12 months) and percentage days abstinent (at six and 12 months). We anticipated that these would not be normally distributed. Despite the skewed distribution of outcome data, we used ordinary parametric tests because this has the advantage of enabling inferences to be made about the arithmetic mean [32]. Non-parametric bootstrapping was used to assess the robustness of confidence intervals to non-normality of these outcome measures [33].

Differences in weekly alcohol consumption were compared among those receiving experimental and control treatment using univariate tests. Regression analysis was then conducted in order to take account of any differences in baseline alcohol consumption or other potential confounding factors. Multivariate models were built using forward stepwise regression. Differences in secondary outcome measures were examined in the same way. Data was analysed using SPSS (version 11.0).

Economic evaluation

A broad cost perspective was taken in order to assess the impact of brief-intervention on all service providing sectors, including health, social care, voluntary and criminal justice. Costs to the economy as a result of lost productivity were also calculated.

Established costing methods were employed to estimate the cost of the AHW intervention [34], using information from the alcohol health workers on staffing and the amount of time spent with each client. Calculations were based on a 30 minute intervention plus ten minutes spent on preparation, paperwork and referral and the intervention being delivered by experienced nurses in a hospital. The cost of the intervention was estimated to be £15.

Hospital costs were elicited from the Chartered Institute of Public Finance and Accountancy database [35] and NHS Reference costs [36]. Contacts with the police were costed using the Metropolitan Police Ready Reckoner [37] and the cost of time spent in prison was taken from the Prison Service Annual report [38]. All the costs above were specific to the local provider. National unit costs were used for all other services [39-41] but were weighted to take into consideration the higher costs associated with services in London. It was assumed that medication was prescribed in the cheapest generic form and unit costs were taken from the British National Formulary [42]. All unit costs were for the financial year 2001/02 and published costs were inflated to 2001/02 using the Retail Price Index or the Hospital and Community Health Service Index [41].

The primary economic analysis involved testing for differences in total costs incurred between study groups. Complete case analysis was used in the first instance and was based on the subjects with full data at both follow-ups. However commentators have criticised this approach as it reduces the potential power of the analysis and could bias results if the complete cases differ significantly from the original sample [43]. In order to take this into account, sensitivity analysis was used to explore the impact of including participants for whom only six-month follow-up data was available with the 12-month data estimated using the Last Value Carried Forward (LVCF) technique [44]. This technique involves the assumption that costs in the second six-month period were equal to costs in the first six-months after randomisation. As with the analysis of other outcomes, non-parametric bootstrapping was used to assess the robustness of confidence intervals to non-normality of the cost distribution [33].

Cost-effectiveness was considered by calculation of the incremental cost-effectiveness ratio (ICER) at 12 months between the experimental and control arms of the trial. The ICER is equal to the difference in cost divided by the difference in effects between the two groups. Effects were measured using the primary outcome measure – the number of units consumed on an average week. In common with recently published cost-effectiveness analyses in mental health [45;46], cost-effectiveness acceptability curves were used to represent statistical uncertainty around the ICER. Cost-effectiveness acceptability curves are a graphical representation of the probability that one intervention is cost-effective compared to another, over a range of possible values that a decision-maker may be willing to pay for a unit change in the outcome of interest (also known as the ceiling ratio).

RESULTS

Recruitment and follow-up

Five thousand two hundred and forty people were screened during the study period (see CONSORT diagram - Figure 1). Of these 1167 (22.3%) were identified as drinking hazardously using the PAT. Seven hundred and sixty three of these (65.4%) were willing to accept brief advice, of which 657 (86.1%) met study inclusion criteria. Most of those who did not meet inclusion criteria either requested to see an AHW or had addresses outside Greater London. Fifty eight people refused to take part in the study. The remaining 599 patients (91% of eligible patients) were randomised.

Four hundred and sixty eight (78%) of the sample were male and their ages ranged from 18 to 90 (mean 44 years). The group reported drinking between 3 and 94 units of alcohol per session (mean 22 units) and 69% believed that their attendance in the AED was related to alcohol. Of the 599 study sample 287 (47.9%) were randomised to experimental treatment and 312 (52.1%) to control treatment. Characteristics of those randomised to each arm of the trial are compared in table 1. Age, sex and measures of alcohol use were very similar among the two groups, though patients presenting to AED following accidents were more likely to be randomised to the control arm of the trial.

Of the 599 randomised participants, 55 (9.2%) withdrew consent to be contacted for follow-up interviews in the week after their entry into the study. At twelve month follow-up 384 interviews were completed (64% of the randomised participants, 71% of those who agreed to be followed up). The rate of follow-up in each arm of the trial was similar – 65.8% of those in the experimental arm of the trial and 63.5% of those in the control arm. Characteristics of those who were and were not followed up at 12 months are presented in table 2. While age, sex and level of alcohol consumption were similar among both groups a greater proportion of those who were not followed up stated that their reason for attending the AED had been related to alcohol.

