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Randomised controlled trial of two brief interventions against long-term benzodiazepine use: Cost-effectiveness

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Abstract
Previous findings have indicated that a letter from a patient's General Practitioner (GP) and a short GP consultation leads to reduced intake among long-term benzodiazepine (BZD) users. To compare the cost-effectiveness and potential cost savings of these two brief interventions. Economic evaluation conducted alongside a prospective randomised controlled trial from the perspective of the NHS. A total of 273 long-term BZD users (=>6 mos) at seven general practices and regarded by their GPs as suitable to take part in the study within the Newcastle and North Tyneside District Health Authority were identified from repeat prescription computer records. Patients were randomised to usual GP care + assessment only or the offer of a short consultation (12 mins approx) with the patient's GP (or practice pharmacist/practice nurse) or a letter signed by the GP advising gradual reduction in BZD intake. Economic measures taken were: costs of intervention; savings (costs) of changes in health service use from before to after intervention; savings to the NHS from reductions in drug use and dispensing costs; total costs of brief intervention; simulations of savings (costs) extrapolated to the District Health Authority. The letter was the more cost-effective intervention when taking into account changes in health service use and savings to the drugs bill. If all GPs in Newcastle and North Tyneside screened long-term BZD users on their lists and sent the letter studied here to those considered suitable to receive it, it is estimated that savings to the District Health Authority would be a minimum of £4.9 million per annum. Routine implementation of the letter intervention in general practice throughout the UK would result in large financial gains to the NHS. These savings represent a conservative estimate of savings to the public sector, as wider savings to the social care system may also be expected as a result of the policy.

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Introduction

A companion paper (Heather et al. 2004) reported the results of an RCT of two forms of brief intervention – the offer of a short consultation with the patient's GP or a letter to the patient signed by the GP advising a gradual reduction in BZD intake – in their effects on BZD consumption among long-term users (>= 6 mos). The main findings were that both forms of intervention resulted in significantly greater reductions in BZD intake than a control condition in which patients were given an assessment only but that there were no significant differences in this respect between the two interventions. There was no evidence that brief interventions increased psychological distress or had an adverse effect on general health.

This article concerns an economic evaluation of the brief interventions and includes calculations of (i) the costs of intervention, (ii) possible savings or costs resulting from changes in health service use, (iii) any savings to the NHS from reductions in drug use and dispensing costs, (iv) the total costs of brief intervention and (v) simulations of savings or costs extrapolated to the District Health Authority based on the routine application of the methods of delivering brief interventions reported here. The economic design was cost minimisation given that there were no significant differences in health outcomes between the interventions as measured by the GHQ and nine SF-36 sub-scores, although a significant improvement was found in the SF-36 mental component for patients undergoing a true reduction on benzodiazepine use. The study was conducted from an NHS perspective, and a cost minimisation design is used based on the findings from the companion paper above (Heather et al. 2004).

Methods

Details of recruitment of general practices and patients, inclusion and exclusion criteria, forms of intervention and other aspects of study protocol are given in the companion paper (Heather et al. 2004). Ethical approval for the study was obtained from Newcastle and North Tyneside Health Authority/University of Newcastle upon Tyne/University of Northumbria at Newcastle Joint Ethics Committee.

A total of 284 patients were randomly allocated to a Consultation group ($n = 98$), a Letter group ($n = 93$) or an assessment-only Control group ($n = 93$). Eleven patients were subsequently withdrawn from the analysis because they had died during the follow-up interval or had left the practice and information on the main outcome measure was unavailable. This left 273 patients (95 in the Consultation group, 88 in the Letter group and 90 in the Control group) for analysis. At six month follow-up, 188 patients (69%) attended the surgery, were interviewed at home or filled in a postal questionnaire. Relatively more retired patients were contacted at follow-up while the non-follow up group contained more patients who were employed or economically inactive (sick or homemakers) ($\chi^2 = 7.86$, $df = 1$, $p = 0.019$).

No significant differences were detected on any variable between the data collected from face to face interviews and data collected by postal questionnaires and these data were

merged before analysis. Differences in follow-up rates between the three study groups (Consultation group = 68.4%; Letter group = 68.2%; Control group = 70.0%) were not significant ($\chi^2 = 0.29$, df = 2, $p = 0.87$). Complete economic data was available for 184 of the 188 patients followed up, Consultation group ($n = 65$), a Letter group ($n = 57$) or an assessment-only Control group ($n = 62$).

Economic measures

Change in BZD intake between the six month periods before and after the intervention is one of the major economic outcomes. This was taken from practice records and was available for all 273 patients entering the analysis. BZD intake for each patient was converted to a standard measure of 10 mg diazepam equivalents (Ashton 1994). The intervention costs were estimated from data provided by Newcastle and North Tyneside Health Authority, Newcastle City Health NHS Trust and the Department of Health.

Data on use of health services were taken from the *Health Services Utilisation Questionnaire*, an instrument adapted from a previous questionnaire developed at the University of York and used to record patients' use of various health services over the past three months which has been used in several large economic evaluations (UKATT Research Team 2005; Coulton et al. 2006). Patients were asked to record all GP consultations. This would include the intervention consultation for this group. A three month period was used to allow better recall of events by patients. Costs of health service use were compared between the three months prior to assessment and to follow-up for the two interventions and control groups (see Table I). Costs were calculated by multiplying quantities if resources used in the period by a unit cost for each item. Unit costs are presented in Table II, and are taken from the PSSRU Unit Costs of Health and Social Care (Coulton et al. 2006) and Department of Health Reference Costs (Curtis and Netten 2005).

Analysis

The information collected as part of the study is presented below in five parts. The differential costs of the two brief interventions, the letter and the consultation, are the first calculations to be presented. Because of difficulties in successfully carrying out the GP intervention, alternative delivery methods were considered and the potential costs of using a practice pharmacist are included in this section.

The second part of the analysis covers changes in health service use before and after the intervention and comprises those with baseline questionnaire and follow-up interview data ($n = 184$). For each individual, a figure for costs or savings from the change in health service use from the three months before assessment to the three months prior to follow-up was calculated using average costs for each type of use. Figures are presented in this section as average net savings (costs) of each intervention compared to the assessment-only controls. Reductions in BZD intake also involve direct savings to the NHS in the form of reductions in drug use and dispensing costs. In the third part of the analysis, the average savings (costs) for individuals in the two intervention groups are presented compared to the assessment-only controls.

Fourthly, from the three components above, it is possible to calculate a comparison between the interventions and the control group in terms of overall costs (savings). Finally, in the fifth section, a simulation is presented on the net costs (savings) of the interventions

Table I. Health service costs and savings by study group.

	Letter $n=57$		Consultation $n=65$		Control $n=62$	
Baseline	Mean	SD	Mean	SD	Mean	SD
GP consultation	31.50	29.90	28.11	26.07	39.61	35.82
GP home visits	24.84	58.94	21.78	55.75	12.37	39.09
Prescriptions	303.25	289.94	344.94	275.57	297.09	281.68
Practice nurse	5.05	8.51	4.71	9.63	8.13	19.12
District nurse	5.61	9.45	5.23	10.70	9.03	21.25
Health visitor	2.81	21.19	.00	.00	.00	.00
Accident & Emergency	52.11	206.43	16.92	66.60	31.94	101.34
Outpatient	97.26	191.27	52.42	167.66	48.44	102.56
Inpatient	341.96	1103.59	.00	.00	257.23	1277.27
Day cases	28.89	152.87	.00	.00	39.85	178.15
Benzodiazepines	10.29	6.36	10.67	6.99	9.42	6.83
Total	904.26	1322.88	502.85	377.51	753.10	1349.21
Follow up						
GP consultation	22.63	24.46	23.69	25.53	28.39	26.50
GP home visits	26.39	59.44	5.45	21.43	11.42	29.91
Prescriptions	372.03	336.82	385.56	324.76	411.27	350.89
Practice nurse	6.95	24.46	4.57	6.44	4.72	7.44
District nurse	7.72	27.17	5.08	7.15	5.24	8.27
Health visitor	.00	.00	.00	.00	.00	.00
Accident & Emergency	22.19	73.39	10.15	39.96	18.63	52.64
Outpatient	97.26	171.58	63.08	124.08	95.94	272.07
Inpatient	104.92	526.34	126.08	747.02	125.04	741.30
Day cases	14.45	109.08	25.34	143.32	203.66	957.29
Benzodiazepines	7.86	6.05	8.40	5.47	7.96	6.03
Total	683.08	636.53	675.47	817.95	912.26	1311.04

Note: All figures in UK pounds at 2004/5 prices.

across a period of one year if these interventions were implemented at a district health authority level.