Full service-use data at both follow-up periods required for the primary economic analysis were available for only 56% of participants. A comparison of the baseline characteristics of those followed-up and those not revealed only that men were less likely to be included in the economic analysis. The additional inclusion of participants with 6-month data only using the LVCF technique for missing data increased the follow-up rate to 396, or 66% of the total number randomised.

In order to test blinding, researchers were asked to predict the randomisation status of a sample of 48 participants after they had completed the 12-month follow-up. The correct condition was forecast in 41.6% of cases.

Attendance at appointment with AHW and treatment fidelity

Examination of the records of AHWs revealed that 84 (29.3%) of those randomised to the experimental arm of the trial attended for an appointment. In addition to this 10 (3.2%) of those in the control arm of the trial also saw an AHW in the AED in the 2 weeks following their entry into the trial. Attendance at the AHW appointment was greater among older participants (Beta = 0.03, p= 0.006). Those who thought their attendance in the AED was related to alcohol were 2.7 times more likely to attend the appointment and those offered an appointment with the AHW on the same day as their attendance in the AED were six times more likely to attend.

Of the random sample of 50 sets of AHW notes that were examined, 50 (100%) made reference to current patterns of consumption, 49 (98%) made reference to the clients drinking history and 41 (82%) provided details of information given and/or referral to other services.

Alcohol consumption at six and twelve months

Levels of alcohol consumption at six and twelve months are presented in table 3. The distribution of primary and secondary outcomes at both points was positively skewed. Log and square root transformation of the data was unsuccessful, but comparison findings from non-parametric bootstrapping and parametric t-tests demonstrated the robustness of confidence intervals to non-normality of these outcome measures.

At six months those in the experimental arm of the trial were drinking fewer units of alcohol than those in the control arm of the trial (difference in means = -23.4 units, CI = -42.4 to -4.1, t = -2.4, p = 0.02). At twelve month follow-up participants in the experimental arm of the trial were still drinking less than those in the control condition but the difference was not statistically significant (difference in means = -13.6 units, CI = -29.5 to 2.2, t = -1.7, p = 0.09).

At six months those in the experimental arm of the trial were drinking significantly fewer units of alcohol per drinking day than controls (difference = -4.1 units, CI = -7.2 to -1.1, t = -2.7, p = 0.01). A statistically significant but smaller difference was also observed at 12 month follow-up

(difference = -2.9 units, CI = -5.6 to -0.2, t = -2.8, p = 0.04). Little difference in the percentage of abstinent days was seen at either 6 or 12 months, with those in both arms of the trial consuming alcohol just over once every two days.

Univariate analysis suggested that two factors, gender and number of units consumed during a drinking session at baseline, were associated with higher levels of mean weekly alcohol consumption at 12 months; men consumed more alcohol than women (69.1 units compared to 47.9, F=7.4, p =0.007) and higher levels of baseline consumption predicted higher levels at follow-up (r= 0.32, p <0.001). Multivariate analysis demonstrated that only one factor, lower consumption at baseline (t = 6.2, p<0.001) was associated with lower levels of alcohol consumption at 12 months.

At six months those who attended an appointment with the AHW were drinking a mean of 14 fewer units of alcohol per week than those who did not attend an appointment (60.1 units compared to 74.0, F=1.02, p=0.31). Other factors that were associated with reduced alcohol consumption also predicted attendance at an appointment with an AED, including age, belief that initial presentation was related to alcohol and being a repeat attender. When these factors were included in a multivariate model the effect of attendance at an appointment with an AHW on weekly alcohol consumption remained, but did not reach statistical significance. No difference in mean weekly alcohol consumption at twelve months was seen among those who attended an appointment with an AHW and those who did not (63.3 units compared to 64.2).

Secondary outcome measures

Secondary outcome measures at six and 12 months are presented in table 4. Those in the experimental arm of the trial made 0.5 fewer visits to the AED in the year following randomisation. Differences in general mental health, suicidal ideation and quality of life were not seen, but those in the experimental arm of the trial were more likely to report that they had intentionally harmed themselves at some point in the year. Thirty four (17.3%) of 196 in the experimental arm of the trial and 17 (7.9%) of the 214 in the control arm of the trial reported deliberately harming themselves on at least one occasion (difference = 9.4%, CI =3.0 to 16.3). Univariate analysis suggested that four other factors predicted DSH in the year following randomisation, female gender, higher baseline alcohol consumption, higher levels of attendance at AED in the six months prior to randomisation and initial presentation with a psychiatric problem all increased the likelihood of deliberate self harm over the follow up period. A multivariate model of factors associated with DSH was built using forward stepwise regression. Randomisation status remained in this model with those randomised to the experimental arm of the trial being 2.3 times more likely to report harming themselves in the year following entry into the trial.

Economic evaluation

Table 5 lists the resources used by those in the experimental and control arm of the trial over the 12-month follow-up period. Use of services varied between the two groups but no particularly large differences were observed. Alcohol treatment services (excluding the AHW in A&E) were used by individuals in both groups. These included hospital-based treatment services, community support programmes run by the public and voluntary sectors and self-help groups such as Alcoholics Anonymous. On aggregate, 33% of those in the experimental and 31% of those in the control arm of the trial had any contact with an alcohol treatment service, a difference that was not statistically significant.

Table 6 details the total costs per patient over the 12-month follow-up period. Total costs per patient were £21,015 in the AHW group and £19,659 in the control group. This difference of £1,446 was not statistically significant (p=0.47). Total NHS costs were lower in the AHW group (£2,641 versus £2,774), but this difference was also non-significant (p=0.87). Accommodation accounted for the greatest proportion of total costs (over 80%), whilst NHS costs were 16% of total costs in the AHW group and 17% in the control group.

Sensitivity analyses were undertaken to assess the generalisability of the results by replacing all local unit costs with national unit costs. This resulted in lower mean costs in both groups but no change in the statistical significance of the difference between the groups. Using the LVCF technique to impute missing data increased the number of cases included in the analysis but differences in costs remained statistically insignificant. Finally, increasing the cost of the AHW intervention to the potential maximum cost (based on estimated maximum length of an individual session) does not change the results to any significant extent.

Cost-effectiveness

The primary clinical outcome measure (units of alcohol consumed per week) was used to explore the relative cost-effectiveness of the interventions. Considering costs to all services and the economy, observed data suggest that the AHW intervention for hazardous drinking in AED was both more effective and more costly than usual care. The consequent ICER was £123 per unit decrease in the number of units of alcohol consumer per week. The statistical uncertainty surrounding the ICER is represented in the cost-effectiveness acceptability curve in figure 2. It demonstrates that the AHW dominates the control intervention over the full range of values that a decision-maker might be willing to pay for a reduction in units of alcohol consumed per week. The curve for the AHW shows that there is more than a 70% probability that the AHW is more cost-effective than the control intervention.

DISCUSSION

This study demonstrated that among people found to be drinking excessive alcohol during treatment in an AED, referral for brief intervention from an alcohol health worker was associated with lower alcohol consumption at 6 month follow up than provision of an information leaflet on alcohol and health. Levels of alcohol consumption at 12 months were lower among those referred for brief intervention at 12 months but the difference was no longer statistically significant. Furthermore the study confirmed findings of previous work in the department that focussed screening and brief intervention for alcohol misuse is feasible in this setting.

Over a 12 month period more than 5,000 patients who presented to the AED with one of 10 conditions that are most commonly associated with excessive alcohol consumption were screened for hazardous drinking. Of these over a fifth were found to be drinking hazardously and two-thirds agreed to accept an offer of brief intervention. At six month follow up those given an appointment with an AHW consumed significantly fewer units of alcohol per week and fewer drinks per drinking day than those given an information leaflet about alcohol and health. At twelve month follow up, those offered an appointment with an AHW continued to consume fewer drinks per drinking day but differences in mean weekly alcohol consumption were no longer statistically significant.

Lower levels of re-attendance in the AED were seen among those referred for brief intervention. With a mean reduction of 0.5 visits per person in the experimental arm of the trial, the number needed to treat, in order to avoid one visit to the AED, was two. In other words, for every two people that were referred for brief intervention one visit to the AED over the following 12 months was avoided. Lower levels of alcohol consumption among those referred for brief intervention were not associated with differences in mental health or quality of life.

There were no statistically significant differences in costs or cost effectiveness over the 12-month follow-up period. However, using a decision-making approach to consider the relative costs and effects of the intervention, cost-effectiveness acceptability curves demonstrated that there is at least a 70% probability that referral to an AHW is the more cost-effective strategy in reducing the consumption of alcohol among AED attenders with a hazardous level of drinking. In addition, the brevity of the treatment, its low cost and short-term efficacy add to its case for selection.

Study limitations

In this pragmatic trial we aimed to maximise the recruitment of patients by limiting exclusion criteria and using clinical staff in the department to recruit study participants. While this enabled us to recruit a broad range of participants it meant that we collected limited baseline data and recruited a population that proved difficult to follow-up. Herein lie two limitations of the study. The limited amount of baseline data that we obtained meant that we were unable to examine *changes* in alcohol consumption, mental health, quality of life and costs that may have taken place after

entry into the study. While data from baseline PAT provided an indication of alcohol consumption prior to randomisation we do not know how many units of alcohol study participant were drinking before entry into the study. Comparison of baseline characteristics of those in each arm of the trial suggests that randomisation was successful but it is possible that baseline differences in alcohol consumption or other outcomes were present at the start of the trial. Such differences could contribute to the apparent differences in levels of alcohol consumption, reattendance at the AED and suicidal behaviour that we found.