Results

Costs of intervention

The following section presents the cost of the intervention, measured in 2005 prices. Only patients with full cost data ($n=184$) were included in the economic analysis, which represented 98% of the 188 patients followed up. The average cost per patient of the letter intervention, including costs of retrieving long-term BZD users from practice computer databases and preparation and mailing of letters, was £0.68.

In one practice a practice pharmacist carried out all consultations (27 patients) at a cost of £9.46 per patient. This practice was compared with a practice in the same locality with a similar number of GP partners (6 *vs*. 8). There was no significant difference in effectiveness between the two practices but the practice pharmacist saw twice the number of patients who achieved a ''true reduction'' of 25% or more in BZD intake.

Average cost per patient of the consultation, including the cost of a consultation with the GP (GP's time, booklet and timetable) and an appointment letter, was £18.07. This cost

Table II. Health service costs and savings by study group.

	GP consultation	GP home visits	Prescriptions	Practice nurse	District nurse	Health visitor	A & E	Outpatient	Inpatient	Day cases	Benzo	Intervention	Total cost change
Letter	−8.87	1.55	68.78	1.89	2.11	−2.81	−52.11	0.00	−237.04	−14.45	−2.43	0.68	−242.70
	34.44	65.83	309.00	23.80	26.44	21.19	206.43	226.84	1252.20	190.05	3.54		1418.43
Consultation	−4.42	−16.34	40.62	−0.14	−0.15	0.00	−16.92	10.66	126.08	25.34	−2.27	18.07	180.54
	29.46	57.61	273.14	10.73	11.92	0.00	66.60	175.01	747.02	143.32	4.55		865.09
Control	−11.23	−0.95	114.18	−3.41	−3.79	0.00	−31.94	47.50	−132.19	163.81	−1.47		140.53
	39.26	42.05	387.06	20.28	22.54	0.00	101.34	280.30	1446.35	982.16	3.15		1829.00
Total	−8.09	−5.61	74.13	−0.61	−0.68	−0.87	−32.88	19.77	−73.43	59.67	−2.05		35.95
	34.47	56.04	325.89	18.85	20.95	11.80	134.98	230.35	1181.50	587.86	3.81		1424.01
Over and above control													
LETTER	2.36	2.50	−45.40	5.31	5.90	−2.81	−20.17	−47.50	−104.86	−178.26	−0.96	0.68	−383.23
CONSULT	6.81	−15.39	−73.56	3.27	3.64	0.00	15.01	−36.84	258.27	−138.48	−0.80	18.07	40.01

estimate is used for all cases as we are assuming any potential policy would be implemented at a general practice level, and therefore our estimates are conservative.

Changes in costs of health service use

Among all those with data at both initial assessment and follow-up points, there were significant reductions in the frequency with which patients had consulted their GP ($\chi^2 = 16.02$; $p < 0.001$), received a GP visit ($\chi^2 = 13.496$; $p < 0.001$), seen a practice nurse ($\chi^2 = 9.68$; $p = 0.0019$) and attended an out-patient hospital appointment ($\chi^2 = 10.93$; $p < 0.001$). There were no significant differences between study groups in changes in any aspect of health service use, including GP consultations and home visits. (Full details are available on request.)

A mean health care saving of £217 per patient in the letter group was calculated using bootstrapped cost data. In contrast, health care costs were increased by an average of £190 per patient in the consultation group. (Costs for the consultation group cover only the 3 months prior to assessment and do not include the scheduled GP consultation to discuss reduction of BZD use.)