Previous studies in the AED have demonstrated that users of emergency services can be difficult to follow up with studies regularly reporting almost half of study participants failing to complete follow up interviews [14,9]. Our reliance on clinicians in the AED to recruit study participants led a number of people (n=34, 5.7%) who did not have a permanent address in London being inappropriately randomised into the trial. Our decision to seek confirmation of consent to follow-up interviews may have further reduced the follow-up rate, although we felt this was a necessary step to ensure ethical standards of recruitment. Our failure to collect data on over a third of those who were randomised needs to be taken into consideration when interpreting the study findings. The rate of loss to follow-up was similar in each arm of the trial and characteristics of those who did and did not complete the 12 month follow-up did not differ significantly. However it is possible that differences in the impact of the intervention among those we did not follow up exist and that collection of follow data on all participants would have led to a different estimate of the impact of the intervention.

Our attempts to avoid interviewer bias by blinding researchers who collected follow up data appear to have been successful. Researchers correctly identified less than half of those who were referred for brief intervention. However it is possible that study participants awareness' of the type of intervention they received could have affected their responses to questions about subsequent use of alcohol. Previous studies that have compared self-reported alcohol consumption with biological correlates of excessive alcohol consumption have concluded that self-report measures provide an accurate measure of consumption [47,48]. We believe that restricting follow up measures to interviews enabled us to maximise recruitment and limit loss to follow up.

While current service provision in Britain and elsewhere means that the vast majority of people who attend AEDs and drink excessive alcohol receive no intervention, we considered it unethical to randomise control patients to no intervention in a department where routine screening for alcohol misuse has been operating for over 15 years. In this study control patients were told by staff that they were drinking excessive alcohol and given an information leaflet on alcohol and health that included information about local and national alcohol services. This interaction in itself constitutes a brief intervention and previous research has demonstrated the beneficial effects of health education leaflets on alcohol consumption [49]. Forty-two (26% of the 162 CT participants who completed the economic analysis) of those in the control arm of the trial made contact with

community alcohol services in the year following their attendance in the AED. By comparing two forms of active intervention we are likely to have underestimated the impact that referral for brief intervention would have had, if it had been compared to treatment as usual in most other AEDs.

Impact of referral for to the alcohol Health Worker and attendance at an appointment

Patients who received referral for brief intervention were drinking a mean of 23 fewer units of alcohol per week at six months than those who were provided with an information leaflet. At twelve months the difference was approximately 14 units. The reason for the reduction in the difference between the groups was that control patients were drinking less alcohol at 12 months than they were at six months. While previous studies have reported that the impact of brief interventions may be short lived [50] we found that levels of alcohol consumption among those in the experimental arm of the trial did not increase between 6 and 12 months after the intervention was delivered.

While levels of alcohol consumption in those that received active intervention were lower than those who did not, levels of alcohol consumption remained high in both groups. At the six month follow-up 108 (62.1%) of those in the experimental arm of the trial were drinking more than recommended weekly limits [51,52] compared to 136 (72.3%) of those in the control group. The number needed to treat in order to help one person become a non-hazardous drinker was therefore 10. These results suggest that although referral for brief intervention can produce reductions in people's alcohol consumption, it is less successful at reducing consumption to a level that will not damage their health.

Although the study demonstrated reductions in alcohol consumption among those referred for brief intervention, less than a third of those referred for an appointment attended it. This level of attendance is lower than previous occurred in the department [9]. Prior to the start of the study AHW visits to the AED were reduced from five [9] to three a week. Higher rates of attendance at AHW appointments were found among older patients, those who believed their attendance was related to alcohol and those given an appointment to see the AHW on the same day as they presented to the AED. We believe that the reduction in the number of days that the AHW attends the department contributed to the reduction in attendance.

While referral for an appointment with an AHW was associated with lower levels of alcohol consumption at six months we did not find a statistically significant reduction in the amount of alcohol consumed by those who attended an appointment compared to those that did not attend. The study was not designed to examine the impact of attendance at an appointment with an AHW and the low level of attendance at the appointment meant that we had limited statistical power to examine the impact of seeing an AHW.

Implications for service delivery

This study provides further evidence that screening and brief intervention for alcohol misuse among people attending AEDs is possible. In addition to reducing levels of alcohol consumption brief intervention leads to lower levels of re-attendance in the AED in the following year. For every two people referred for brief intervention, one subsequent attendance in the AED was avoided. In this study eight people needed to be screened in order to identify two who were drinking hazardously. The use of a brief screening instrument such as the PAT means that large numbers of people can be screened in a relatively short period of time. We estimate that the time taken to screen patients and refer those drinking hazardously is less than the additional time taken up by people who would otherwise reattend the department.

It is difficult to account for the increase in suicidal behaviour that we found among those referred for brief intervention. The absence of a measure of baseline suicidal ideation means that we can not rule out the possibility that, through chance, those in the experimental arm of the trial were more inclined to suicidal behaviour prior to their recruitment into the study. Alternatively the apparent association could be the result of chance (a type I error). The lack of effect on mental health status or even suicidal ideation makes this finding even more difficult to interpret. However we cannot rule out the possibility that referral for brief intervention had a detrimental effect on mental health and that this contributed to the higher rate of deliberate self harm that was seen in this group. While studies that have examined the impact of health consequences feedback on health anxiety have not reported consistent findings [53], health anxiety following feedback from opportunistic screening has been reported [54]. The impact of opportunistic screening and referral for brief intervention for excessive alcohol consumption is worthy of further investigation.