Direct costs and savings to the NHS

The financial savings of a reduction in BZD use were calculated for cost of tablets and dispensing costs. First, the cost of a single BZD tablet was computed by taking the average cost of each type of BZD tablet and weighting this average by the relative proportions of patients prescribed each type of BZD tablet. A dispensing fee per BZD tablet was included, calculated at £1.20 per 28 tablets or £0.04 per single tablet. The equivalent cost per BZD tablet was calculated to be £0.07 (£0.03 cost of tablet + £0.04 dispensing cost per tablet). The level of change in BZD use was then multiplied by the cost of a single BZD tablet equivalent to provide a cost (saving) figure, per patient, of change in BZD use. The average saving per patient in the letter group was £2.43 (SD = 3.54), in the consultation group £2.27 (SD = 4.55) and in the control group £1.47 (SD = 3.15). Thus, compared to non-intervention controls, the letter group yielded an average saving per patient of £0.96 and the consultation group of £0.80 over a six month period.

Total cost figures

A net cost (saving) figure was calculated for each patient. This figure comprised the cost of the intervention offset against the savings from BZD reduction and from changes in health service use. (The latter figure multiplied by two to give 6 rather than 3 month estimates.) Baseline and follow up costs are presented in Table I. Baseline costs in the intervention group were higher than in the letter group compared to the consultation group. Each patient receiving the letter intervention yielded an average saving of £383 compared to the control group. In the consultation group there was an average increase in costs per patient of £40 compared to controls. Given similar health outcomes and little evidence for any adverse impacts, these results suggest that the letter is not only cost-effective compared to the consultation intervention but also generates financial savings for the NHS.

Table III. Unit costs (2004/5 prices).

Item	Cost	Source
A and E	£110	Curtis, L. and Netten A (2005)
Inpatient	£443	NHS Ref costs (weighted average of all inpatient (TELIP))
Outpatient	£115.5	NHS Ref costs average of first attendance (£142) and follow up (£89) TOPS FAA and TOPS FUA
Day care	£549	NHS Ref costs (weighted average of all outpatient (TDC)
GP	£20	Curtis, L. and Netten A (2005)
PN	£9	Curtis, L. and Netten A (2005)
GP Home	£59	Curtis, L. and Netten A (2005)
District Nurse	£20	Curtis, L. and Netten A (2005)
Prescription	£32.40	Curtis, L. and Netten A (2005)
Health Visitor	£20	Curtis, L. and Netten A (2005)

Sources: Curtis & Netten (2005) and NHS reference costs (Department of Health 2005).

Simulation at the District Health Authority level

Figures for individual patients were extrapolated to provide an estimation of the costs (savings) of intervention versus no intervention at a District Health Authority level. First, the number of long-term BZD users in Newcastle and North Tyneside was estimated from the number of known long-term BZD users in the seven practices in this study (=1297). This figure was divided by 7 (the number of practices in the study) to give an approximate figure for an ''average'' practice (=185) and this was multiplied by 77 (the number of practices in the area) to give an estimate of 14,245 long-term BZD users in the District Health Authority.

It was assumed that all GPs in the district would screen all long-term BZD users on their lists and then send the letter or offer the consultation to those found suitable, with the proportion found suitable being the average of proportions applying to practices in the study. Thus, the average net cost/saving of each intervention was multiplied by 6553 (46% of 14,245) and then by two to arrive at yearly figures. Secondly, added to this was an additional one-off cost of £16,221, the estimated cost of GP time necessary to screen patients for eligibility. GP screening costs were calculated by multiplying the average time per patient for screening (0.60 min) by the estimated cost per minute of GP time (£1.90 based on figures in Government Expenditure Plans), then multiplying this figure by 14,245 (the BZD-using population in the Newcastle and North Tyneside region). The cost of GP screening was then added to the cost/savings of the interventions over the 12-month period. Results are shown in Table III.

Discussion

Higher rates of health care utilization and health problems have previously been reported in the literature (Zandstra et al. 2002). In this article, the absence of significant differences between intervention and control groups means it cannot be concluded that the reductions in the use of health services reported here were an effect of intervention. However, it may be that, as with the decrease in BZD consumption (Heather et al. 2004), the control group showed reductions in health services use as a result of completing the assessment, thus lowering the probability of finding significant effects of intervention on these measures.

Table IV. Estimated net costs/savings for one year for each intervention compared to controls extrapolated to the Newcastle and North Tyneside Health Authority (all costs in 2004/5 prices)[a].

Intervention and cost	Population	Cost change	Intervention cost	Average costs	Average cost of intervention over controls
Letter ((6553 × −£217) × (2)) + £16221	6553	−£241	£16,221	−£3,142,300	−£4,990,300
Consultation ((6553 × +£190) × (2)) + £16221	6553	£181	£16,221	£2,388,400	£540,500
Controls (6553 × +£160) × (2)	6553	£141	£0	£1,847,900	–

Note: [a]Figures may not add due to rounding.

Ignoring potential wider health care savings and given that there were no significant differences in effectiveness of the two interventions, the letter would be more cost-effective than the consultation intervention. When costs and savings of all types were combined (i.e. costs of intervention, costs or savings of changes in use of health services and savings to the drugs bill), each patient in the letter intervention showed an average saving of £383 over a six month period compared to patients in the control group. Thus, in the letter group on average, the costs of intervention were offset by savings in the drugs bill and in use of health services from before to after intervention. In the consultation group, no cost saving was found and there was an average increase in costs per patient of £40 compared to controls. However, the data on the use of health services before and after intervention is very skewed and influenced by some outliers and therefore further research would be useful to replicate these results. Another important research issue is whether changes are sustainable in the longer term, beyond the follow up of this study.

The savings to be made by the District Health Authority if the letter were sent to all long-term BZD users thought suitable by GPs were estimated to be almost £5 million per annum. If GPs in our study had been too conservative in excluding patients and some of the excluded patients would have shown a positive response, the true savings to the Health Authority from sending the letter to suitable patients would be greater than this. In practice, explicit criteria for exclusion could be developed to allow a greater number of patients to receive the letter.

A further assumption on which this estimate was based is that all long-term BZD users deemed suitable for the letter intervention would in fact receive it, i.e. there would be perfect compliance by GPs with the protocol. However, problems were encountered in the study regarding GP compliance with delivery of the consultation and similar problems might well apply to the letter if research support in identifying long-term BZD users and delivering the intervention were not available in routine practice. This is a reason for believing that, depending on the degree of compliance with the protocol shown by GPs, the estimate of savings to be made by implementing the letter intervention would be an over-estimate of those applying to ''real world'' conditions (Table IV).

It is also relevant that the logistic regression analysis reported in the companion paper (Heather et al. 2004) identified one variable predicting a poorer response to either intervention, i.e. the patient's ''stage of change'' (Diclemente and Prochaska 1998) regarding a reduction in BZD use. Thus in an optimal implementation of the findings, a few patients would be offered a more intensive intervention (e.g. ''motivational interviewing'' Miller and Rollnick 1991) than the letter or consultation. This will be pursued in the development of guidelines for GPs based on the present findings. However, in the interests of clarity, this factor has not been taken into account in calculating

simulated savings to the District Health Authority. It should perhaps be emphasised that, because the letter is by far the cheaper intervention and has been shown to be capable of producing substantial savings, it should be the first-line strategy for most long-term BZD users whenever possible.

A serendipitous finding arose from that fact that GPs in one participating practice declared themselves too busy to carry out the consultation which was therefore delivered by the practice pharmacist, with outcomes comparable to those from a similarly-sized practice in the same locality where the consultation was carried out by a GP. The costs of consultation by the practice pharmacist were almost half those of the GP, suggesting that, as their role in primary health care continues to expand, intervention regarding patients' long-term BZD use could become a part of the service offered by practice pharmacists. Although this study provided no economic justification for offering a brief consultation of the kind investigated here, practice pharmacists could be trained to carry out motivational interviewing with patients who do not respond to receiving a letter advising BZD reduction. Given their expert knowledge of drug therapies, intervention by the practice pharmacists may be a solution to the GP's workload problem. This possibility deserves further evaluation.

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