Future areas of enquiry

Our finding that less than a third of those who were referred for an appointment with an AHW attended it are in sharp contrast to previous work in the department when 60% attended. Since 1998, when the previous study was undertaken, the number of days per week that the AHW attends the department has fallen from five to three. Given our finding that those referred for an appointment on the same day as their attendance in the AED were six times more likely to attend than those given an appointment on a different day, the reduction in the number of days that the AHW attends seems the most likely explanation for the reduced level of attendance observed during this study. Factors that influence whether people are willing to accept the offer of brief intervention need to be further explored. Our findings suggest that there may be a 'teachable moment' during which a patient is willing to accept intervention, but that delaying its delivery may mean that a person is less willing to accept it. An investigation of the 'half-life' of the teachable moment in this and other contexts could assist the development of optimal methods for delivering brief interventions for alcohol misuse.

While this study has demonstrated that referral for brief intervention in the AED can be effective, important logistical barriers to the more widespread adoption of this practice exist [55]. Continuing time pressure on those who work in AED and professional ambivalence toward screening are important obstacles to screening and brief intervention in the AED [21,56]. Conversely the development of even simpler and quicker ways to identify and manage hazardous drinkers would support the more widespread use of screening and brief intervention. We believe that it may be possible to develop instruments for detecting hazardous drinking that are even shorter than the PAT. Findings from this study suggest that a recommendation that someone should have an appointment to discuss their alcohol consumption may in itself be an important brief intervention. By involving staff who are already in contact with patients, the level of acceptance of the intervention can be increased [15]. The impact of screening and referral to *local community-based* alcohol services should be evaluated as this might provide a simpler and less costly intervention in areas where AED-based brief interventions for alcohol misuse are not available.

Although levels of attendance at appointments was low, two thirds of those who drank excessively agreed to accept the offer of a brief intervention and 303 (68.8%) believed that their attendance was related to their consumption of alcohol. In addition to public health interventions aimed at reducing the level of alcohol consumption, further work to identify the prevalence of alcohol misuse in other medical meetings, and the acceptability of brief intervention, may provide additional opportunities to intervene to reduce the potentially health harming effects of excessive alcohol consumption.

Future studies of brief intervention for alcohol misuse would provide important opportunities to test our chance finding of a possible association between active treatment and increase incidence of suicidal behaviour.

CONCLUSIONS

Screening and referral for brief intervention for alcohol misuse in an AED is feasible and results in lower levels of alcohol consumption over the following six months. Reduced alcohol consumption is associated with lower levels of reattendance in the department. Although the cost-effectiveness of the intervention from a societal perspective is unclear, cost-effectiveness acceptability curves suggest that there is over a 70% probability that the AHW intervention is more cost-effective than the control intervention.

The findings of this study lead us to conclude that patients attending AEDs should be screened for alcohol misuse and that those found to be consuming excessive alcohol should be referred for brief intervention.

Figure 1. CONSORT diagram showing patients flow through the study (from screening to 12 month follow-up).

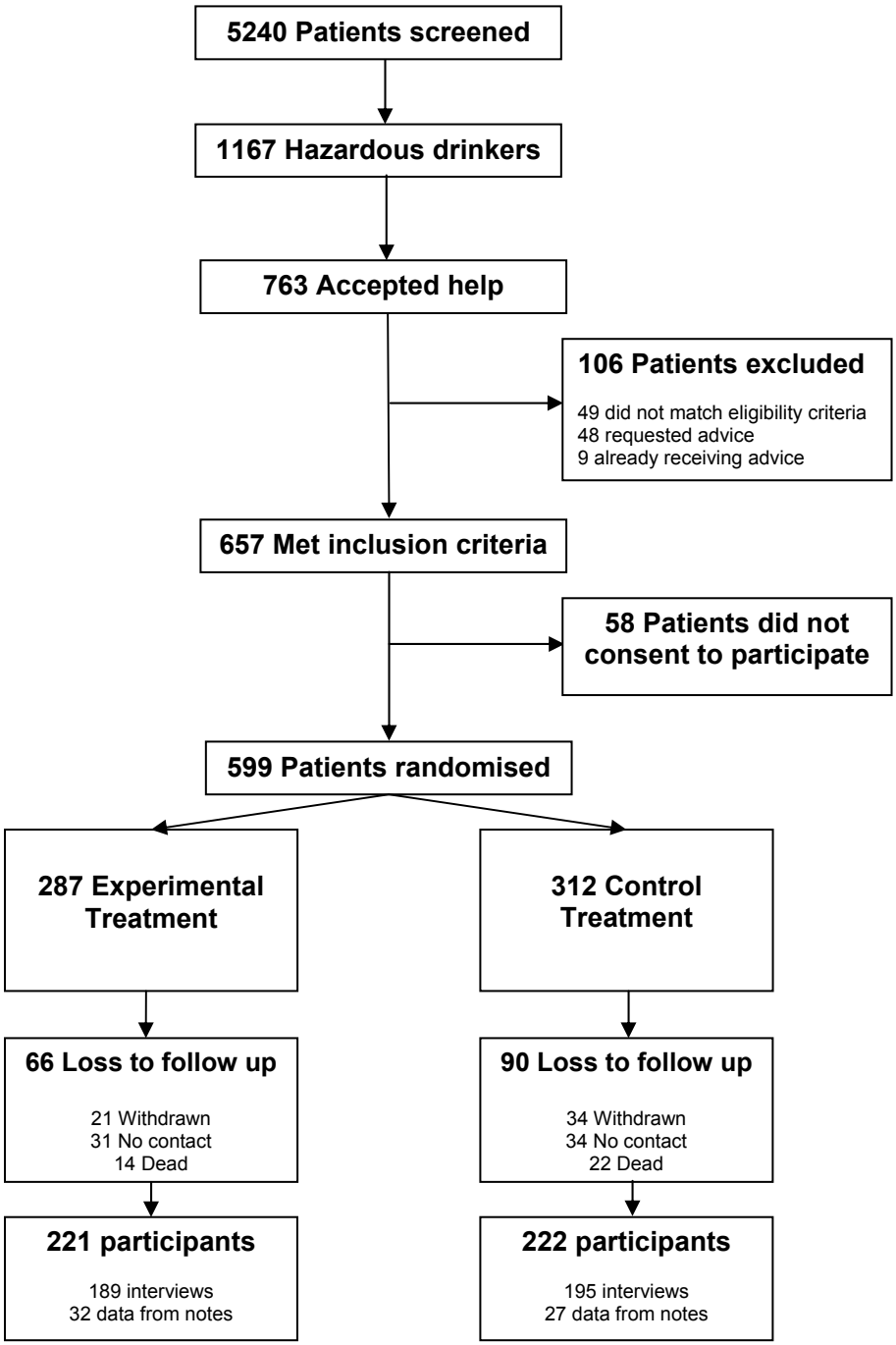


Table 1: Comparison of baseline characteristics of 599 participants randomised to experimental or control treatment.

Characteristic		Control Treatment N=312	Experimental Treatment N=287	Difference in means or proportions (95% CI)
Age in years (mean)		44.5	43.1	-1.4 (-3.8 to 0.9)
Sex: male		248 (79.5)	220 (76.7)	-2.8 (-9.5 to 3.8)
Presenting Condition	**Fall**	56 (17.9)	39 (13.6)	-4.3 (-10.2 to 1.5)
	Collapse	41 (13.1)	42 (14.6)	1.5 (-4.1 to 7.0)
	Head Injury	12 (3.8)	21 (7.3)	3.5 (-0.2 to 7.2)
	Assault	39 (12.5)	26 (9.1)	-3.4 (-8.4 to 1.5)
	Gastrointestinal	39 (12.5)	34 (11.8)	-0.7 (-5.9 to 4.6)
	Unwell	35 (11.2)	48 (16.7)	5.5 (-0.1 to 11.1)
	Psychiatric	27 (8.7)	26 (9.1)	0.4 (-4.2 to 5.0)
	Cardiac	23 (7.4)	19 (6.6)	-0.8 (-4.8 to 3.3)
	Accident	21 (6.7)	9 (3.1)	-3.6 (-7.0 to -0.2)*
	Other	19 (6.1)	23 (8.0)	1.9 (-2.2 to 6.0)
Mean units consumed during drinking session		20.9	21.5	0.6 (-1.6 to 2.8)
Believed initial AED attendance related to drinking		162 (71.7)	141 (65.9)	-5.8 (-14.4 to 2.9)

*$p < 0.05$.

Table 2: Comparison of baseline characteristics among study participants who were and were not followed-up at 12-months

Characteristic		Followed up 384 (%)	Not followed up 215 (%)	Difference in means or proportions (95% CI)
Age in years (mean)		43.9	43.7	-0.2 (-2.3 to 2.6)
Sex: male		293 (76.3)	175 (81.4)	5.1 (-1.6 to 11.8)
Presenting Condition	**Fall**	57 (14.8)	38 (17.7)	2.9 (-3.4 to 9.1)
	Collapse	56 (14.6)	27 (12.6)	-2.0 (-7.7 to 3.6)
	Head Injury	22 (5.7)	11 (5.1)	-0.6 (-4.4 to 3.1)
	Assault	44 (11.5)	21 (9.8)	-1.7 (-6.8 to 3.4)
	Gastrointestinal	43 (11.2)	30 (14.0)	2.8 (-2.9 to 8.4)
	Unwell	49 (12.8)	34 (15.8)	3.0 (-7.0 to 1.1)
	Psychiatric	37 (9.6)	16 (7.4)	-2.2 (-6.8 to 2.4)
	Cardiac	31 (8.1)	11 (5.1)	-3.0 (-7.0 to 1.1)
	Accident	18 (4.7)	12 (5.6)	0.9 (-2.8 to 4.6)
	Other	27 (7.0)	15 (7.0)	0.0 (-4.3 to 4.2)
Mean units consumed during drinking session		21.1	21.4	0.3 (-2.6 to 2.0)
Believed initial AED attendance related to drinking		190 (65.7)	113 (74.8)	9.1 (0.3 to 17.9)*

*$p < 0.05$

Table 3: Alcohol consumption among those in the experimental and control arm of the trial at 6 and 12 months

Outcome	6 Months			12 months		
	Experimental Treatment N=174	**Control Treatment N=189**	**Difference in means (95% CI)**	**Experimental Treatment N=189**	**Control Treatment N=195**	**Difference in means (95% CI)**
Mean weekly consumption (units)	59.7	83.1	-23.4 (-42.4 to -4.1)*	57.2	70.8	13.6 (-29.50 to 2.19)
Mean units consumed per drinking day (DDD)	13.0	17.1	-4.1 (-7.2 to -1.1)**	13.1	16.0	2.9 (-5.60 to -0.16)*
Percentage Days Abstinent (PDA)	46.1	41.9	4.2 (-3.2 to 11.6)	48.0	44.6	3.4 (-3.50 to 10.2)

* p <0.05, ** p<0.01

Table 4: Secondary outcomes among those in the experimental and control arm of the trial

Outcome	6 Months			12 months		
	Experimental Treatment N=174	**Control Treatment N=189**	**Difference in prop. (95% CI)**	**Experimental Treatment N=189**	**Control Treatment N=195**	**Difference in prop. (95% CI)**
Mean number of attendances at local AED	-	-	-	1.2	1.7	0.5 (-1.1 to -0.02)*
GHQ +ve (cut off point 4+)	69 (44.2)	69 (40.1)	4.1 (-6.58 to 14.80)	-	-	-
Mean EQ-5D single score	-	-	-	0.69	0.71	0.02 (-0.09 to 0.05)
Suicidal ideation	68 (43.3)	68 (39.8)	3.5 (-7.16 to 14.16)	62 (38.8)	68 (38.6)	0.2 (-10.30 to 10.50)
Deliberate self harm	24 (15.2)	13 (7.5)	7.7 (0.84 to 14.50)*	16 (10.0)	6 (3.4)	6.6 (1.25 to 12.00)*

* $p < 0.05$.

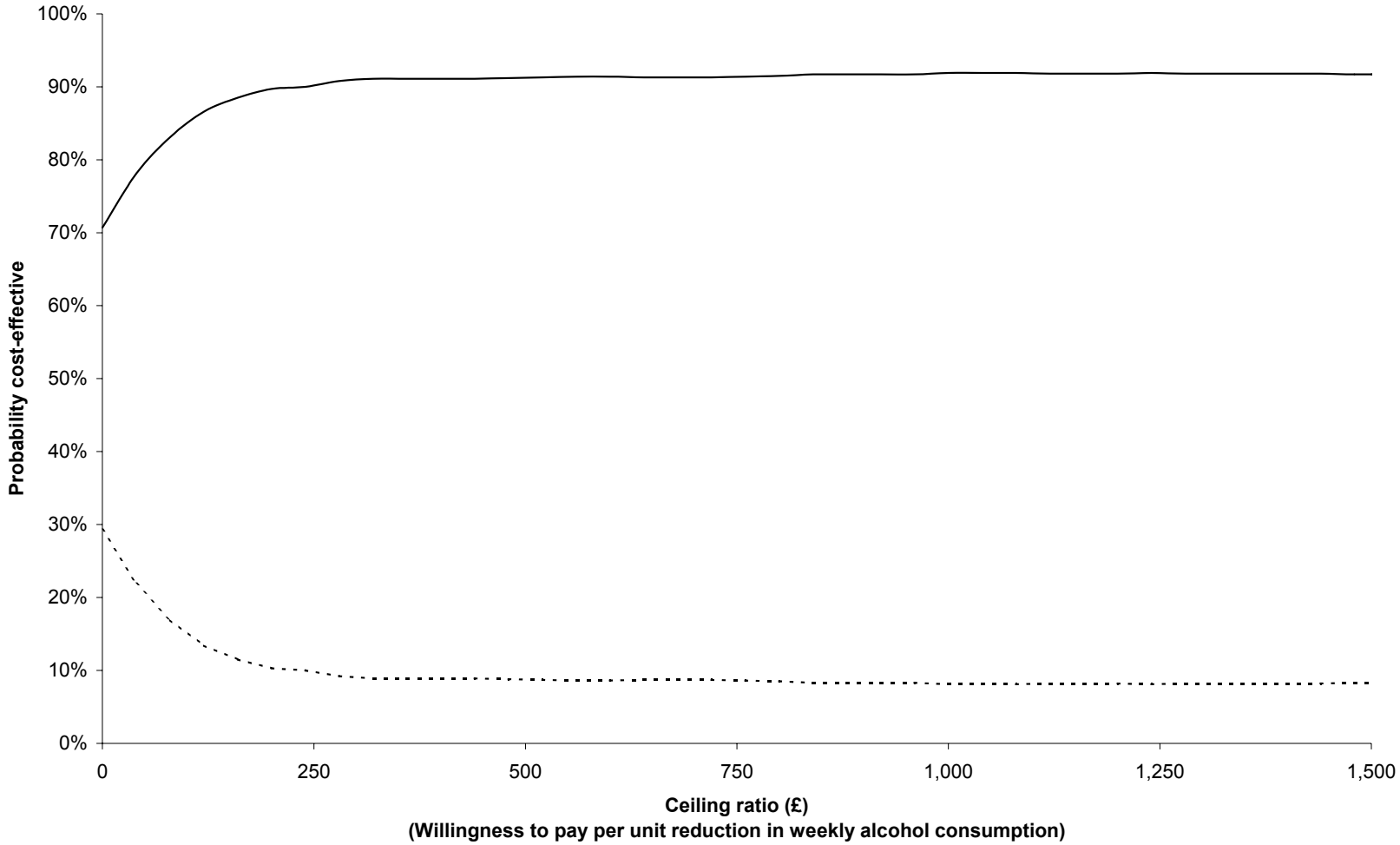
Table 5: Use of resources during the 12-month follow-up period

Service (unit)	Use of resources. Mean (s.d.)		Unit cost or range
	Experimental group (n=131)	Control group (n=159)	
Alcohol Services			
Inpatient (day)	4 (19)	4 (24)	179
Outpatient (attendance)	1 (9)	0 (0)	67
Daypatient (attendance)	0 (0)	0 (4)	67
Other alcohol support (contacts)	8 (29)	6 (24)	5-30
Hospital Services			
Accident and emergency (attendance)	1 (2)	1 (2)	75
Emergency ambulance (calls)	1 (1)	1 (1)	263
Inpatient (days)	3 (7)	4 (14)	186 – 1,206
Outpatient (attendance)	2 (4)	2 (9)	27-231
Daypatient (attendance)	0 (0)	0 (0)	86
Primary Care			
General practitioner (contact)	6 (10)	5 (7)	14 – 44
Practice nurse (contact)	0 (1)	1 (3)	9
District nurse (contact)	1 (6)	1 (7)	19
Community psychiatric nurse (contact)	0 (2)	0 (2)	26
Community psychiatrist (contact)	1 (2)	0 (1)	103
Clinical psychologist (contact)	1 (3)	0 (1)	31
Occupational therapist (contact)	0 (1)	0 (0)	44
Counsellor (contact)	1 (7)	1 (5)	30
Other social and non-statutory services			
Social worker (contact)	1 (4)	1 (3)	30
Social work assistant (contact)	0 (4)	3 (20)	21
Home help (contact)	6 (34)	4 (29)	9
Advice (contact)	2 (5)	2 (5)	22
Solicitor (contacts)	1 (3)	0 (2)	44
Fire service (domestic call out)	0 (0)	0 (0)	3,561
Other (contact)	2 (6)	1 (4)	2 – 45
Criminal Justice			
Police (contact)	1 (3)	7 (80)	23 – 46
Probation officer (contact)	1 (5)	0 (4)	30
Prison (nights)	0 (3)	1 (7)	52 – 69
Court (days)	0 (1)	0 (1)	605 – 9,457

Table 6: Twelve-months costs per patient

	Experimental group (n=131)			Control group (n=159)			Mean Difference (95% CI)		
	Mean	(SD)	%	Mean	(SD)	%			*P*
NHS	2,641	(5,603)	13	2,774	(7,692)	14	-133	(-1,719 to 1,453)	0.87
Hospital	2,385	(5,478)	11	2,576	(7,635)	13	-192	(-1,758 to 1,375)	0.81
Primary care	257	(482)	1	198	(370)	1	59	(-40 to 157)	0.24
Social services	71	(322)	0	117	(662)	1	-46	(-170 to 79)	0.47
Voluntary services	106	(265)	1	54	(148)	0	52	(1 to 103)	0.05
Fire services	190	(1,110)	1	134	(681)	1	56	(-153 to 265)	0.60
Criminal justice	310	(1,524)	1	274	(1,324)	1	36	(-294 to 365)	0.83
Accommodation	17,573	(13,174)	84	16,211	(13,129)	82	1,361	(-1,693 to 4,415)	0.38
Productivity	119	(401)	1	94	(345)	0	25	(-61 to 111)	0.56
Total	21,015	(15,458)	100	19,659	(16,076)	100	1,356	(-2,314 to 5,025)	0.47

Figure 2: Cost-effectiveness acceptability curve: probability that AHW is cost-effective (CT = broken line, ET = unbroken line)



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